CITY OF TULARE

Storm Drainage System Master Plan

July 2009

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CITY OF TULARE

Storm Drainage System Master Plan

FINAL REPORT

July 2009

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July 13, 2009
7608A00

City of Tulare
411 East Kern Avenue
Tulare, California 93277

Attention: Kenneth Ramage, P.E.

Subject: City of Tulare Storm Drainage System Master Plan

Dear Mr. Ramage:

We are pleased to submit this final report for the City of Tulare (City) Storm Drainage System Master Plan (Master Plan). Enclosed are ten copies of the Master Plan report. The report presents planning assumptions, the evaluation of the storm drainage collection systems, recommended facility improvements to correct existing deficiencies and to serve future growth, and a capital improvement program.

We would like to extend our thanks to you, Mr. Darrel Pyle, City Manager; Mr. Lew Nelson, Public Works Director; Mr. Mike Whitlock, Senior Civil Engineer; Mr. Richard Bono, Wastewater Superintendent, and other City Staff whose courtesy and cooperation were valuable components in completing and producing this report.

Sincerely,

CAROLLO ENGINEERS, P.C.

David L. Stringfield, P.E.
Partner

Tim Loper, P.E.
Project Manager

DLS/TJL:asw

Enclosures: Storm Drainage System Master Plan (10)

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City of Tulare

STORM DRAINAGE SYSTEM MASTER PLAN

FINAL

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City of Tulare

STORM DRAINAGE SYSTEM MASTER PLAN

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STORM DRAINAGE SYSTEM MASTER PLAN

This executive summary presents a brief background of the City of Tulare (City) storm drainage system, the need for this master plan, proposed improvements to mitigate existing system deficiencies, and proposed expansion projects. A summary of capital improvement program costs, through the planning year 2030, is included at the end of this chapter.

ES.1 STUDY OBJECTIVE

On September 21, 2006, the City authorized Carollo Engineers, P.C., (Carollo) to prepare this storm drainage system master plan study, which included the following tasks:

- Establish storm drainage system planning and evaluation criteria.
- Create a hydraulic and hydrologic computer model of the storm drainage system.
- Evaluate the capacity of the existing storm drainage system.
- Review existing system deficiencies and propose improvements to enhance system capacity.
- Recommend improvements needed to service anticipated future growth.
- Develop a Capital Improvement Program (CIP) with a planning horizon of 2030.

ES.2 STUDY AREA

The City is located along Highway 99 in Tulare County within the Central San Joaquin Valley of California, approximately 45 miles south of Fresno and 60 miles north of Bakersfield.

Tulare was founded in 1872 by the Southern Pacific Railroad, and incorporated in 1888. Agriculture is a major component of the City's economy, due to its highly productive farmland. Tulare is attractive to food processors and distributors because of its central location and abundance of locally grown products.

The City recently updated its general plan. The City limits and Urban Development Boundary (UDB), as established from the City's Land Use Diagram are 19 square miles (12,281 acres) and 37 square miles (23,608 acres), respectively. The current City limits and UDB are shown on Figure ES.1. The study area boundary for this master plan is the UDB.

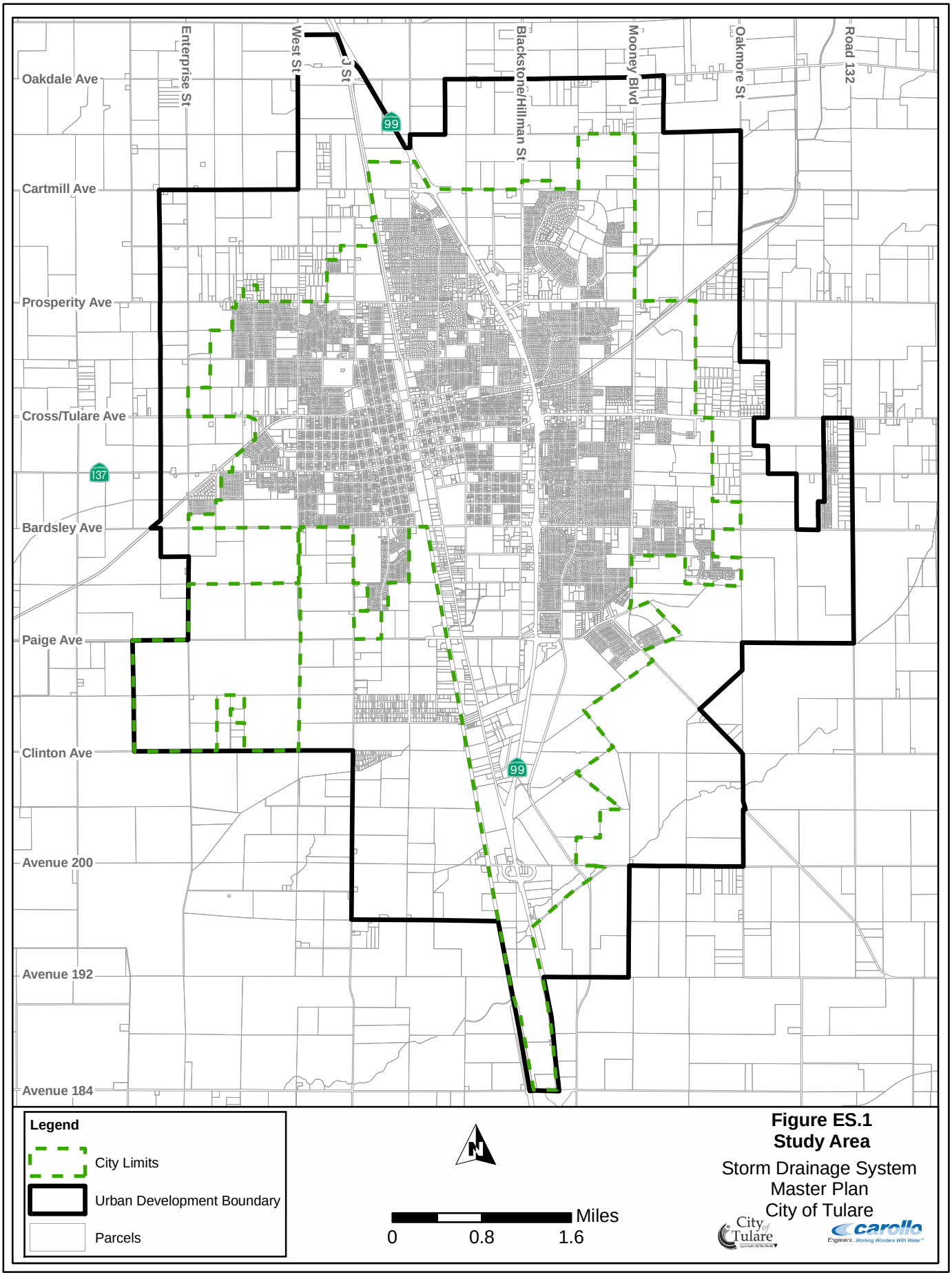


Figure ES.1
Study Area

Storm Drainage System
Master Plan
City of Tulare

ES.3 STORM DRAINAGE SYSTEM OVERVIEW

The existing storm drainage system collects and conveys surface water runoff throughout the City to City-owned stormwater basins and pump stations for retention or discharge to Tulare Irrigation District (TID) owned facilities, where applicable.

The existing storm drainage system shown on Figure ES.2 is composed of neighborhood collection systems, detention basins, retention basins, pump stations, and storm drains. Stormwater is disposed of by percolation and/or by discharge to TID pipelines, canals, and ditches. Discharge to the TID facilities is permitted under an agreement between TID and the City. In general, approval from TID is required prior to discharge to TID facilities, with the exception of certain City owned pump stations, which are permitted to discharge automatically to TID facilities. Figure ES.2 also shows the location of the City storm drain outfalls. Stormwater is discharged through the outfalls either automatically or after a major storm event with TID approval, depending on the pump station.

ES.4 DESIGN STORMS

Two design storms were used for the evaluation of the City's existing storm drainage system and for the design of future storm drainage facilities. The 24-hour, 10-year event was used for evaluating storm conveyance facilities, while the 24-hour, 100-year event was used for evaluating the combined capacity of basins, streets, and pipes. The 10-year and 100-year recurrence intervals have become standard selections in most locations in California because they provide a balance between level of service and affordability, and provide reasonable standards of care. Design storms for the City are provided in Table ES.1.

ES.5 EVALUATION AND PROPOSED IMPROVEMENTS

The City's existing and future collection system were evaluated under the design flow conditions presented in Table ES.1 using the evaluation criteria presented in the body of this report. A hydraulic and hydrologic computer model was assembled and used in the evaluation of the City's existing storm drainage system and for planning future facilities.

In general, existing capacity deficiencies were identified in older areas of the City (i.e. Downtown Subbasin) where storage is currently unavailable or lacking. Many of the older storm drains within the City were sized to convey discharge from the City's Class I pump stations, which do not have enough pumping capacity to convey peak runoff generated within the system.

The proposed improvements mitigate existing deficiencies and to serve future growth are shown Figure ES.3. Details of each improvement are also provided in Table ES.2.

Table ES.1 Depth-Duration-Frequency Data Storm Drainage System Master Plan City of Tulare											
	5-min	**10-min**	**15-min**	**30-min**	**1-hr**	**2-hr**	**3-hr**	**6-hr**	**12-hr**	**24-hr**	**48-hr**
2-year	0.16	0.21	0.25	0.34	0.45	0.55	0.62	0.76	0.92	1.13	1.38
5-year	0.23	0.31	0.36	0.48	0.64	0.79	0.89	1.09	1.34	1.65	2.03
10-year	0.31	0.4	0.46	0.6	0.77	0.95	1.07	1.32	1.63	2.01	2.48
25-year	0.39	0.5	0.57	0.73	0.93	1.15	1.3	1.61	1.99	2.47	3.05
50-year	0.46	0.58	0.66	0.83	1.05	1.3	1.47	1.83	2.26	2.8	3.47
100-year	0.53	0.66	0.75	0.93	1.16	1.44	1.63	2.03	2.52	3.13	3.88

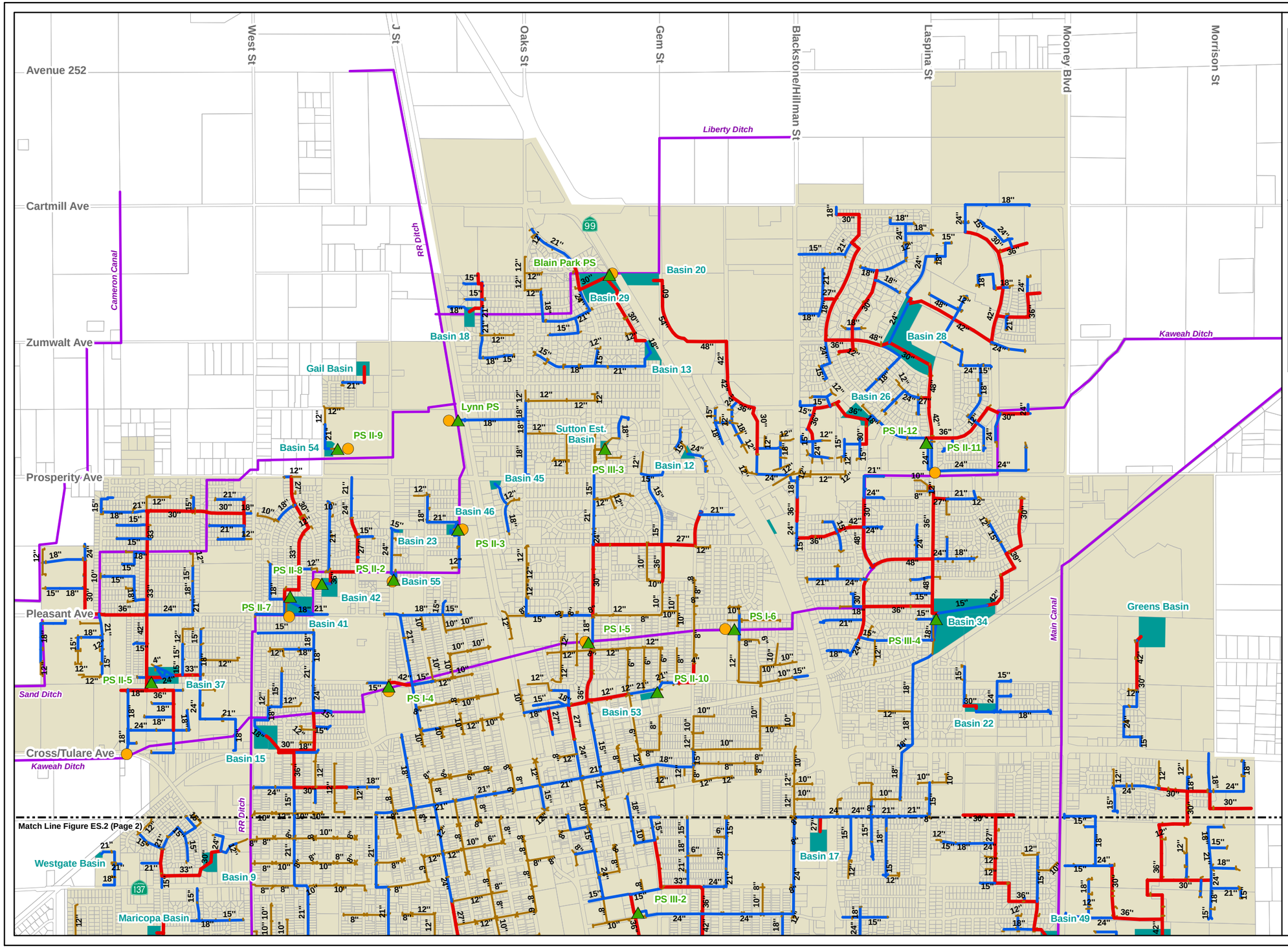
ES.5.1 Project Prioritization

The master plan CIP provides a breakdown of recommended improvement projects over five phases. Improvement projects to correct existing deficiencies should be implemented by the City as soon as possible. Due to budget and time constraints, however, it may not be feasible for the City to implement all existing system improvement projects within the first or second CIP phase. In order to provide guidance to the City in identifying the most critical improvements, the recommended improvement projects were prioritized based on the severity of the existing or expected deficiency. Projects given highest priority should be implemented as soon as possible, whereas projects given a lower priority can likely be pushed back to later CIP phases.

Improvement projects needed to service future growth will be constructed at the time a specific development comes on line. Therefore, the phasing of future improvements is subject to change dependant upon the rate of growth in the City.

The priorities are described below:

- **Existing Lower Priority** - Facilities required to mitigate potential flooding conditions in localized areas. These improvements are not considered major conveyance or storage facilities.
- **Existing Higher Priority** - Major conveyance or storage facilities necessary to mitigate potential flooding conditions in a large tributary area.
- **Future Development Related** - Storm drainage facilities required to service future growth.



Legend

Existing Storm Drainage System

- Outfall
- Pump Station

Storm Drain Pipelines

Diameter

- 12" and Smaller
- 14" - 24"
- 27" and Larger
- Retention/Detention Basin
- Canal/Waterway
- City Limits
- Parcels

N

0 1,500 3,000 Feet

Figure ES.2
Existing Storm Drainage System (Page 1 of 2)

Storm Drainage
System Master Plan
City of Tulare

City of Tulare

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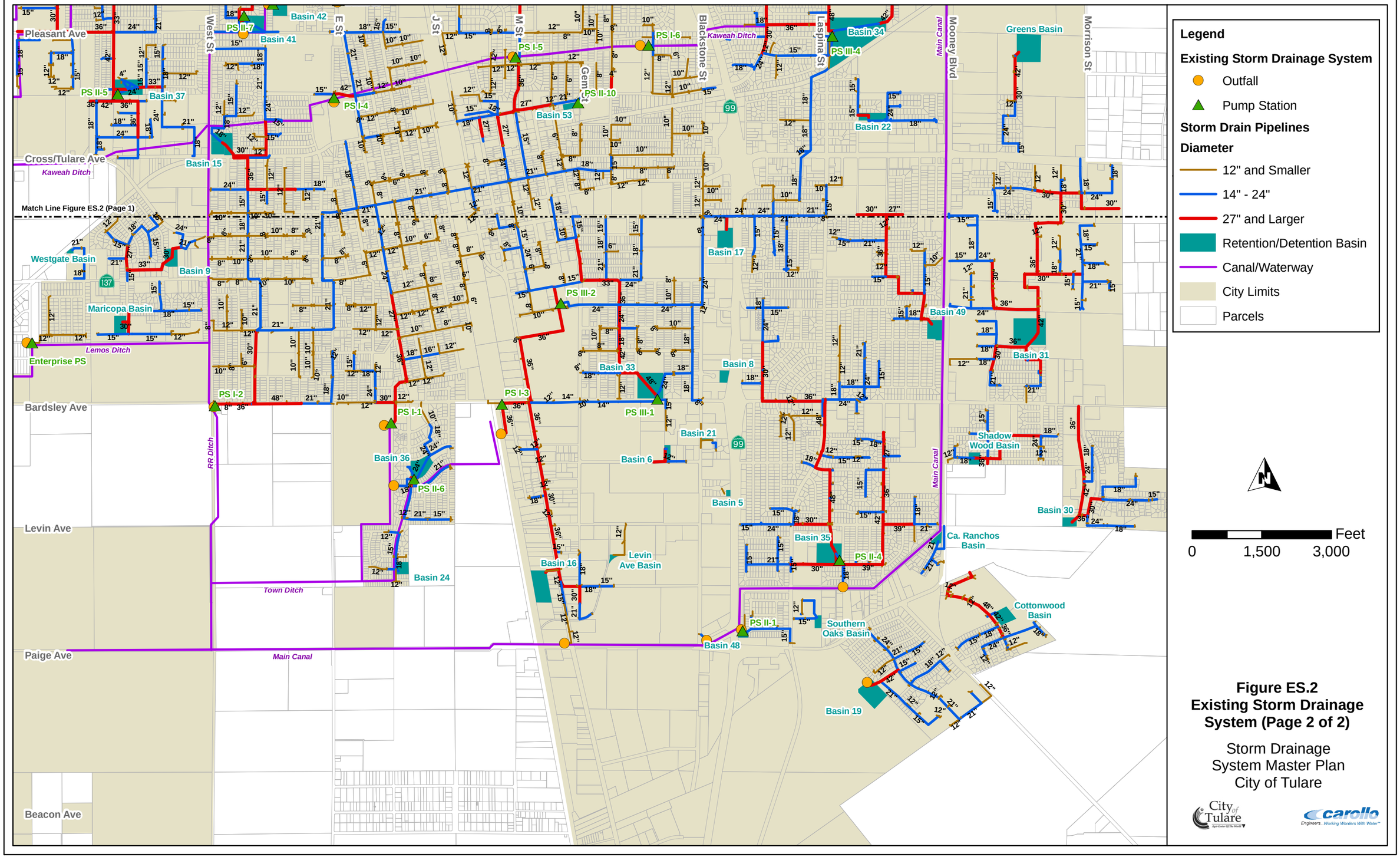

Figure ES.2
Existing Storm Drainage System (Page 2 of 2)

Storm Drainage
System Master Plan
City of Tulare

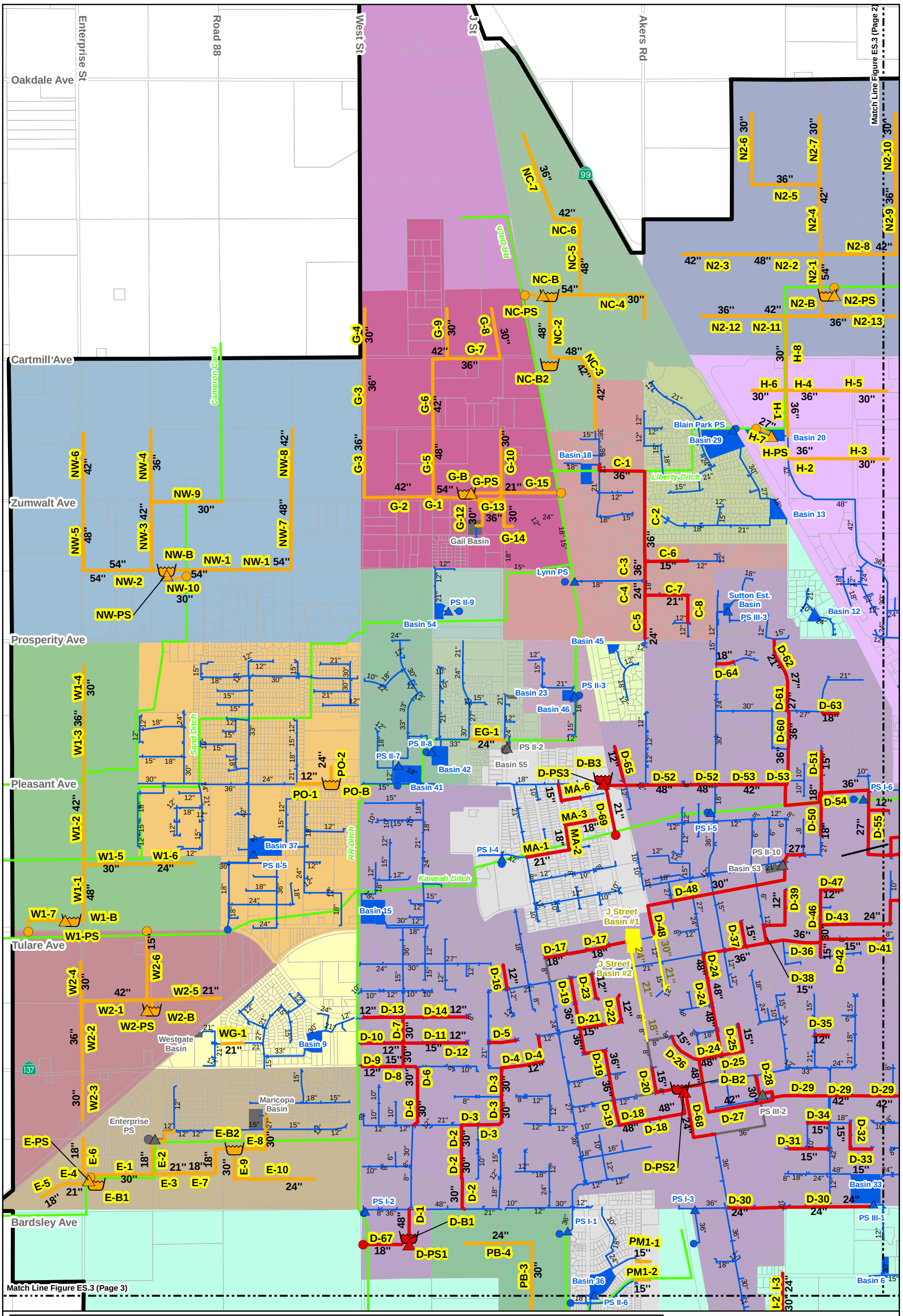

Figure ES.3
Proposed Improvements
(Page 1 of 3)

Storm Drainage
System Master Plan
City of Tulare

City of Tulare
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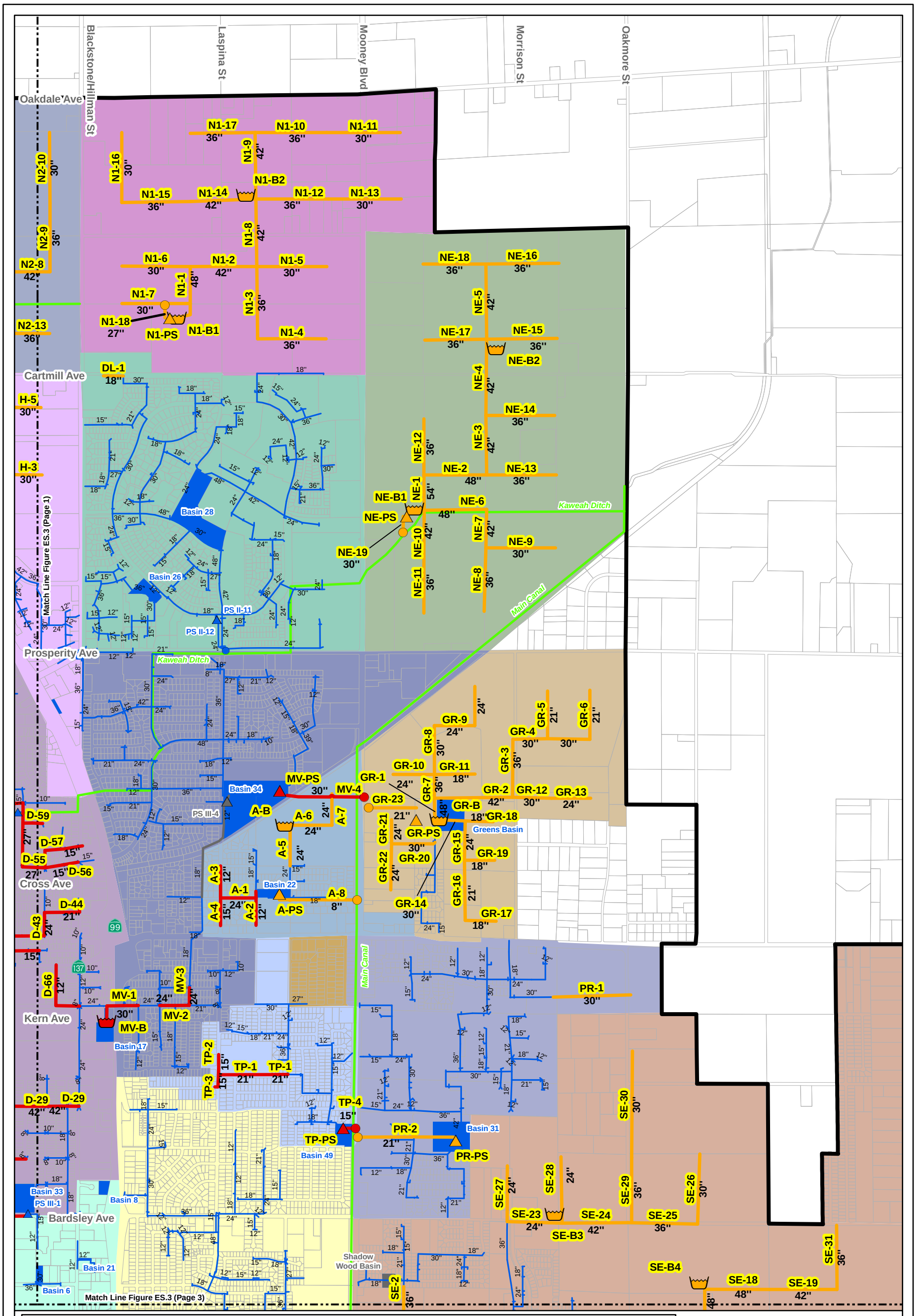

Figure ES.3
Proposed Improvements
(Page 2 of 3)

Storm Drainage
System Master Plan
City of Tulare

City of Tulare
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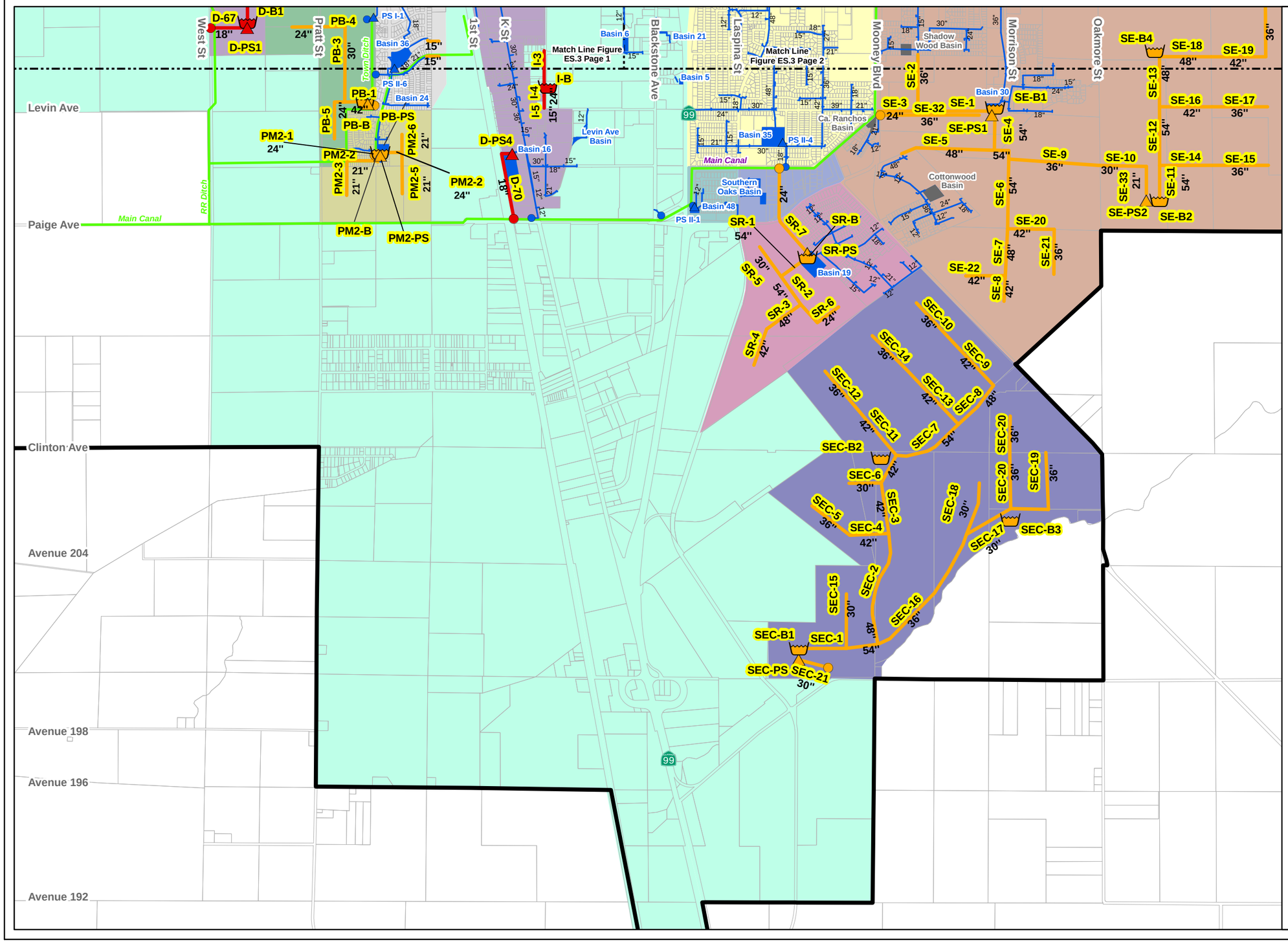


Figure ES.3
Proposed Improvements
(Page 3 of 3)

Storm Drainage
System Master Plan
City of Tulare

Table ES.2 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
Academy Subbasin									
A-1	Pipe	Academy Avenue	Mountain View St. to Laspina St.	X	X	--	24	New	800
A-2	Pipe	Mountain View Street	Academy Ave. to 200' n/o Highway 137	X	X	--	12	New	500
A-3	Pipe	Laspina Street	Academy Ave. to Eastgate Ave.	X	X	--	12	New	600
A-4	Pipe	Laspina Street	Academy Ave. to 200' n/o Highway 137	X	X	--	15	New	500
A-5	Pipe	Aronian Street	Eastgate Ave. to 800' n/o Eastgate Ave.			--	24	New	800
A-6	Pipe	800' n/o Eastgate Ave.	Aronian St. to 800' e/o Aronian St.			--	24	New	800
A-7	Pipe	Latimier Street	800' n/o Eastgate Ave. to 1,400' n/o Eastgate Ave.			--	24	New	600
A-8	Force Main	Academy Avenue	Basin 22 to Main Canal			--	8	New	1,500
A-B	Detention Basin	Aronian Street	Proposed Academy Basin			--	3 acre-ft	New	--
A-PS	Pump Station	Mountain View Street	Academy Pump Station (Class II discharge from Basin 22)			--	5.5 cfs	New	--
California Subbasin									
C-1	Pipe	Alcott St/Dickens Ave	100' n/o Dickens Ave to Oaks St	X		21/--	36	Replace/New	1,000
C-2	Pipe	Oaks Street	Dickens Ave to 150' s/o Sandra Ave	X		--	36	New	1,500
C-3	Pipe	Oaks Street	150' s/o Sandra Ave to Lynn Ave	X		12/18	36	Replace	600
C-4	Pipe	Oaks Street	Lynn Ave to Lois Ave	X		18	30	Replace	300
C-5	Pipe	Oaks Street	Lois Ave to Prosperity Ave	X		18	24	Replace	800
C-6	Pipe	Gail Avenue	Oaks St to 500' w/o M St	X		12	15	Replace	800
C-7	Pipe	Lois Avenue	Oaks St to Williams St	X		12	21	Replace	800
C-8	Pipe	Williams Street	Lois Ave to Berkeley Ave	X		12	15	Replace	500
Del Lago Subbasin									
DL-1	Pipe	Cartmill Avenue	800' e/o Hillman St to 300' e/o Hillman St			--	18	New	500
Downtown Subbasin									
D-1	Pipe	Sacramento Street	Bardsley Ave to Proposed Downtown Basin 1	X		--	48	New	500
D-2	Pipe	Cleveland St/Howard St	Bardlsey Ave to Sonora Ave	X		10/--	30	Replace/New	1,600
D-3	Pipe	Sonora Ave/Pratt St	Howard St to Inyo Ave	X		21	30	Replace	1,800
D-4	Pipe	Inyo Ave/D St	Pratt St to Kern Ave	X		8	12	Replace	1,300
D-5	Pipe	Kern Avenue	Pratt St to D St	X		8	15	Replace	500
D-6	Pipe	Sacramento Street	Sonora Ave to Inyo Ave	X		21	30	Replace	1,400
D-7	Pipe	Santa Clara Street	Inyo Ave to Tulare Ave	X		21	30	Replace	900
D-8	Pipe	Inyo Avenue	Santa Clara St to Los Angeles St	X		8	15	Replace	400
D-9	Pipe	Inyo Avenue	Los Angeles St to e/o West St	X		8	12	Replace	400
D-10	Pipe	Kern Avenue	Santa Clara St to e/o West St	X		8/10	12	Replace	800
D-11	Pipe	Kern Avenue	Santa Clara St to California St	X		10	15	Replace	800
D-12	Pipe	Kern Avenue	California St to A St	X		8	12	Replace	400
D-13	Pipe	Tulare Avenue	Santa Clara St to e/o West St	X		8/10	12	Replace	700
D-14	Pipe	Tulare Avenue	Santa Clara St to California St	X		10	15	Replace	800
D-15	Pipe	Tulare Avenue	California St to A St	X		8	12	Replace	400
D-16	Pipe	C Street	King Ave to San Jaoquin Ave	X		8	12	Replace	500
D-17	Pipe	San Joaquin Avenue	E St to I St	X		6/8	18	Replace	1,600
D-18	Pipe	Apline Avenue	Proposed Downtown Basin 2 to G St	X		8/--	48	Replace/New	1,300
D-19	Pipe	G St/F St	Apline Ave to King Ave	X		8/10	36	Replace	3,400
D-20	Pipe	I St/Sonora Ave	Proposed Downtown Basin 2 to Owens Ave	X		--	15	New	900
D-21	Pipe	Kern Avenue	F St to H St	X		6/10	15	Replace	800
D-22	Pipe	H Street	Kern Ave to Tulare Ave	X		8/10	12	Replace	500
D-23	Pipe	G Street	King Ave to Tulare Ave	X		8	12	Replace	500
D-24	Pipe	K St/L St	Proposed Downtown Basin 2 to King Avenue	X		10/15/24/--	48	Replace/New	3,300
D-25	Pipe	Owens Ave/M St	L St to Inyo Ave	X		8/10	15	Replace	1,000
D-26	Pipe	J St	Owens Ave to Inyo Ave	X	X	--	15	New	700
D-27	Pipe	MLK Jr. Avenue	K St to O St (to Abandon PS III-2)	X		--	42	New	1,800
D-28	Pipe	Land O Lakes Facility	Sonora Ave to PS III-2 (PS III-2 to be Abandoned, Pipeline Direction Reversed)	X		30	30	Replace	700
D-29	Pipe	MLK Jr. Avenue	N St to Blackstone St	X		24	42	Replace	2,900
D-30	Pipe	Bardsley Avenue	K St to PS III-1	X		14	24	Replace	2,700
D-31	Pipe	Cedar Avenue	Q St to O St	X		8	15	Replace	800
D-32	Pipe	R Street	Elm Ave to Cedar Ave	X		8	15	Replace	500
D-33	Pipe	Cedar Avenue	R St to S St	X		8	15	Replace	400
D-34	Pipe	Elm Avenue	Q St to P St	X		8	15	Replace	400
D-35	Pipe	Mariposa Avenue	Center St to 300' e/o Center St	X		8	12	Replace	300
D-36	Pipe	King Avenue	L St to Cherry St	X		18/21	36	Replace	2,200
D-37	Pipe	N Street	King Avenue to San Joaquin Ave	X		8	15	Replace	500
D-38	Pipe	O St/San Joaquin Ave	King Ave to Gem St	X		8/12	15	Replace	1,000
D-39	Pipe	Gem Street	San Joaquin Ave to Academy Ave	X		8	12	Replace	300
D-40	Pipe	Cherry Street	King Avenue to San Joaquin Ave	X		15	30	Replace	300
D-41	Pipe	Sycamore Avenue	Cherry St to Highland St	X		8	15	Replace	1,200
D-42	Pipe	Cherry Street	King Ave to Inyo Ave	X		8	15	Replace	300
D-43	Pipe	San Joaquin Ave/Highland St	Cherry St to Apricot Ave	X		10	24	Replace	1,700
D-44	Pipe	Apricot Avenue	Highland St to Blackstone St	X		10	21	Replace	700
D-45	Pipe	Blackstone Street	Apricot St to Academy St	X		10	18	Replace	200
D-46	Pipe	Cherry Street	San Joaquin Ave to Academy Ave	X		10	15	Replace	700
D-47	Pipe	Academy Avenue	Cherry St to 400' e/o Cherry St	X		10	12	Replace	400
D-48	Pipe	Pine Street	Basin 53 to J St (Pine Storm Drain and Abandon Basin 53 and PS II-10)	X		--	30	New	3,500
D-49	Pipe	Cross Avenue	Auburn St to Basin 53 (Abandon Basin 53 and PS II-10)	X		21	27	Replace	400
D-50	Pipe	Cherry Street	n/o Cross Ave to s/o Pleasant Ave	X		8	18	Replace	1,000
D-51	Pipe	Cherry Street	s/o Pleasant Ave to Terrace Ave	X		8	15	Replace	600
D-52	Pipe	Pleasant Avenue	Proposed Downtown Basin 3 to M St	X		15/--	48	Replace/New	2,300
D-53	Pipe	Pleasant Avenue	M St to Gem St	X		12	42	Replace	1,300
D-54	Pipe	Lyndale Ave/Bash Ave	Delwood St to Pleasant Ave	X		--	36	New	2,300
D-55	Pipe	Delwood St/Cross St	Highland St to Bash Ave	X		12	27	Replace	1,500
D-56	Pipe	Cross Avenue	Highland St to Blackstone St	X		10	15	Replace	600
D-57	Pipe	Highland St/Beverly Ave	Cross Ave to Bonita St	X		12/10	21	Replace	600
D-58	Pipe	Beverly Avenue	Bonita St to Blackstone St	X		10	15	Replace	400
D-59	Pipe	Windsor Avenue	Delwood St to Highland St	X		8	12	Replace	400
D-60	Pipe	Gem Street	Pleasant Ave to Merritt Ave	X		10/--	36	Replace/New	1,400
D-61	Pipe	Gem Street	Merritt Ave to 800'n.o Merritt Ave	X		15	27	Replace	800
D-62	Pipe	Gem Street	800' n/o Merritt Ave to Prosperity Ave	X		15	21	Replace	500
D-63	Pipe	Merritt Avenue	Cherry St to 300' e/o Cherry St	X		12	18	Replace	300
D-64	Pipe	Estate Avenue	M St to 300' e/o M St	X		12	18	Replace	300
D-65	Pipe	I Street	Pleasant Ave to 700' n/o Pleasant Avenue	X	X	--	12	New	700
D-66	Pipe	Salida St/Kern Ave	Inyo Ave to Blackstone St	X	X	--	12	New	1,200
D-67	Force Main	Bardsley Avenue	Force Main from Downtown Pump Station 1 (D-PS1)	X		--	18	New	700
D-68	Force Main	w/o J Street	Force Main from Downtown Pump Station 2 (D-PS2)	X		--	24	New	1,200

Table ES.2 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
D-69	Force Main	I Street	Force Main from Downtown Pump Station 3 (D-PS3)	X		--	21	New	1,000
D-70	Force Main	I Street	Force Main from Downtown Pump Station 4 (D-PS4)	X		--	18	New	1,800
D-B1	Detention Basin	Bardsley Avenue	Proposed Downtown Basin 1	X		--	35 acre-ft	New	--
D-B2	Detention Basin	w/o J Street	Proposed Downtown Basin 2	X		--	55 acre-ft	New	--
D-B3	Detention Basin	I Street	Proposed Downtown Basin 3	X		--	45 acre-ft	New	--
D-PS1	Pump Station	Bardsley Avenue	Downtown Pump Station 1 (Class II discharge from Downtown Basin 1)	X		--	10.0 cfs	New	--
D-PS2	Pump Station	w/o J Street	Downtown Pump Station 2 (Class III discharge from Downtown Basin 2)	X		--	14.0 cfs	New	--
D-PS3	Pump Station	I Street	Downtown Pump Station 3 (Class II discharge from Downtown Basin 3)	X		--	12.0 cfs	New	--
D-PS4	Pump Station	I Street	Downtown Pump Station 4 (Class II discharge from Basin 16)	X		--	8.0 cfs	New	--
Enterprise Subbasin									
E-1	Pipe	700' n/o Bardsley Ave	200' e/o Enterprise St to 1,400' e/o Enterprise St			--	30	New	1,200
E-2	Pipe	Haven Street	700' n/o Bardsley Ave to Sonora St			--	18	New	1,200
E-3	Pipe	700' n/o Bardsley Ave	1,400' e/o Enterprise St to 2,000' e/o Enterprise St			--	21	New	600
E-4	Pipe	700' n/o Bardsley Ave	Future City Basin 40 to Bardsley Ave			--	21	New	700
E-5	Pipe	n/o Bardsley Avenue	400' w/o Enterprise St to 800' w/o Enterprise St			--	18	New	600
E-6	Pipe	Enterprise Street	700' n/o Bardsley Ave to Sonora St			--	18	New	900
E-7	Pipe	700' n/o Bardsley Ave	Basin 39 (E-B2) 2,000' e/o Enterprise St.			--	18	New	1,300
E-8	Pipe	Maricopa St	Future City Basin 39 to Santa Barbara St			27	30	New/Replace	1,300
E-9	Pipe	2,400' w/o West St	300' s/o Sonora St to 900' s/o Sonora St			--	30	New	600
E-10	Pipe	900' s/o Sonora St	2,400' w/o West St to 900' w/o West St			--	24	New	1,500
E-11	Force Main	700' n/o Bardsley Ave	Force Main from Enterprise Pump Station (E-PS)			--	15	New	100
E-B1	Detention Basin	700' n/o Bardsley Ave	Future City Basin 40			--	20 acre-ft	New	--
E-B2	Detention Basin	300' s/o Sonora St	Future City Basin 39			--	15 acre-ft	New	--
E-PS	Pump Station	700' n/o Bardsley Ave	Enterprise Pump Station (Class II discharge from Basin 40)			--	5.0 cfs	New	--
Evergreen Subbasin									
EG-1	Pipe	Saratoga Avenue	A St. to E St.			--	24	New	700
Gail Subbasin									
G-1	Pipe	Zumwalt Ave	600' e/o Sacramento St to Sacramento St			--	54	New	600
G-2	Pipe	Zumwalt Ave	Sacramento St to West St			--	42	New	1,300
G-3	Pipe	West St	Zumwalt Ave to Cartmill Ave			--	36	New	2,500
G-4	Pipe	West St	Cartmill Ave to 1,200' n/o Cartmill Ave			--	30	New	1,300
G-5	Pipe	Sacramento Street	Zumwalt Ave to Elster Ave			--	48	New	1,200
G-6	Pipe	Sacramento Street	Elster Ave to Cartmill Ave			--	42	New	1,600
G-7	Pipe	Cartmill Avenue	Sacramento St to 1,000' e/o Sacramento St			--	36	New	1,000
G-8	Pipe	1,000' e/o Sacramento St	Cartmill Ave to 1,500' n/o Cartmill Ave			--	30	New	1,500
G-9	Pipe	Sacramento Street	Cartmill Ave to 1,400' n/o Cartmill Ave			--	30	New	1,400
G-10	Pipe	E Street	Zumwalt Ave to Elster Ave			--	30	New	1,400
G-11	Pipe	Zumwalt Ave	400' w/o E St to Future City Basin 43 (G-B)			--	42	New	300
G-12	Pipe	400' w/o E St	Gail Basin to Zumwalt Ave			--	30	New	600
G-13	Pipe	Zumwalt Ave	400' w/o E St to E St			--	36	New	400
G-14	Pipe	E Street	Zumwalt Ave to 500' s/o Zumwalt Ave			--	30	New	600
G-15	Force Main	Zumwalt Ave	Force Main from Gail Pump Station (G-PS)			--	21	New	1,600
G-B	Detention Basin	Zumwalt Ave	Future City Basin 43			--	50 acre-ft	New	--
G-PS	Pump Station	Zumwalt Ave	Gail Pump Station (Class II discharge from Basin 43)			--	13.0 cfs	New	--
The Greens Subbasin									
GR-1	Pipe	1,500' w/o Morrision St	The Greens Basin to 2,700' s/o Prosperity Avenue			--	48	New	500
GR-2	Pipe	2,700' s/o Prosperity Ave	1,500' w/o Morrison St to Morrison St			--	42	New	1,500
GR-3	Pipe	Morrison Street	2,700' s/o Prosperity Ave to 1,600' s/o Prosperity Ave			--	36	New	1,100
GR-4	Pipe	1,600' s/o Prosperity Ave	Morrison St to 1,400' e/o Morrison St			--	30	New	1,400
GR-5	Pipe	600' e/o Morrison St	1,600' s/o Prosperity Ave to 700' s/o Prosperity Ave			--	21	New	900
GR-6	Pipe	1,400' e/o Morrison St	1,600' s/o Prosperity Ave to 700' s/o Prosperity Ave			--	21	New	900
GR-7	Pipe	1,500' w/o Morrison St	2,700' s/o Prosperity Ave to 2,300' s/o Prosperity Ave			--	36	New	900
GR-8	Pipe	1,500' w/o Morrison St	2,300' s/o Prosperity Ave to 1,400' s/o Prosperity Ave			--	30	New	900
GR-9	Pipe	s/o Prosperity-w/o Morrison	w/o Morrison St to s/o Prosperity Ave			--	24	New	1,500
GR-10	Pipe	2,300' s/o Prosperity Ave	600' e/o Mooney Blvd to 1,400' e/o Mooney Blvd			--	24	New	800
GR-11	Pipe	2,300' s/o Prosperity Ave	1,500' w/o Morrison St to 700' w/o Morrison St			--	18	New	800
GR-12	Pipe	2,700' s/o Prosperity Ave	Morrison St to 700' e/o Morrison St			--	30	New	700
GR-13	Pipe	2,700' s/o Prosperity Ave	700 ' e/o Morrison St to 1,400' e/o Morrison St			--	24	New	700
GR-14	Pipe	2,200' n/o Tulare Ave	Greens Basin to 1,000' w/o Morrison St			--	30	New	500
GR-15	Pipe	1,000' w/o Morrison St	2,200' n/o Tulare Ave to 1,500' n/o Tulare Ave			--	24	New	700
GR-16	Pipe	1,000' w/o Morrison St	1,500' n/o Tulare Ave to 400' n/o Tulare Ave			--	21	New	1,100
GR-17	Pipe	400' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St			--	18	New	600
GR-18	Pipe	2,200' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St			--	18	New	600
GR-19	Pipe	1,500' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St			--	18	New	600
GR-20	Pipe	1,700' n/o Tulare Ave	1,400' e/o Mooney Blvd to 600' e/o Mooney Blvd			--	30	New	800
GR-21	Pipe	600' e/o Mooney Blvd	1,700' n/o Tulare Ave to 2,200' n/o Tulare Ave			--	24	New	500
GR-22	Pipe	600' e/o Mooney Blvd	1,700' n/o Tulare Ave to 800' n/o Tulare Ave			--	24	New	900
GR-23	Force Main	2,200' n/o Hwy 137	Force Main from The Greens Pump Station (GR-PS)			--	21	New	1,200
GR-B	Detention Basin	2,200' n/o Hwy 137	Proposed Expansion to the Greens Basin			6 acre-ft	45 acre-ft	Expand	--
GR-PS	Pump Station	2,200' n/o Hwy 137	The Greens Pump Station (Class II discharge fro the Greens Basin)			--	11.5 cfs	New	--
Horizon Subbasin									
H-1	Pipe	Gem Street	1,500' s/o Cartmill Ave to 600' s/o Cartmill Ave			--	36	New	900
H-2	Pipe	1,900' s/o Cartmill Ave	Gem St to 600' e/o Gem St			--	36	New	600
H-3	Pipe	1,900' s/o Cartmill Ave	600' e/o Gem St to 700' w/o Hillman St			--	30	New	1,300
H-4	Pipe	600' s/o Cartmill Ave	Gem St to 600' e/o Gem St			--	36	New	600
H-5	Pipe	600' s/o Cartmill Ave	600' e/o Gem St to 700' w/o Hillman St			--	30	New	1,300
H-6	Pipe	600' s/o Cartmill Ave	1,400' w/o Gem St to Gem St			--	30	New	1,400
H-7	Force Main	1,400' s/o Cartmill Ave	Force Main from Outlet Center Pump Station (H-PS)			--	27	New	250
H-8	Pipe	Gem Street	Overflow Pipe between Horizon and North 2 Subbasin			--	30	New	1,400
H-PS	Pump Station	1,400' s/o Cartmill Ave	Outlet Center Pump Station (Class II discharge from Outlet Center Basin)			--	22.0 cfs	New	--
Industrial Subbasin									
I-1	Pipe	O Street	O Street Basin to O Street	X		--	36	New	100
I-2	Pipe	O Street	s/o Chestnut Ave to Almond Ave	X		--	30	New	500
I-3	Pipe	O Street	Almond Ave to Walnut Ave	X		--	24	New	400
I-4	Pipe	O Street	s/o Chestnut Ave to n/o Levin Ave	X		--	24	New	200
I-5	Pipe	O Street	n/o Levin Ave to Levin Ave	X		--	15	New	300
I-B	Detention Basin	O Street	Future O Street Basin	X		--	6.3 acre-ft	New	--
Maple Subbasin									
MA-1	Pipe	Maple Avenue	E St to G St	X		12/15	21	Replace	800
MA-2	Pipe	G Street	Maple Ave to Beaumont Ave	X		10	18	Replace	500
MA-3	Pipe	Beaumont Avenue	G St to H St	X		10	18	Replace	400

Table ES.2 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
MA-4	Pipe	Beaumont Avenue	H St to I St	X		8	15	Replace	400
MA-5	Pipe	G Street	Pleasant Ave to Oakland Ave	X		10	15	Replace	300
MA-6	Pipe	Oakland Avenue	G St to H St	X		10	15	Replace	300
Mountain View Subbasin									
MV-1	Pipe	Kern Avenue	Basin 17 to Forrest St	X		24	30	Replace	900
MV-2	Pipe	Kern Avenue	Sruce St to Canby St	X		21	24	Replace	600
MV-3	Pipe	Canby Street	Kern Ave to Sequoia St	X		--	24	New	300
MV-4	Force Main	Live Oak Park	Force Main from Live Oak Pump Station (MV-PS)	X		--	30	New	1,500
MV-B	Retention Basin	Kern Avenue	Basin 17 Expansion	X		8 acre-ft	15 acre-ft	Expand	--
MV-PS	Pump Station	Live Oak Park	Live Oak Pump Station (Class II discharge from Basin 34 & Abandon PS III-4)	X		--	25.0 cfs	New	--
Northeast Subbasin									
NE-1	Pipe	1,100' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 1,900' s/o Cartmill Ave			--	54	New	1,000
NE-2	Pipe	1,900' s/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			--	48	New	1,200
NE-3	Pipe	2,300' e/o Mooney Blvd	1,900' s/o Cartmill Ave to 700' s/o Cartmill Ave			--	42	New	1,100
NE-4	Pipe	2,300' e/o Mooney Blvd	700' s/o Cartmill Ave to 600' n/o Cartmill Ave			--	42	New	1,300
NE-5	Pipe	2,300' e/o Mooney Blvd	600' n/o Cartmill Ave to 2,000' n/o Cartmill Ave			--	42	New	1,400
NE-6	Pipe	2,600' s/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			--	48	New	1,200
NE-7	Pipe	2,300' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 3,300' s/o Cartmill Ave			--	42	New	700
NE-8	Pipe	2,300' e/o Mooney Blvd	3,300' s/o Cartmill Ave to 700' n/o Prosperity Ave			--	36	New	1,200
NE-9	Pipe	3,300' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	30	New	1,300
NE-10	Pipe	1,100' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 3,300' s/o Cartmill Ave			--	42	New	800
NE-11	Pipe	1,100' e/o Mooney Blvd	3,300' s/o Cartmill Ave to 700' n/o Prosperity Ave			--	36	New	1,200
NE-12	Pipe	1,100' e/o Mooney Blvd	1,900' s/o Cartmill Ave to 700' s/o Cartmill Ave			--	36	New	1,100
NE-13	Pipe	1,900' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	36	New	1,300
NE-14	Pipe	700' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	36	New	1,300
NE-15	Pipe	600' n/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	36	New	1,300
NE-16	Pipe	2,000' n/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	36	New	1,400
NE-17	Pipe	600' n/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			--	36	New	1,200
NE-18	Pipe	2,000' n/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			--	36	New	1,200
NE-19	Force Main	2,600' n/o Prosperity Ave	Force Main from Northeast Pump Station (NE-PS)			--	30	New	300
NE-B1	Detention Basin	2,600' n/o Prosperity Ave	Proposed Northeast 1 Basin			--	85 acre-ft	New	--
NE-B2	Detention Basin	600' n/o Cartmill Ave	Proposed Northeast 2 Basin			--	17 acre-ft	New	--
NE-PS	Pump Station	2,600' n/o Prosperity Ave	Northeast Pump Station (Class II discharge from Northeast 1 Basin)			--	25.0 cfs	New	--
North 1 Subbasin									
N1-1	Pipe	2,000' e/o Hillman St	North 1 Basin 1 to 600' s/o Ave 252			--	48	New	1,500
N1-2	Pipe	600' s/o Ave 252	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd			--	42	New	1,300
N1-3	Pipe	2,000' w/o Mooney Blvd	600' s/o Ave 252 to 700' n/o Cartmill Ave			--	36	New	1,400
N1-4	Pipe	700' n/o Cartmill Ave	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			--	36	New	1,300
N1-5	Pipe	600' s/o Ave 252	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			--	30	New	1,300
N1-6	Pipe	600' s/o Ave 252	700' e/o Hillman St to			--	30	New	1,300
N1-7	Pipe	1,300' n/o Cartmill Ave	700' e/o Hillman St to 2,000' e/o Hillman St			--	30	New	1,300
N1-8	Pipe	2,000' w/o Mooney Blvd	600' s/o Ave 252 to 650' n/o Ave 252			--	42	New	1,300
N1-9	Pipe	2,000' w/o Mooney Blvd	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	36	New	1,300
N1-10	Pipe	650' s/o Oakdale Ave	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			--	36	New	1,300
N1-11	Pipe	650' s/o Oakdale Ave	700' w/o Mooney Blvd to 600' e/o Mooney Blvd			--	30	New	1,500
N1-12	Pipe	650' n/o Ave 252	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			--	36	New	1,300
N1-13	Pipe	650' n/o Ave 252	700' w/o Mooney Blvd to 600' e/o Mooney Blvd			--	30	New	1,400
N1-14	Pipe	650' n/o Ave 252	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd			--	42	New	1,200
N1-15	Pipe	650' n/o Ave 252	700' e/o Hillman St to 2,000' e/o Hillman St			--	36	New	1,300
N1-16	Pipe	700' e/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	30	New	1,300
N1-17	Pipe	650' s/o Oakdale Ave	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd			--	36	New	1,300
N1-18	Force Main	1,300' n/o Cartmill Ave	Force Main from North 1 Pump Station (N1-PS)			--	27	New	200
N1-B1	Detention Basin	1,300' n/o Cartmill Ave	Proposed North 1 Basin 1			--	55 acre-ft	New	--
N1-B2	Detention Basin	650' n/o Ave 252	Proposed North 1 Basin 2			--	25 acre-ft	New	--
N1-PS	Pump Station	1,300' n/o Cartmill Ave	North 1 Pump Station (Class II discharge from North 1 Basin 1)			--	20.0 cfs	New	--
North 2 Subbasin									
N2-1	Pipe	2,000' w/o Hillman St	650' n/o Cartmill Ave to 650' s/o Ave 252			--	54	New	1,300
N2-2	Pipe	650' s/o Ave 252	2,000' w/o Hillman St to 3,300' w/o Hillman St			--	48	New	1,300
N2-3	Pipe	650' s/o Ave 252	3,300' w/o Hillman St to 4,600' w/o Hillman St			--	42	New	1,300
N2-4	Pipe	2,000' w/o Hillman St	650' s/o Ave 252 to 650' n/o Ave 252			--	48	New	1,300
N2-5	Pipe	650' n/o Ave 252	2,000' w/o Hillman St to 3,300' w/o Hillman St			--	36	New	1,300
N2-6	Pipe	3,300' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	30	New	1,300
N2-7	Pipe	2,000' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	30	New	1,300
N2-8	Pipe	650' s/o Ave 252	2,000' w/o Hillman St to 650' w/o Hillman St			--	42	New	1,400
N2-9	Pipe	650' w/o Hillman St	650' s/o Ave 252 to 650' n/o Ave 252			--	36	New	1,300
N2-10	Pipe	650' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	30	New	1,300
N2-11	Pipe	650' n/o Cartmill Ave	2,000' w/o Hillman St to 3,300' w/o Hillman St			--	48	New	1,300
N2-12	Pipe	650' n/o Cartmill Ave	3,300' w/o Hillman St to 4,100' w/o Hillman St			--	42	New	800
N2-13	Pipe	650' n/o Cartmill Ave	2,000' w/o Hillman St to 650' w/o Hillman St			--	36	New	1,400
N2-14	Force Main	2,000' w/o Hillman St	Force Main from North 2 Pump Station (N2-PS)			--	27	New	200
N2-B	Detention Basin	2,000' w/o Hillman St	Proposed North 2 Basin			--	100 acre-ft	New	--
N2-PS	Pump Station	2,000' w/o Hillman St	North 2 Pump Station (Class II discharge from North 2 Basin)			--	25.0 cfs	New	--
North Commercial Subbasin									
NC-1	Pipe	1,100' n/o Cartmill Ave	300' e/o J St to 900' e/o J St			--	54	New	600
NC-2	Pipe	e/o J St	Cartmill Ave to n/o Cartmill Ave			--	48	New	1,720
NC-3	Pipe	800' e/o J St	Cartmill Ave to s/o Cartmill Ave			--	42	New	1,450
NC-4	Pipe	1,100' n/o Cartmill Ave	800' e/o J St to Oaks St			--	30	New	1,700
NC-5	Pipe	900' e/o J St	1,100' n/o Cartmill Ave to 2,500' n/o Cartmill Ave				48	New	1,400
NC-6	Pipe	2,500' n/o Cartmill Ave	1,100' e/o J St to 600' e/o J St				42	New	500
NC-7	Pipe	600' e/o J St	2,600' s/o Oakdale Ave to 900' s/o Oakdale Ave				36	New	1,700
NC-8	Force Main	1,100' n/o Cartmill Ave	Force Main from North Pump Commercial Station (NC-PS)			--	24	New	200
NC-B	Detention Basin	1,100' n/o Cartmill Ave	Proposed North Commercial Basin			--	40 acre-ft	New	--
NC-B2	Detention Basin	Highway 99	Grade separation pond			--	26 acre-ft	New	--
NC-PS	Pump Station	1,100' n/o Cartmill Ave	North Commercial PS (Class II discharge from North Commerc. Basin)			--	16.5 cfs	New	--
Northwest Subbasin									
NW-1	Pipe	Gail Street	Northwest Basin to 1,300' w/o West St			--	54	New	2,600
NW-2	Pipe	Gail Street	Northwest Basin to 1,300' e/o Enterprise St			--	54	New	1,300
NW-3	Pipe	1,300' e/o Enterprise St	Gail St to Zumwalt Ave			--	42	New	1,300
NW-4	Pipe	1,300' e/o Enterprise St	Zumwalt Ave to 1,300' n/o Zumwalt Ave			--	36	New	1,300
NW-5	Pipe	Enterprise Street	Gail St to Zumwalt Ave			--	48	New	1,300
NW-6	Pipe	Enterprise Street	Zumwalt Ave to 1,300' n/o Zumwalt Ave			--	42	New	1,200

Table ES.2 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
NW-7	Pipe	1,300' w/o West St	Gail St to Zumwalt Ave			--	48	New	1,400
NW-8	Pipe	1,300' w/o West St	Zumwalt Ave to 1,300' n/o Zumwalt Ave			--	42	New	1,300
NW-9	Pipe	Zumwalt Avenue	1,300' e/o Enterprise St to 2,600' e/o Enterprise St			--	30	New	1,300
NW-10	Force Main	Gail Street	Force Main from Northwest Pump Station (NW-PS)			--	30	New	200
NW-B	Detention Basin	Gail Street	Proposed Northwest Basin			--	90 acre-ft	New	--
NW-PS	Pump Station	Gail Street	Northwest Pump Station (Class II discharge from Northwest Basin)			--	28.0 cfs	New	--
Palm Ranch Subbasin									
PR-1	Pipe	s/o State Highway 137	1,500' w/o Oakmore St to Oakmore St			--	30	New	1,500
PR-2	Force Main	s/o Alpine Avenue	Palm Ranch Pump Station Force Main (PR-PS)			--	21	New	1,800
PR-PS	Pump Station	s/o Alpine Avenue	Palm Ranch Pump Station (Class II discharge from existing Basin 31)			--	11.5 cfs	New	--
Parkwood Meadows No. 1 Subbasin									
PM1-1	Pipe	Oakwood St Extension	Vetter St to 300' e/o Vetter St			--	15	New	300
PM1-2	Pipe	Old Town St Extension	Vetter St to 300' e/o Vetter St			--	15	New	300
Parkwood Meadows No. 2 Subbasin									
PM2-1	Pipe	E Street	Basin 24 to Lemonwood Ave			12	24	Replace	300
PM2-2	Pipe	Lemonwood Avenue	E St to 200' w/o Applewood St			--	21	New	700
PM2-3	Pipe	200' w/o Applewood St	Lemonwood St to 800' s/o Lemonwood St			--	21	New	800
PM2-4	Pipe	Peachwood Avenue	Basin 24 to 600' e/o E St			--	24	New	500
PM2-5	Pipe	600' e/o E St	Peachwood Ave to 650' n/o Paige Ave			--	21	New	1,000
PM2-6	Pipe	600' e/o E St	Peachwood Ave to 400' n/o Peachwood Ave			--	21	New	400
PM2-7	Force Main	E Street	Force Main from Parkwood Meadows 2 Pump Station (PM2-PS)			--	12	New	100
PM2-B	Detention Basin	E Street	Proposed Basin 24 Expansion			5 acre-ft	14 acre-ft	Expand	--
PM2-PS	Pump Station	E Street	Parkwood Meadows 2 Pump Station (Class II discharge from Basin 24)			--	3.5 cfs	New	--
Pleasant Oak Subbasin									
PO-1	Pipe	Pleasant Avenue	Denair St to 700' e/o Denair St			--	12	New	700
PO-2	Pipe	w/o West Street	Pleasant Ave to 500' n/o Pleasant Ave			--	21	New	500
PO-B	Detention Basin	Pleasant Avenue	Pleasant Oak Basin			--	3 acre-ft	New	--
Pratt/Bardsley Subbasin									
PB-1	Pipe	200' n/o Dogwood Ave	600' e/o Pratt St to 1,100' e/o Pratt St			--	42	New	500
PB-2	Pipe	600' e/o Pratt St	200' n/o Dogwood Ave to 1,500' n/o Dogwood Avenue			--	36	New	1,300
PB-3	Pipe	600' e/o Pratt St	1,500' n/o Dogwood Avenue to 600' s/o Bardsley Ave			--	30	New	1,300
PB-4	Pipe	600' s/o Bardsley Ave	600' e/o Pratt St to 700' w/o Pratt St			--	24	New	1,300
PB-5	Pipe	300' e/o Pratt St	600' s/o Dogwood Ave to 1,500' n/o Dogwood Ave			--	24	New	1,100
PB-6	Force Main	200' n/o Dogwood Ave	Force Main from West/Paige Pump Station (WP-PS)			--	12	New	200
PB-B	Detention Basin	200' n/o Dogwood Ave	Proposed West/Paige Basin			--	15 acre-ft	New	--
PB-PS	Pump Station	200' n/o Dogwood Ave	West/Paige Pump Station (Class II discharge from West/Paige Basin)			--	4.0 cfs	New	--
Southeast Subbasin									
SE-1	Pipe	Levin Avenue	Basin 30 to 700' w/o Basin 30			--	36	New	1,800
SE-2	Pipe	Nelder Grove Street	Levin Ave to Azalea Ave			--	36	New	1,300
SE-3	Pipe	Levin Avenue	900' e/o Mooney Blvd to Mooney Blvd			--	24	New	900
SE-4	Pipe	Morrison Street	Basin 30 to 1,000' s/o Levin Ave			--	54	New	1,000
SE-5	Pipe	Foster Dr Extension	Dover Canyon St to Morrison St			--	48	New	2,200
SE-6	Pipe	Morrison Street	1,000' s/o Levin Ave to 3,200' s/o Levin Ave			--	54	New	2,200
SE-7	Pipe	Morrison Street	3,200' s/o Levin Ave to 4,300' s/o Levin Ave			--	48	New	1,100
SE-8	Pipe	Morrison Street	4,300' s/o Levin Ave to 4,900' s/o Levin Ave			--	42	New	600
SE-9	Pipe	1,200 s/o Levin Ave	Morrison St to 2,200' e/o Morrison St			--	36	New	2,200
SE-10	Pipe	1,200 s/o Levin Ave	2,200' e/o Morrison St to the College of the Sequoias PS (SE-PS2)			--	30	New	1,100
SE-11	Pipe	3,900' e/o Morrison St	College of the Sequoias Basin to 1,200' s/o Levin Ave			--	54	New	800
SE-12	Pipe	3,900' e/o Morrison St	1,200' s/o Levin Ave to Levin Ave Extension			--	54	New	1,400
SE-13	Pipe	3,900' e/o Morrison St	Levin Ave Extension to 1,200' n/o Levin Ave Extension			--	48	New	1,200
SE-14	Pipe	1,200 s/o Levin Ave	3,900' e/o Morrison St to 2,700' w/o Road 132			--	42	New	1,300
SE-15	Pipe	1,200 s/o Levin Ave	2,700' w/o Road 132 to 1,400' w/o Road 132			--	36	New	1,300
SE-16	Pipe	Levin Avenue Extension	3,900' e/o Morrison St to 2,700' w/o Road 132			--	42	New	1,200
SE-17	Pipe	Levin Avenue Extension	2,700' w/o Road 132 to 1,400' w/o Road 132			--	36	New	1,300
SE-18	Pipe	1,200' n/o Levin Ave Ext	3,900' e/o Morrison St to 2,700' w/o Road 132			--	48	New	1,300
SE-19	Pipe	1,200' n/o Levin Ave Ext	2,700' w/o Road 132 to 1,400' w/o Road 132			--	42	New	1,100
SE-20	Pipe	3,200' s/o Levin Ave	Morrison St to 1,100' e/o Morrison St			--	42	New	1,100
SE-21	Pipe	1,100' e/o Morrison St	3,200' s/o Levin Ave to 4,300' s/o Levin Ave			--	36	New	1,100
SE-22	Pipe	4,300' s/o Levin Ave	Morrison St to 900' w/o Morrison St			--	42	New	900
SE-23	Pipe	Bardsley Avenue	Morrison St to 1,000' e/o Morrison St			--	24	New	1,000
SE-24	Pipe	Bardsley Avenue	1,000' e/o Morrison St to Oakmore St			--	42	New	1,200
SE-25	Pipe	Bardsley Avenue	Oakmore St to 1,300' e/o Oakmore St			--	36	New	1,300
SE-26	Pipe	Bardsley Avenue	1,300' e/o Oakmore St to 2,600' e/o Oakmore St			--	30	New	1,300
SE-27	Pipe	Morrison Street	Bardsley Ave to 1,000' n/o Bardsley Ave			--	24	New	1,000
SE-28	Pipe	1,000' e/o Morrison St	Bardsley Ave to 1,100' n/o Bardsley Ave			--	24	New	1,100
SE-29	Pipe	Oakmore Street	Bardsley Ave to 1,100' n/o Bardsley Ave			--	36	New	1,300
SE-30	Pipe	Oakmore Street	1,100' n/o Bardsley Ave to 3,100' n/o Bardsley Ave			--	30	New	2,000
SE-31	Pipe	1,400' w/o Road 132	1,200' n/o Levin Ave Ext to Bardsley Ave			--	36	New	1,200
SE-32A	Force Main	Levin Avenue	Dual Force Main for Southeast Pump Station (SE-PS1)			--	21	New	2,300
SE-32B	Force Main	Levin Avenue	Dual Force Main for Southeast Pump Station (SE-PS1)			--	21	New	2,300
SE-33	Force Main	1,200' s/o Levin Ave	Force Main for College of the Sequoias Pump Station (SE-PS2)			--	21	New	600
SE-B1	Detention Basin	Levin Avenue	Proposed Expansion of Basin 30			--	100 acre-ft	Expand	--
SE-B2	Detention Basin	1,200' s/o Levin Ave	Proposed College of the Sequoias Basin 1			--	55 acre-ft	New	--
SE-B3	Detention Basin	Bardsley Avenue	Proposed Southeast Basin			--	20 acre-ft	New	--
SE-B4	Detention Basin	1,200' n/o Levin Ave Ext	Proposed College of the Sequoias Basin 2			--	12 acre-ft	New	--
SE-PS1	Pump Station	Levin Avenue	Southeast Pump Station (Class II discharge from Basin 30)			--	30.0 cfs	New	--
SE-PS2	Pump Station	1,200' s/o Levin Ave	College of the Sequoias Pump Station (Class III, pumps following storm)			--	14.0 cfs	New	--
Southeast Commercial Subbasin									
SEC-1	Pipe	500' n/o Elk Bayou	SEC-B1 to 4,600' w/o Road 124			--	54	New	3,000
SEC-2	Pipe	4,600' w/o Road 124	500' n/o Elk Bayou to 1,900' n/o Elk Bayou			--	48	New	1,400
SEC-3	Pipe	4,600' w/o Road 124	1,900' n/o Elk Bayou to 4,100' n/o Elk Bayou			--	42	New	2,200
SEC-4	Pipe	3,400' n/o Hosfield	4,600' w/o Road 124 to 5,900' w/o Road 124			--	42	New	1,300
SEC-5	Pipe	3,400' ne/o Laspina St	2,600' nw/o Elk Bayou to 3,700' nw/o Elk Bayou			--	36	New	1,100
SEC-6	Pipe	4,600' n/o Hosfield	4,600' w/o Road 124 to 5,900' w/o Road 124			--	30	New	1,300
SEC-7	Pipe	5,900' se/o Foster Dr	3,100' sw/o Road 124 to 1,900' sw/o Road 124			--	54	New	1,200
SEC-8	Pipe	5,900' se/o Foster Dr	1,900' sw/o Road 124 to 700' sw/o Road 124			--	48	New	1,200
SEC-9	Pipe	700' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr			--	42	New	1,300
SEC-10	Pipe	700' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr			--	36	New	1,100
SEC-11	Pipe	3,100' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr			--	42	New	1,300
SEC-12	Pipe	3,100' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr			--	36	New	1,100
SEC-13	Pipe	1,900' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr			--	42	New	1,300

Table ES.2 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
SEC-14	Pipe	1,900' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr			--	36	New	1,100
SEC-15	Pipe	6,100' w/o Road 124	700' n/o Hosfield to 2,000' n/o Hosfield			--	30	New	1,300
SEC-16	Pipe	500' n/o Elk Bayou	4,600' w/o Road 124 to 3,400' w/o Road 124			--	36	New	1,900
SEC-17	Pipe	500' n/o Elk Bayou	3,400' w/o Road 124 to 2,100' w/o Road 124			--	30	New	1,300
SEC-18	Pipe	3,400' w/o Road 124	500' n/o Elk Bayou to 1,800' n/o Elk Bayou			--	30	New	1,300
SEC-19	Pipe	n/o Elk Bayou-w/o Road 124	SEC-B3 to 5,300' n/o Hosfield			--	36	New	2,200
SEC-20	Pipe	2,100' w/o Road 124	SEC-B3 to 6,200' n/o Hosfield			--	36	New	2,200
SEC-21A	Force Main	n/o Hosfield	Dual Force Main for Southeast Commercial Pump Station (SEC-PS)			--	21	New	300
SEC-21B	Force Main	n/o Hosfield	Dual Force Main for Southeast Commercial Pump Station (SEC-PS)			--	21	New	300
SEC-B1	Detention Basin	n/o Hosfield	Proposed Southeast Commercial Basin 1			--	115 acre-ft	New	--
SEC-B2	Detention Basin	5,900' se/o Foster Dr	Proposed Southeast Commercial Basin 2			--	35 acre-ft	New	--
SEC-B3	Detention Basin	2,200' w/o Road 124	Proposed Southeast Commercial Basin 3			--	25 acre-ft	New	--
SEC-PS	Pump Station	n/o Hosfield	Southeast Commercial PS (Class II discharge from SE Commercial Basin 1)			--	30.0 cfs	New	--
Sunrise Subbasin									
SR-1	Pipe	1,200' se/o Foster Dr	1,600' sw/o Sunrise St to Basin 19			--	54	New	800
SR-2	Pipe	1,600' sw/o Sunrise St	1,200' se/o Foster Dr to 2,000' se/o Foster Dr			--	54	New	800
SR-3	Pipe	1,100' se/o Laspina St	1,600' sw/o Sunrise St to 2,600' sw/o Sunrise St			--	48	New	1,000
SR-4	Pipe	700' se/o Laspina St	2,600' sw/o Sunrise St to 3,600' sw/o Laspina St			--	42	New	900
SR-5	Pipe	1,600' sw/o Sunrise St	1,400' se/o Foster Dr to 500' se/o Foster Dr			--	30	New	900
SR-6	Pipe	1,600' sw/o Sunrise St	2,700' se/o Foster Dr to 2,200' se/o Foster Dr			--	24	New	1,200
SR-7	Force Main	w/o Elsinore Street	Force Main from Sunrise Pump Station (SR-PS)			--	21	New	2,200
SR-B	Detention Basin	w/o Elsinore Street	Expand Existing Basin 19			20 acre-ft	55 acre-ft	Expand	--
SR-PS	Pump Station	w/o Elsinore Street	Sunrise Pump Station (Class II discharge from Basin 19)			--	14.0 cfs	New	--
Terrace Park Subbasin									
TP-1	Pipe	Kohn Avenue	Aronian St to Laspina St	X	X	--	21	Replace/New	1,300
TP-2	Pipe	Laspina Street	Kohn Ave to 400' n/o Kohn Ave	X	X	--	15	New	400
TP-3	Pipe	Laspina Street	Kohn Ave to Sonora Ave	X	X	--	15	New	300
TP-4	Force Main	Marvin Avenue	Force Main for Terrace Park Pump Station (TP-PS)	X		--	15	New	200
TP-PS	Pump Station	Marvin Avenue	Terrace Park Pump Station (Class II discharge from Basin 49)	X		--	5.0 cfs	New	--
West No. 1 Subbasin									
W1-1	Pipe	Enterprise Street	Tulare Ave to 1,200' n/o Tulare Ave			--	48	New	1,200
W1-2	Pipe	Enterprise Street	1,200' n/o Tulare Ave to Pleasant Ave			--	42	New	1,500
W1-3	Pipe	Enterprise Street	Pleasant Ave to 1,400' n/o Pleasant Ave			--	36	New	1,400
W1-4	Pipe	Enterprise Street	1,300' s/o Prosperity Ave to 500' s/o Prosperity Ave			--	30	New	800
W1-5	Pipe	1,200' n/o Tulare Ave	Enterprise St to 1,100' e/o Enterpise St			--	30	New	1,100
W1-6	Pipe	1,200' n/o Tulare Ave	1,100' e/o Enterprise St to 2,100' e/o Enterprise St			--	24	New	1,000
W1-7	Force Main	Tulare Avenue	Force Main from West No. 1 Pump Station (W1-PS)			--	15	New	800
W1-B	Detention Basin	Enterprise Street	Proposed West No. 1 Basin			--	30 acre-ft	New	--
W1-PS	Pump Station	Enterprise Street	West No. 1 Pump Station (Class II discharge from West No. 1 Basin)			--	7.5 cfs	New	--
West No. 2 Subbasin									
W2-1	Pipe	1,300' s/o Tulare Ave	1,300' e/o Enterprise St to Enterprise St			--	42	New	1,300
W2-2	Pipe	Enterprise Street	1,300' s/o Tulare Ave to Inyo Ave			--	36	New	1,400
W2-3	Pipe	Enterprise Street	Inyo Ave to 800' s/o Inyo Ave			--	30	New	800
W2-4	Pipe	Enterprise Street	1,300' s/o Tulare Ave to 600' s/o Tulare Ave			--	30	New	700
W2-5	Pipe	1,300' s/o Tulare Ave	1,300' e/o Enterprise St to 2,600' e/o Enterprise St			--	21	New	1,300
W2-6	Force Main	1,300' e/o Enterprise St	Force Main from West No. 2 Pump Station (W2-PS)			--	15	New	1,300
W2-B	Detention Basin	1,300' e/o Enterprise St	Proposed West No. 2 Basin			--	30 acre-ft	New	--
W2-PS	Pump Station	1,300' e/o Enterprise St	West No. 2 Pump Station (Class II discharge from West No. 2 Basin)			--	7.5 cfs	New	--
Westgate Subbasin									
WG-1	Pipe	n/o Inyo Ave	Connection between existing 21" storm drains			--	21	New	380

A summary of the project prioritization by improvement project can be found in the body of the report. The following subsection summarizes the most critical improvements.

ES.5.1.1 Highest Priority Improvements

Of the higher priority improvements to the existing system, certain projects were identified as the most crucial to mitigate existing deficiencies. These projects are required to mitigate potential flooding in the Downtown Subbasin, which was found to be the most severely deficient subbasin in the City. Two major groups of projects were identified. These include the facilities necessary to convey stormwater runoff to the proposed Downtown Basin No. 1 (D-B1) and Downtown Basin No. 2 (D-B2):

- **Downtown Basin No. 1 (D-1 through D-3, D-67, D-B1, and D-PS1)**. This group of improvements is required to provide storage capacity to the southwestern portion of the Downtown Subbasin. Improvements D-2 and D-3 provide a means of conveying stormwater runoff from certain areas of the Downtown Subbasin to the proposed Downtown Basin No. 1 (D-B1).
- **Downtown Basin No. 2 (D-18 through D-19, D-24, D-36, D-68, D-B2, and D-PS2)**. These improvements are the most critical improvements to provide needed storage capacity to the central portion of the Downtown Subbasin. Improvements D-19. D-24, and D-36 are the most critical pipelines associated with the Downtown Basin No. 2 (D-B2) and will convey peak runoff to it.
- **Removal of Storm Drain Connections to Sanitary Sewer (A-1 through A-4, D-26, D-65, D-66, TP-1 through TP-3)**. In recent years, the City has implemented several improvement projects to remove storm drain connections to the sanitary sewer collection system. There are still several areas in the City where direct connections to the sewer still exist. Projects to remove these connections should be given high priority, because these areas pose a risk for sanitary sewer overflows.

The construction of the two aforementioned detention basins and associated piping should provide the most relief to the City in the potential for flooding during a major storm. For this reason, these projects should be given the highest priority of the proposed improvement projects.

ES.6 CAPITAL IMPROVEMENT PROGRAM

The cost estimates presented in the CIP have been prepared for general master planning purposes and for guidance in project evaluation and implementation. Final costs of a project will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule, and other variable factors such as: preliminary alignments generation, investigation of alternative routings, and detailed utility and topography surveys.

Knowledge about site-specific conditions for each proposed project is limited at the master planning stage; therefore the Estimated Construction Costs include a 30 percent contingency to account for unforeseen events and unknown field conditions. The Capital Improvement Costs also include an additional 20 percent (applied to the Estimated Construction costs) for project-related costs, comprising of engineering, administration, construction inspection, and legal costs. Table ES.3 summarizes the master plan CIP.

As shown in Table ES.3, the majority of improvements and capital costs are associated with growth and are therefore allocated to future customers ($120.3 million). The total CIP is estimated to cost approximately $166.1 million, of which 28.0 percent ($45.8 million) is allocated to existing customers.

Table ES.3 Capital Improvement Program Summary
Storm Drainage System Master Plan
City of Tulare

Customer Type	Cost (million dollars)					
	Phase I (2009-2011)	**Phase II (2012-2015)**	**Phase III (2016-2020)**	**Phase IV (2021-2025)**	**Phase V (2026-2030)**	**Total**
Existing[(1)]	17.2	21.1	7.5	0.0	0.0	**45.8**
Future	0.0	24.9	34.5	35.4	25.5	**120.3**
Total	**17.2**	**46.0**	**42.0**	**35.4**	**25.5**	**166.1**

Note:
1. Existing User costs have been distributed throughout several phases based on the project prioritizations presented in the body of the report.

ES.7 TID COORDINATION

As mentioned in this report, the City's storm drainage system is dependant on TID canals for discharge of storm water after it has been collected in the City's storm drainage system. Therefore, it is imperative that the City and TID coordinate in order for the systems to work well together. To achieve this objective, TID Staff has been involved in all phases of this master plan.

There are two areas where coordination between the City and TID can improve the maintenance and operation of the storm drain system. The first is managing nuisance water discharge to TID facilities during periods of the year when TID performs maintenance of its canals. Nuisance water is typically caused from landscape over watering and other non-storm based runoff. The second would be better coordination between the City and TID during March and April when TID is conducting their pre-irrigation deliveries.

ES.7.1 Maintenance Periods

As mentioned earlier in this report, the City has three classes of storm drain pump stations. Class I pumps automatically discharge to TID facilities, Class II require TID approval before discharge, and Class III have no direct discharge to TID facilities. The City currently has eight Class I pump stations (Figure ES.4), which are the focus of this section.

TID typically performs maintenance on their facilities between September and mid December each year. The Class I pump stations discharge nuisance water into the canals during the maintenance period and hinder TID staff from conducting work. In order for TID to perform maintenance projects more efficiently, the Class I pump stations should be controlled to limit the discharge of nuisance water during September to mid December.

Based on discussion with TID staff, the City and TID should coordinate so that during TID maintenance, the Class I pump stations are controlled to limit nuisance water discharge. One possible way to facilitate this would be to allow the wet wells to fill to a higher level before discharging and coordinate with TID on the appropriate time to discharge the collected nuisance water. This would essentially make these Class I pump stations Class II pump stations for a portion of the year. Once the TID maintenance period is over the pump stations would revert back to Class I status.

ES.7.2 March April Pre-Irrigation Water Delivery

TID typically performs a pre-irrigation run in March or April. During the pre-irrigation run, capacity in TID facilities for storm water would be occupied. Based on discussions with TID staff, it was suggested that the City and TID work together to develop a binding document that specifies how the pre-irrigation water delivery should be coordinated with the City's storm drainage needs as specified in the agreement between TID and the City.

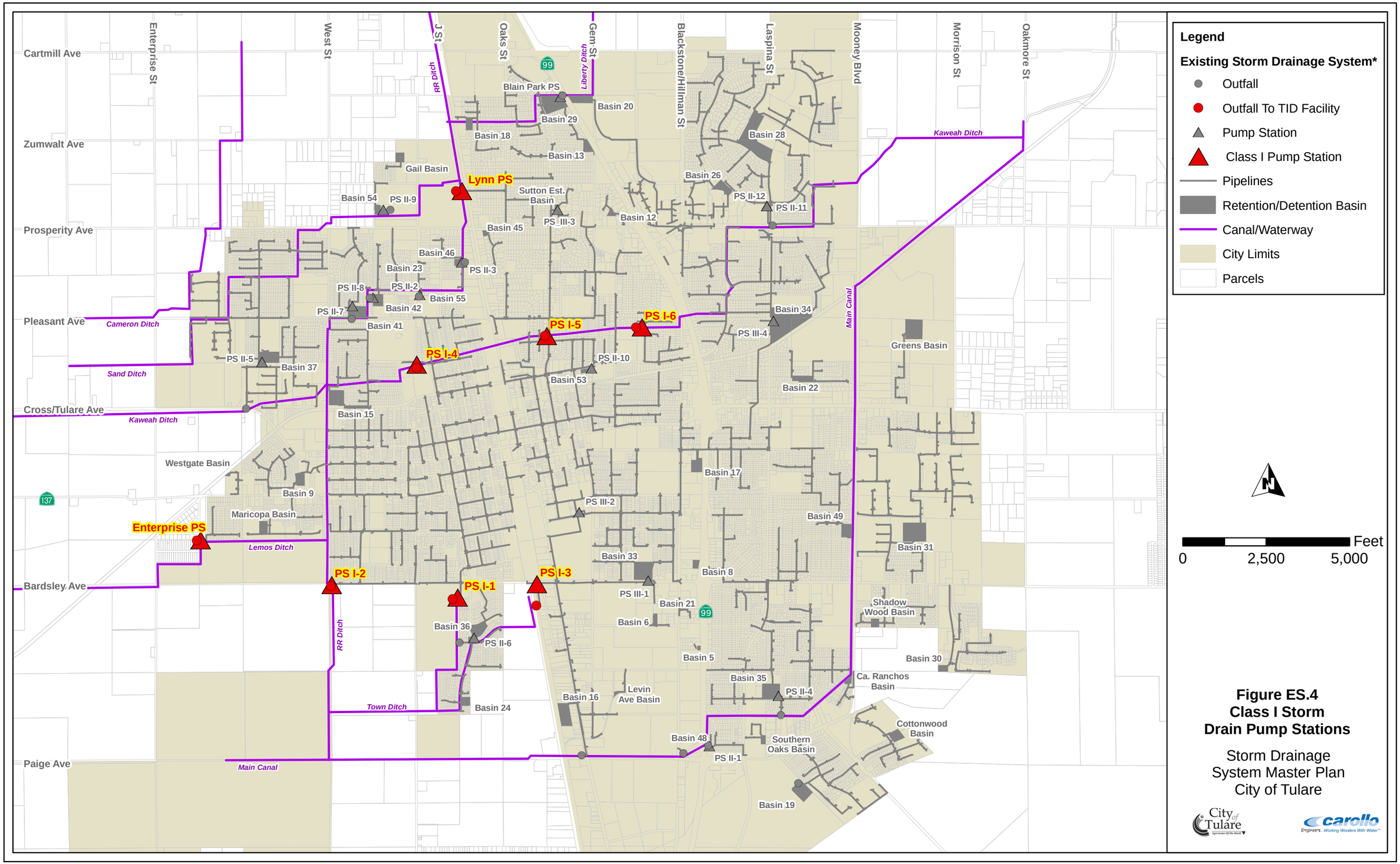


Figure ES.4
Class I Storm
Drain Pump Stations

Storm Drainage
System Master Plan
City of Tulare

*As of January 2009

Chapter 1

INTRODUCTION

This chapter presents the need for this Storm Drainage System Master Plan and the objectives of the study. A list of abbreviations is also provided to assist the reader in understanding the information presented.

1.1 BACKGROUND

The City of Tulare (City) (Figure 1.1) operates its own storm drainage system and associated infrastructure facilities, and serves customers within the City limits. The previous Master Plan of Drainage was completed in April 1975 (1975 Master Plan) and included a capacity evaluation, recommended improvements to mitigate deficiencies, and provided a summary of capital costs associated with the improvements. The 1975 Master Plan was based on planning assumptions and operational conditions that have since changed.

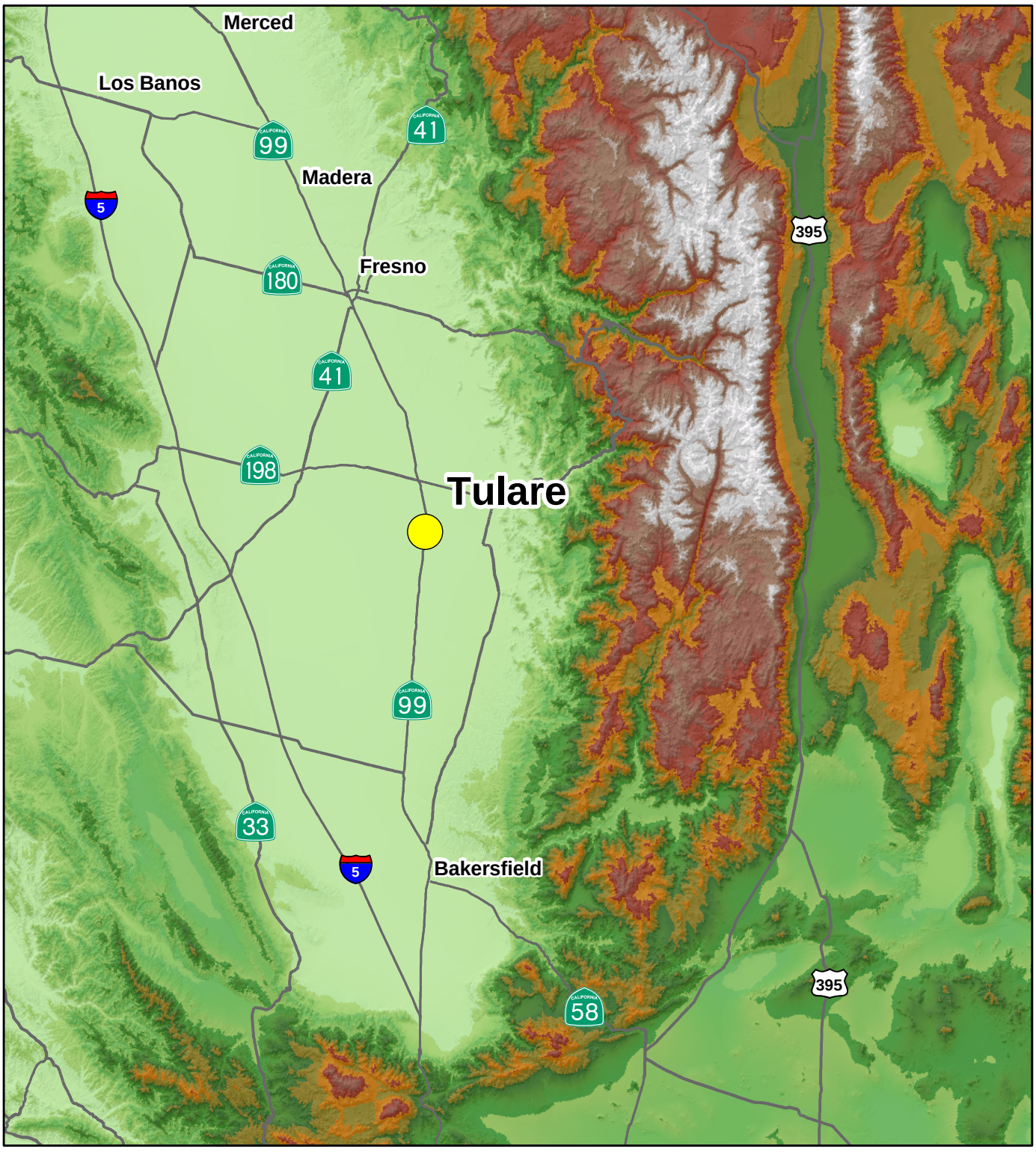
The City recently updated its general plan to the planning horizon of 2030. The land use assumptions and development assumptions used in this master plan are consistent with those provided in the General Plan Update (April 2008). This master plan recommends projects that will serve existing and future customers as development extends to the Urban Development Boundary (UDB) of the General Plan Update.

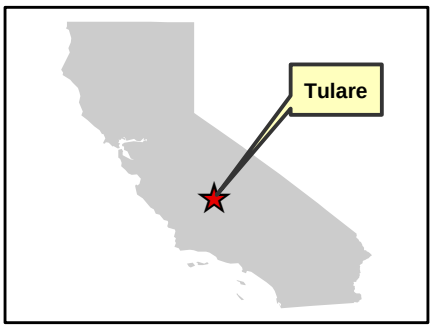
1.2 SCOPE AND AUTHORIZATION

The purpose of this Storm Drainage System Master Plan is to identify capacity deficiencies in the storm drainage system, develop feasible alternatives to correct these deficiencies, and plan the infrastructure that will serve future development.

On September 21, 2006, the City authorized Carollo Engineers, P.C., (Carollo) to prepare this storm drainage system master plan study, which included the following tasks:

- Establish storm drainage system planning and evaluation criteria.
- Create a hydraulic and hydrologic computer model of the storm drainage system.
- Evaluate the capacity of the existing storm drainage system.
- Review existing system deficiencies and propose improvements to enhance system capacity.
- Recommend improvements needed to service anticipated future growth.
- Develop a Capital Improvement Program (CIP) with a planning horizon of 2030.





Legend

Elevation

High : 12,000 Feet

Low : 0 Feet

Major Roads

Miles

0 15 30

Figure 1.1
Regional Location Map

Storm Drainage System
Master Plan
City of Tulare

City of Tulare

carollo
Engineers...Working Wonders With Water™

The study includes several planning assumptions that are documented in this report. Should future planning conditions deviate from the assumptions stated in this master plan (i.e., accelerated growth, more developments with higher densities, etc.), revisions and adjustments to the master plan recommendations would be necessary.

1.3 REPORT ORGANIZATION

The storm drainage system master plan report contains six chapters, followed by appendices that provide supporting documentation for the information presented in the report. The chapters are briefly described below:

Chapter 1 - Introduction. This chapter presents the need for this storm drainage system master plan and the objectives of the study. A list of abbreviations is also provided to assist the reader in understanding the information presented.

Chapter 2 - Planning Area Characteristics. This chapter presents a discussion of this study's planning area characteristics, defining the land use classifications and summarizing the historical population trends. Population projections are also presented.

Chapter 3 - Planning and Evaluation Criteria. The capacity of the City's storm drainage system was evaluated based on the planning criteria defined in this chapter. Precipitation characteristics, design storm duration and frequency, and impervious versus pervious surfaces were reviewed to perform the hydrologic analysis on the system. The developed criteria address the storm drainage system.

Chapter 4 - Existing System and Hydraulic Model. This chapter presents an overview of the City's storm drainage facilities. The chapter also describes the development of the City's storm drainage hydrologic and hydraulic models. These models were used for identifying existing system deficiencies and for recommending improvements.

Chapter 5 - Evaluation and Proposed Improvements. This chapter presents the results of the capacity evaluation of the storm drainage system. The chapter also presents improvements to mitigate existing system deficiencies and for servicing future growth. These improvements are recommended based on the system's technical requirements, cost effectiveness, and operational reliability.

Chapter 6 - Capital Improvement Program. This chapter presents the recommended CIP for the City's storm drainage system. The program is based on the evaluation of the City's storm drainage system, and on the recommended improvements described in the previous chapters of the report. The CIP has been staged to the planning horizon of 2030.

1.4 ACKNOWLEDGMENTS

Carollo wishes to acknowledge and thank Mr. Darrel Pyle, City Manager; Mr. Ken Ramage, City Engineer; Mr. Lew Nelson, Public Works Director; Mr. Mike Whitlock, Senior Civil Engineer; and Mr. Richard Bono, Wastewater Superintendent. Their own and their staff's cooperation and courtesy in obtaining a variety of necessary information were valuable components in completing and producing this report.

1.5 ABBREVIATIONS AND DEFINITIONS

To conserve space and to improve readability, the following abbreviations are used in this report.

Abbreviation	Description
$/LF	Dollars per Linear Foot
ºF	Degrees Fahrenheit
1975 Master Plan	City of Tulare Master Plan of Drainage, April 1975
AACE	Association for the Advancement of Cost Engineering
acre-ft	Acre-Foot
Carollo	Carollo Engineers, P.C.
cfs	Cubic Feet per Second
CIP	Capital Improvement Program
City	City of Tulare
DCIA	Directly Connected Impervious Area
DDF	Depth Duration Frequency
DEM	Digital Elevation Model
DOF	Department of Finance
ENR CCI	Engineering News Record Construction Cost Index
EPA	Environmental Protection Agency
FAR	Floor Area Ratio
FEMA	Federal Emergency Management Agency
ft	Feet
GIS	Geographic Information Systems
gr. ac.	Gross Acres
in.	Inches
in/hr	Inches per Hour
n	Manning’s Friction Coefficient
NRCS	Natural Resources Conservation Service
PS	Pump Station
ROW	Right of Way
RTC	Real Time Controls
SCS	Soil Conservation Service
SD	Storm Drain
sq. ft.	Square Feet
SSO	Sanitary Sewer Overflow
SWMM	Storm Water Management Model
TID	Tulare Irrigation District

Abbreviation	Description
UDB	Urban Development Boundary
USDA	United States Department of Agriculture

1.6 REFERENCES

The following documents were referenced in the preparation of this master plan report.

- City of Tulare Engineering General Design Standards, April 2002.
- City of Tulare Draft Environmental Impact Report for the Tulare Motor Sports Park Complex, May 2008.
- City of Tulare General Plan, April 2008.
- City of Tulare Master Plan of Drainage, Toups Corporation, April 1975.
- Soil Survey of Tulare County, California, Western Part, United States Department of Agriculture Natural Resources Conservation Service, 1999.

Chapter 2

PLANNING AREA CHARACTERISTICS

This chapter presents a discussion of this study's planning area characteristics, defining the land use classifications and summarizing the historical population trends. Population projections, used to estimate the City of Tulare's (City) future storm drainage requirements, are based on the City General Plan Update.

2.1 STUDY AREA

The City is located along Highway 99 in Tulare County within the Central San Joaquin Valley of California, approximately 45 miles south of Fresno and 60 miles north of Bakersfield.

Tulare was founded in 1872 by the Southern Pacific Railroad, and incorporated in 1888. Agriculture is a major component of the City's economy, due to its highly productive farmland. Tulare is attractive to food processors and distributors because of its central location and abundance of locally grown products.

The City recently updated its General Plan. The City limits and Urban Development Boundary (UDB), as established from the City's Land Use Diagram (Updated December 2007), are 19 square miles (12,281 acres) and 37 square miles (23,608 acres), respectively. The current City limits and UDB are shown on Figure 2.1. The study area boundary for this master plan is the UDB.

2.2 SOIL AND TOPOGRAPHY

According to the Soil Survey for Tulare County, California, Western Part from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (http://www.ca.nrcs.usda.gov/), the dominant soil types within City limits include Colpien, Nord, Yettem, Crosscreek, and Flamen soils. Additional soils within City limits include Hanford, Biggriz, and Tagus soils. Figure 2.2 shows the distribution of soil types throughout the City.

The topography of the San Joaquin Valley is generally flat. The City's UDB ground elevations range from approximately 255 feet (ft) to 310 ft above mean sea level.

2.3 CLIMATE

According to the City's website, the average maximum and minimum temperatures in January are 54 degrees Fahrenheit (°F) and 34 °F, respectively. In July, the average maximum and minimum temperatures are 96 °F and 65 °F, respectively. The City's average annual rainfall is 10.15 inches.

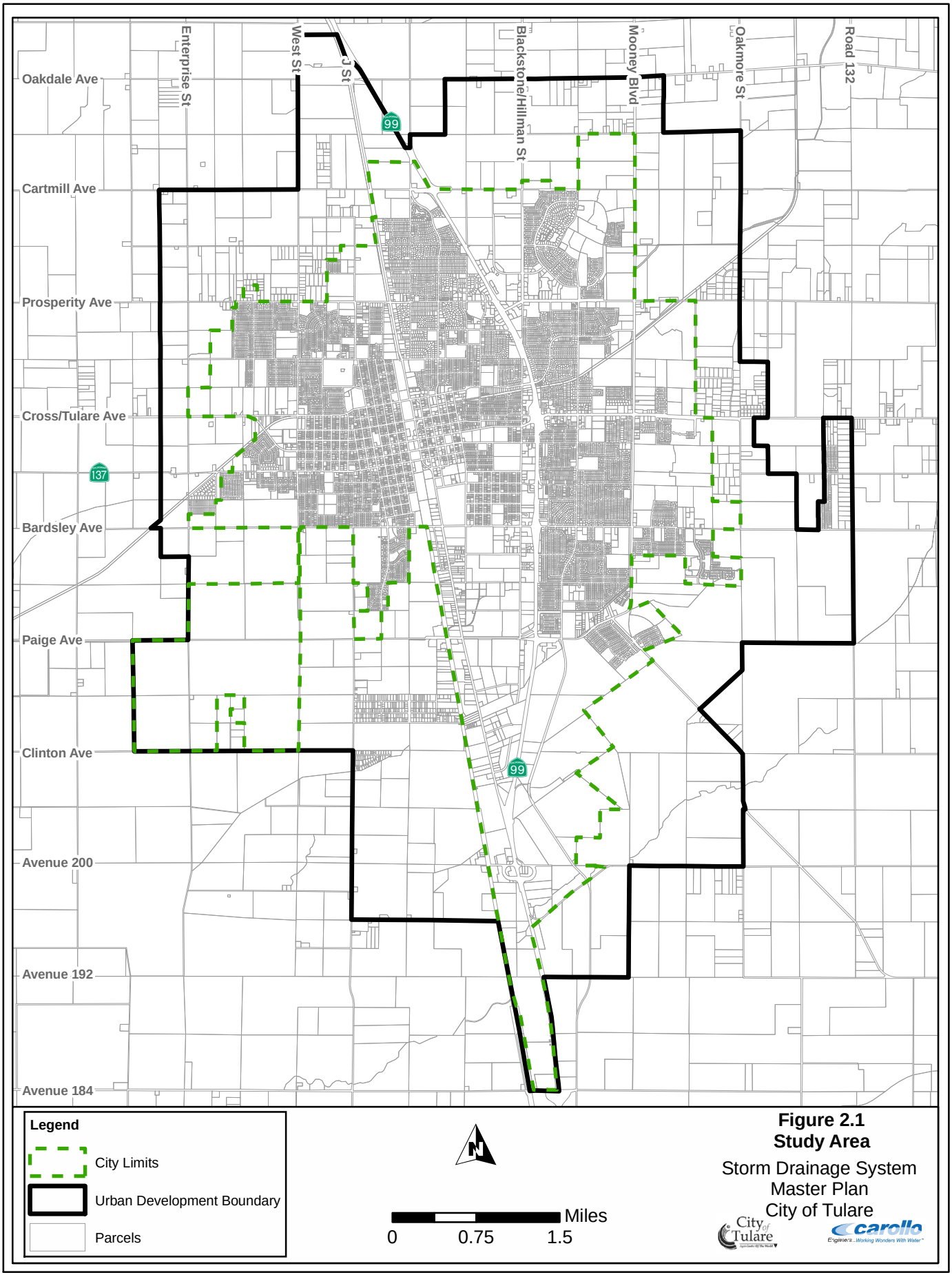


Figure 2.1
Study Area

Storm Drainage System
Master Plan
City of Tulare

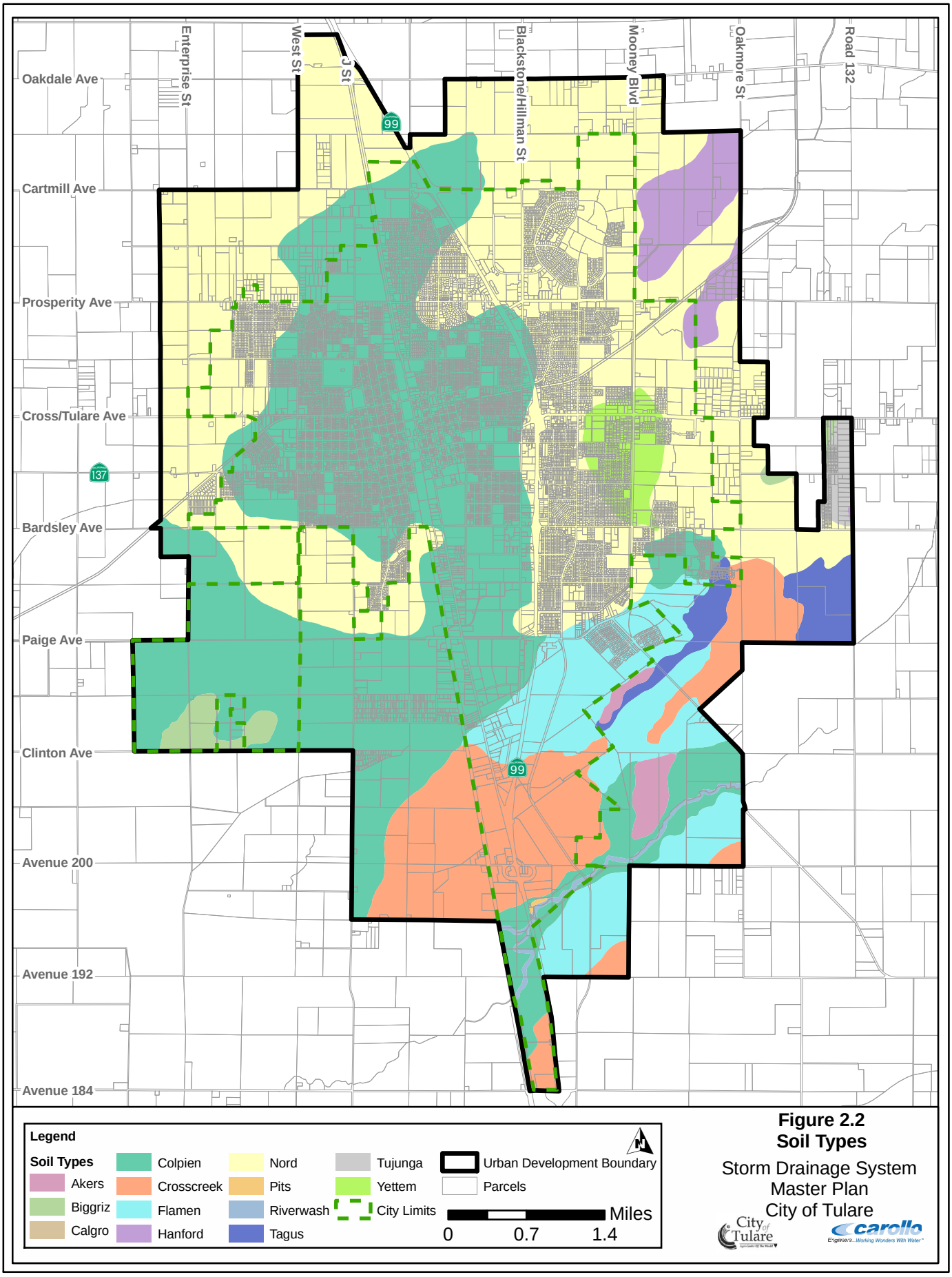


Figure 2.2
Soil Types

Storm Drainage System
Master Plan
City of Tulare

2.4 LAND USE

The land use classifications used in this master plan are consistent with the Land Use Diagram and Standards described in the City's General Plan Update, as shown on Figure 2.3. Table 2.1 summarizes the land use designations, along with acreages, for the current City limits and UDB. Not all land within the City is developed. Table 2.1 also tabulates the existing developed land within the current City limits.

The current City limits encompass approximately 12,281 acres. The existing land uses include 5,056 acres of residential, 1,598 acres of commercial, 1,781 acres of industrial, 340 acres of Parks and Recreation, and 1,625 acres of Public facilities.

Rural Residential (0-2.0 dwelling units/gross acre). This designation established areas for single-family dwellings and mini-farms or ranchettes where agricultural activity is secondary to the residential land use. Lots within this designation are typically large enough to support independent wastewater disposal (septic) systems. The minimum lot size for this designation is 20,000 square feet (sq. ft.).

Rural Estate (2.1-3.0 dwelling units per gross acre). This designation establishes areas for large lot single-family estate dwellings. Uses typically allowed include detached single-family homes, secondary dwellings, and support uses (i.e., servant quarters and/or pool houses). The minimum lot size for this designation is 12,500 sq. ft.

Low Density Residential (3.1-7.0 dwelling units per gross acre). This designation establishes areas for single-family residences in a suburban configuration. Uses typically allowed include detached single-family homes, secondary dwellings, and residential support uses such as churches, schools, and other necessary public utilities and safety facilities. The minimum lot size for this designation is 6,000 sq. ft.

Medium Density Residential (7.1-14.0 dwelling units per gross acre). This land designation establishes areas for single-family and low-density multi-family dwellings located near neighborhood serving uses such as, grocery stores, schools, parks, and other public services. Uses typically allowed include single-family dwellings, second units, town homes, duplexes, triplexes, and mobile park homes. The minimum lot size for this designation is 3,000 sq. ft.

High Density Residential (14.1-29.0 dwelling units per gross acre). This designation establishes areas for multi-family dwellings in urbanized areas with access to public transportation and residential serving uses (i.e., grocers and drug stores). Uses typically

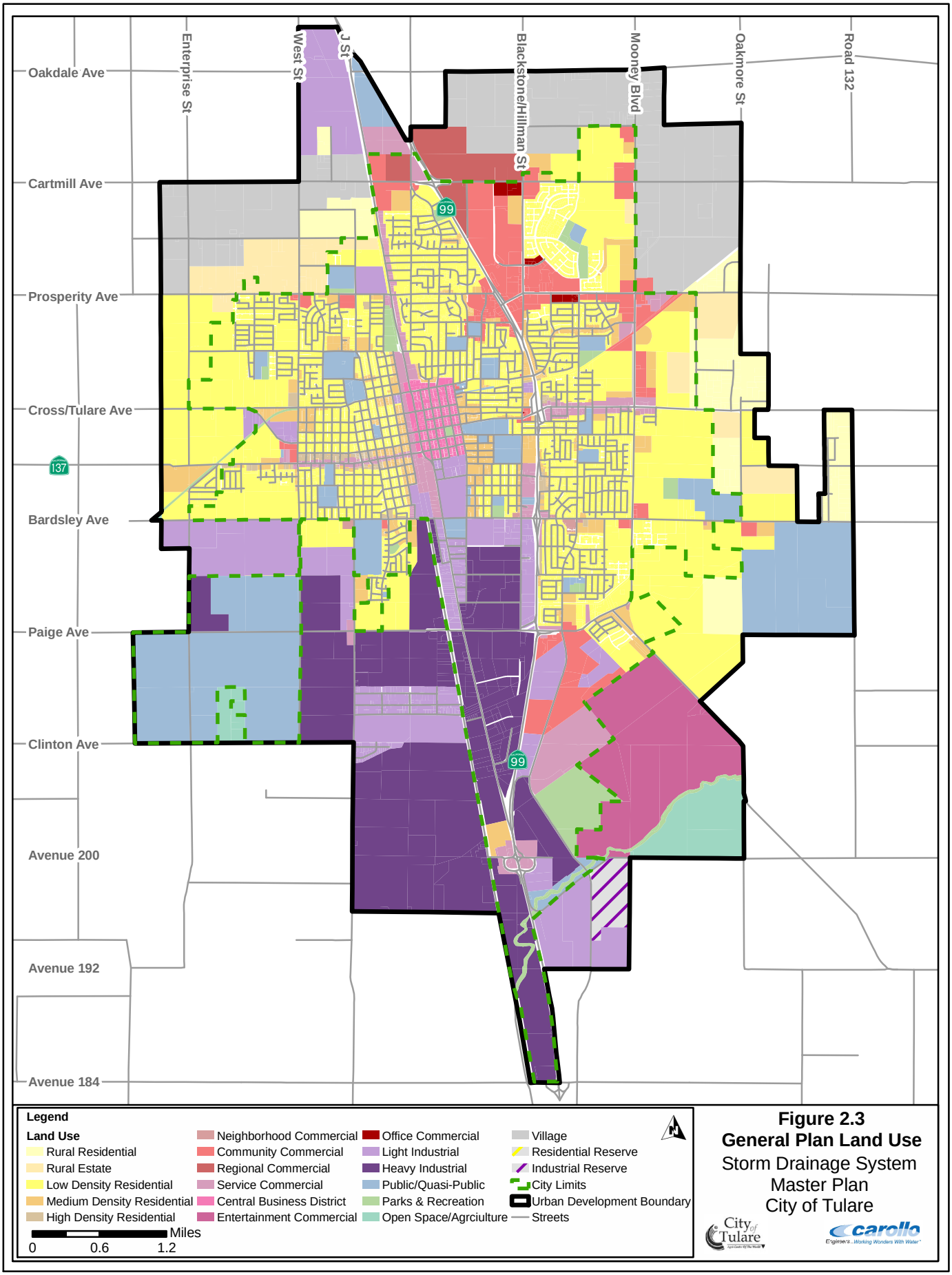


Figure 2.3
General Plan Land Use
Storm Drainage System
Master Plan
City of Tulare

Table 2.1 Land Use and Vacant Area
Sewer System Master Plan
City of Tulare

Land Use Designation	Code	City Limits				Urban Development Boundary
		2006 Total (gr. Ac.)	2006 Vacant (gr. Ac.)	2006 Developed (gr. Ac.)	% Vacant (%)	2030 Total (gr. Ac.)
Residential Designations						
Rural Residential	R-RR	30	29	1	0%	813
Rural Estate	R-RE	90	79	11	1%	623
Low Density Residential	R-LDR	4,257	1,739	2,518	14%	5,612
Medium Density Residential	R-MDR	614	206	408	2%	735
High Density Residential	R-HDR	66	19	47	0%	66
Commercial Designations						
Neighborhood Commercial	C-NC	13	6	7	0%	18
Community Commercial	C-CC	856	610	246	5%	894
Regional Commercial	C-RC	76	76	0	1%	280
Service Commercial	C-SC	506	103	403	1%	577
Central Business District	CBD	130	10	120	0%	130
Entertainment Commercial	C-EC	0	0	0	0%	937
Office Commercial	C-OC	16	14	2	0%	35
Industrial Designations						
Light Industrial	I-LI	561	202	359	2%	1,966
Heavy Industrial	I-HI	1,219	501	719	4%	3,106

Table 2.1 Land Use and Vacant Area
Sewer System Master Plan
City of Tulare

Land Use Designation	Code	City Limits				Urban Development Boundary
		2006 Total (gr. Ac.)	2006 Vacant (gr. Ac.)	2006 Developed (gr. Ac.)	% Vacant (%)	2030 Total (gr. Ac.)
Other Designations						
Public/Quasi-Public	PUB	1,625	149	1,476	1%	2,306
Parks and Recreation	PRK	340	47	293	0%	394
Open Space	OS/AG	13	0	13	0%	386
Roadways and Railroads	--	1,864	0	1,864	0%	2,322
Reserve Designations						
Village	NC	5	0	5	0%	2,272
Residential Reserve	UR-R	0	0	0	0%	0
Commercial Reserve	UR-C	0	0	0	0%	0
Industrial	UR-I	0	0	0	0%	136
Total						
Total		**12,281**	**3,788**	**8,492**	**31%**	**23,608**

Source: Draft General Plan Update (Matrix Design Group)

allowed include duplexes, triplexes, townhomes, and apartments near schools, parks, and other public services. The minimum lot size for this designation is 1,500 sq. ft.

Neighborhood Commercial. This designation establishes areas for daily convenience shopping services adjacent to residential neighborhoods. Uses typically allowed include supermarkets, drug stores, and other residential serving uses that are convenient to vehicular access and highly accessible for pedestrians and bicyclists. These centers typically contain 30,000 to 100,000 square feet of floor area on approximately 2 to 5 acres. Neighborhood centers usually include a grocery store as a leading tenant, and generally require a support population or 3,000 to 40,000 people. The maximum intensity of this designation is 0.60 FAR, and the minimum development size is 2 acres.

Community Commercial. This designation establishes areas for community oriented uses with a community wide market base. Uses typically allowed include community commercial centers, shopping plazas, and shopping centers that include a junior department store, or a large variety, discount or department store with direct and convenient arterial access and access for pedestrians, bicyclists, and public transit. These centers typically contain 100,000 to 300,000 square feet of floor area on 7 to 20 acres. The maximum intensity of this designation is 0.27 FAR, and the minimum development size is 7 acres.

Regional Commercial. This designation establishes areas for regional retail centers capable of drawing consumers from outside the Planning Area. Uses typically allowed include regional malls and outlet centers that contain department stores, comparison, and specialty retail uses with direct and visual arterial and highway access. Developments in this designation typically contain 500,000 or more square feet of commercial space on approximately 20 to 50 acres. The maximum intensity of this designation is 0.27 FAR, and the minimum development size is 20 acres.

Service Commercial. This designation establishes areas for neighborhood, business, and industrial serving uses. Uses typically allowed include automotive related or heavy equipment sales and services, building maintenance services, construction sales and services, and mini storage. The maximum intensity of this designation is 0.60 FAR, and the minimum development size is 20,000 sq. ft.

Office Commercial. This designation establishes areas for the development of offices and office parks. Uses typically allowed include professional offices (including but not limited to finance, insurance, and real estate), large administrative centers, medical and dental clinics, research and development, and other similar compatible activities. The maximum intensity of this designation is 0.80 FAR, and the minimum development size is 4,000 sq. ft.

Central Business District (0-29.0 dwelling units per gross acre). This designation establishes the Downtown as the predominant urban area of the city to provide a central gathering place for commerce and living. Uses typically allowed include eating and drinking establishments, personal, medical, and professional services, retail sales, medium-high and

high-density residential dwellings, and mixed-use development. The maximum intensity of this designation is 3.0 FAR.

Entertainment Commercial. This designation establishes areas for regional entertainment centers capable of drawing consumers from outside the Planning Area. Uses typically allowed include fairgrounds, race tracks, amusement parks, golf courses, and recreation/entertainment facilities with visual arterial and highway access. The maximum intensity of this designation is 0.20 FAR, and the minimum development size is 50 acres.

Light Industrial. This designation establishes areas for a range of non-intensive business park, industrial park, and warehouse uses that do not have detrimental noise or odor impacts on surrounding urban uses. Uses typically allowed include warehousing, welding and fabrication shops, and business support uses such as retail or eating establishments that serve adjacent light industrial uses and employees. The minimum lot size for this designation is 20,000 sq. ft.

Heavy Industrial. This designation establishes areas for the full range of industrial uses, which may cause noise or odor impacts on surrounding urban uses. Uses typically allowed include manufacturing, processing, fabrication, trucking terminals, ethanol plants, warehouses, asphalt batch plants, mills, lumber yards, and aggregate mining operations and support uses such as retail or eating establishments that support adjacent industrial uses and employees. The minimum lot size for this designation is 40,000 sq. ft.

Public. This designation establishes areas for public and institutional uses that serve the local community. Uses typically allowed include government facilities, schools, libraries, municipal corporation yards, sewer and water facilities, police and fire stations, and hospitals located throughout the community to serve neighborhoods and businesses and promote public safety. The maximum intensity of this designation is 0.60 FAR.

Parks and Recreation. This designation establishes areas for outdoor recreation facilities that serve local and regional users. Uses typically allowed in this designation include pocket, neighborhood, community, regional, natural parks, and other outdoor recreation facilities, such as, golf courses, trails, and open space/habitat preserves. Recreation facilities should be connected with accessibility to pedestrians and bicyclists.

Village. This designation establishes areas for planning new residential growth areas within the Planning Area. Key features of a village include a mix of single family and multifamily development, a neighborhood center, and a range of public uses such as schools and parks. The village center is comprised of neighborhood commercial, higher density residential, schools, public and open space uses.

The Village (V) designation is intended to promote a mixed-use village concept, incorporating the principles of smart growth and also recognizing the environmental and physical constraints of each village area. Each of the villages is assigned a particular land use mix, which will set the general parameters of urban development.

The Village designation is considered a “holding” category. The purpose of the Village designation is to promote the development of a detailed specific plan that will provide the details needed to ensure a comprehensive mixed-use area is developed. A specific plan is required to be submitted and approved to ensure a mixed-use concept, and an approved specific plan is required prior to approval of an annexation request.

2.5 POPULATION

According to data collected from the California Department of Finance (DOF), the City’s population for the year 2006 was approximately 51,477. This corresponds to an increase in population of approximately 18,000 from 1990 to 2006.

The draft General Plan Update projects a population of 130,975 people by the year 2030. In order for this to happen, the City’s population would need to increase by 4 percent per year. This growth rate corresponds with a projected population of approximately 60,000 in 2010, 89,000 in 2020, and 130,975 in 2030, as shown in Table 2.2. Figure 2.4 shows the historical and projected population trends from 1990 to 2030.

Table 2.2 Historical and Projected Population
Storm Drainage System Master Plan
City of Tulare

Master Plan Projected Years	2010	2015	2020	2025	2030[1]
Projected Population[2]	60,000	73,000	89,000	108,000	**130,975**
Annual Increase over 5-Year Period		4.0%	4.0%	4.0%	4.0%

Notes:
1. Source: General Plan Update (Matrix Design Group).
2. A 4.0% annual growth rate through 2030 was used based on projections provided in the draft General Plan Update.

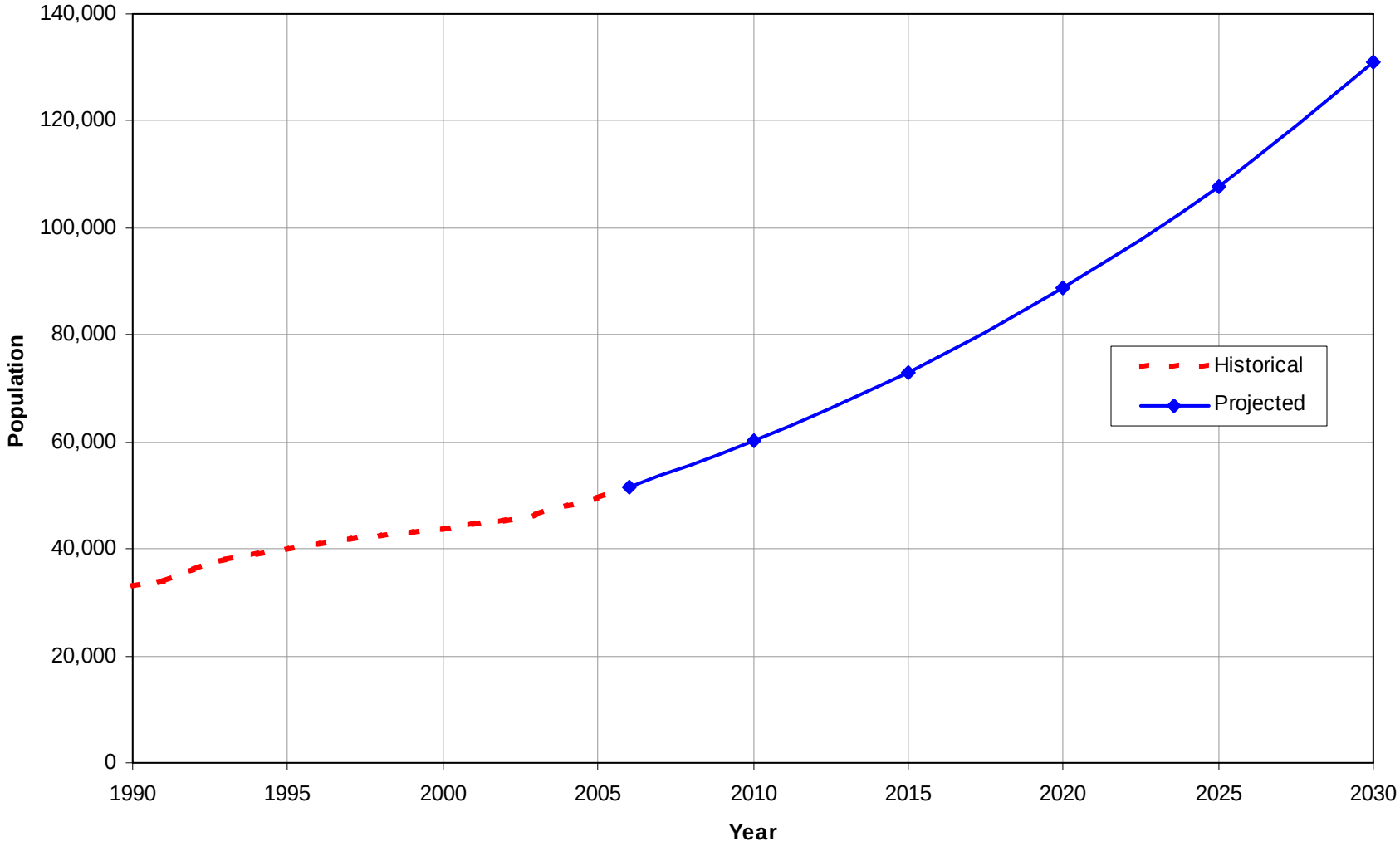


Figure 2.4
Historical and Projected Population
Storm Drainage System Master Plan
City of Tulare

PLANNING AND EVALUATION CRITERIA

The City of Tulare (City) storm drainage facilities were evaluated based on the planning and evaluation criteria defined in this chapter. Precipitation characteristics, design storm duration and frequency, and impervious versus pervious surfaces were reviewed to perform the hydrologic analysis on the system. The planning criteria address the storm drainage system capacity.

3.1 HYDRAULIC ANALYSIS

A hydraulic analysis of the City's storm drainage conveyance system was performed using a hydraulic computer model. This section summarizes the criteria used in the development of the hydraulic model.

3.1.1 Gravity Storm Drains

Capacity analysis of the gravity storm drainage system was performed in accordance with the criteria established in this section.

3.1.1.1 Manning Coefficient (n)

The Manning coefficient 'n' is a friction coefficient and varies with respect to pipe material, size of pipe, depth of flow, smoothness of joints, root intrusion, and other factors. For storm drainpipes, the Manning coefficient typically ranges between 0.012 and 0.015. The Manning's n for all storm drains was assumed to be 0.015 for the hydraulic analysis. This is a conservative estimate for Manning's n, but is reasonable considering the age of some pipes in the system.

3.1.1.2 Surcharge Depth and Street Flooding

Storm drains are designed to surcharge under normal operation. When evaluating the adequacy of the exiting conveyance facilities servicing existing developments, City streets were allowed to flood and provide flow attenuation and storage capacity, thus mitigating some cost-prohibitive improvements. Floodwaters were permitted to accumulate in streets to one foot above the gutter flow line for the 100-year storm.

3.1.2 Pump Stations

There are three general pump station categories in the City; Class I, Class II, and Class III. Class I pump stations are permitted to discharge automatically to Tulare Irrigation District (TID) facilities. This master plan assumes that the City will not construct any new Class I pump stations. All future stormwater runoff will be conveyed to detention and retention basins.

Class II pump stations are not permitted to discharge to TID facilities without TID approval and are used in conjunction with detention basins. This type of pump station is used to draw

down detention basins following a storm event. Future Class II pump stations recommended in this master plan were sized to be capable of draining 100 percent of the basin's storage capacity in 48 hours.

Class III pump stations have no direct discharge into TID facilities. This type of pump station discharges into City owned storm pipes for ultimate disposal by a Class I or Class II pump station. This type of pump station can automatically or manually discharge into City storm pipes. For this study, all future Class III pump stations are used in conjunction with a detention basin and were assumed to discharge to City storm drain pipes following the storm event.

3.2 HYDROLOGIC ANALYSIS

This section describes the hydrological characteristics of the City and the design storms that were used to estimate existing and future storm flows.

3.2.1 Precipitation Characteristics

The City's wet season occurs from November through April, although the majority of the City's rainfall occurs from December through February. Typically, storms that originate over the Pacific Ocean reach their maximum precipitation as they cross over the higher elevations of the coastal range, and decrease in precipitation as they reach lower elevations of the inland valleys. Mean annual precipitation in Tulare is approximately 10.15-inches. Depth-duration-frequency (DDF) curves were derived from data published by the California Department of Water Resources.

3.2.2 Elements of a Design Storm

The planning and design of storm drainage facilities required the selection of a level of protection provided by those facilities. The level of protection is often expressed in terms of the frequency, or return period, of the storm for which the facilities are to prevent damage or for which the facilities will safely pass the stormwater flows. This storm is referred to as the design storm and is an idealized representation of a typical storm with a specified return period.

Selection of the design storm can have a significant impact on the size and cost of required drainage facilities. There are three elements of a design storm: precipitation depth, duration, and frequency.

3.2.2.1 Precipitation Depth

This element is the amount of precipitation occurring during a specified storm duration. The depths of rainfall are statistical depths obtained by studying historical precipitation data, for each duration, for a particular frequency. Precipitation depth is usually expressed in inches.

3.2.2.2 Duration

This element is the specified length of storm time considered. Duration of a design storm event should be at least four times the response time of the drainage basin. The response time is the time required for the flow peak to reach the point of interest, such as a structure, outlet, or spillway. Duration may be expressed in any time unit such as minutes or hours.

3.2.2.3 Frequency

This element is the frequency of occurrence of events with the specified precipitation depth and duration. It is expressed in terms of the return period. To provide a reasonable level of flood protection, the statistical concept of return period, or recurrence interval, is utilized. The frequency aids in assigning a probabilistic meaning to a precipitation event.

3.2.3 Tulare's Design Storm

The City's design storms were developed based on a letter report entitled "Tulare Design Storm Report" by Hydmet, Inc., dated May 2007. The letter report is included in Appendix A. Two design storms were used for the evaluation of the City's existing storm drainage system and for the design of future storm drainage facilities. The 24-hour, 10-year event was used for evaluating storm conveyance facilities, while the 24-hour, 100-year event was used for evaluating the combined capacity of basins, streets, and pipes. The 10-year and 100-year recurrence intervals have become standard selections in most locations in California because they provide a balance between level of service and affordability, and provide reasonable standards of care.

3.2.3.1 Conveyance Facilities

The 24-hour, 10-year design storm was used for sizing of conveyance facilities for drainable areas. The 24-hour, 100-year design storm was used to determine if street flooding exceeds one foot in depth and could flood buildings or create serious safety hazards.

3.2.3.2 Rainfall Frequency

After evaluating a long historical record of maximum rainfall intensities for varying durations, a reasonable statistical interpretation can be made of the data to determine estimates of rainfall intensities or depths as a function of storm duration and of return frequency. Design storms for the City are provided in Table 3.1. Figure 3.1 presents a graphical representation of the design storms for the 24-hour, 10-year and 24-hour, 100-year recurrence intervals.

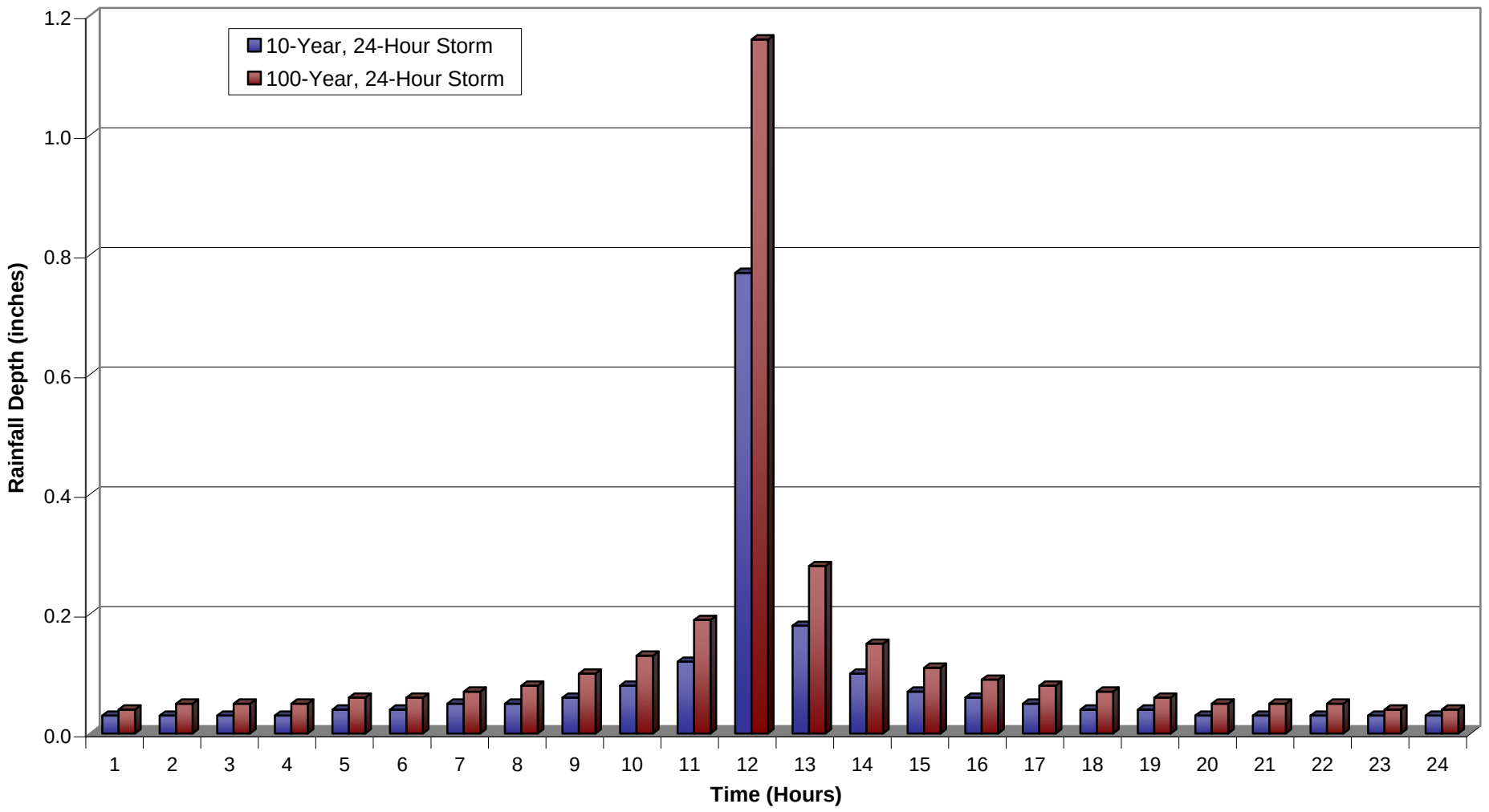


Figure 3.1
Design Storms
Storm Drainage System Master Plan
City of Tulare

Table 3.1 Depth-Duration-Frequency Data Storm Drainage System Master Plan City of Tulare											
	5-min	**10-min**	**15-min**	**30-min**	**1-hr**	**2-hr**	**3-hr**	**6-hr**	**12-hr**	**24-hr**	**48-hr**
2-year	0.16	0.21	0.25	0.34	0.45	0.55	0.62	0.76	0.92	1.13	1.38
5-year	0.23	0.31	0.36	0.48	0.64	0.79	0.89	1.09	1.34	1.65	2.03
10-year	0.31	0.4	0.46	0.6	0.77	0.95	1.07	1.32	1.63	2.01	2.48
25-year	0.39	0.5	0.57	0.73	0.93	1.15	1.3	1.61	1.99	2.47	3.05
50-year	0.46	0.58	0.66	0.83	1.05	1.3	1.47	1.83	2.26	2.8	3.47
100-year	0.53	0.66	0.75	0.93	1.16	1.44	1.63	2.03	2.52	3.13	3.88

3.2.4 Soil Imperviousness

For stormwater modeling, the key factor relating land use to runoff is “effective percent imperviousness.” Rainfall on impervious surfaces is not subject to losses by infiltration into the soil; the only losses in impervious areas are due to depression storage. All initial losses for impervious areas, typically 0.02 to 0.08 inches, are assumed to be satisfied by precipitation preceding the design storm.

3.2.4.1 Effective Percent Imperviousness

The basin proportion of effective or connected impervious area is related to land use, storm water drainage system configuration, and recurrence interval. If runoff from an impervious area flows directly into a concentrated flow path, i.e. into a gutter, it is considered directly connected. If it flows over a pervious area before becoming a concentrated flow, it is unconnected.

The existing impervious cover in small urban areas can be estimated by direct measurements of land use from aerial photography. The impervious area for future land use must be determined from maps contained in the General Plan. To make that determination, it is necessary to develop a table of effective percent impervious values for each land use code. Table 3.2 lists typical effective percent of impervious area for each of the Tulare land use designations.

Table 3.2 Soil Percent Imperviousness Storm Drainage System Master Plan City of Tulare		
Land Use Category	**Effective Percent Impervious**	**Non-Effective Percent Impervious**
Residential Designations		
Rural Residential	35%	15%
Rural Estate	35%	15%
Low Density Residential	35%	15%
Medium Density Residential	50%	5%
High Density Residential	60%	0%
Commercial Designations		
Neighborhood Commercial	95%	0%
Community Commercial	95%	0%
Regional Commercial	95%	0%
Service Commercial	95%	0%
Office Commercial	95%	0%
Central Business District	95%	0%
Entertainment Commercial	65%	0%
Industrial Designations		
Light Industrial (Existing)	70%	0%
Heavy Industrial (Existing)	70%	0%
Light Industrial (Future)(1)	--	--
Heavy Industrial (Future)(1)	--	--
Other Designations		
Public/Quasi-Public	Varies	0%
Parks and Recreation	2%	0%
Open Space	1%	0%
Reserve Designations		
Village	45%	15%
Residential Reserve	45%	15%
Commercial Reserve	95%	0%
Industrial Reserve	70%	0%

Notes:
1. Stormwater runoff for future industrial areas were assumed to be captured in onsite storm drain facilities, per City staff direction.

Future runoff from industrial land use designations were assumed to be contained through on site drainage facilities. In addition, runoff associated with street drainage was also assumed to be captured by onsite drainage facilities. Therefore, drainage facilities in future industrial areas, are not included in this master plan.

3.2.4.2 Non-Effective Percent Imperviousness

In residential urban areas, either a portion of the pervious runoff area has no flow path to the drainage system, or the flow path is via groundwater drains, which effectively delays runoff until it does not contribute to the design hydrographs. These areas are typically backyards, swimming pools, dense shrub landscaping, and gardens. Table 3.2 lists the non-effective percent impervious areas.

3.2.4.3 Pervious Area Runoff

The remaining runoff originates from pervious areas. The Horton Method was used to determine pervious runoff. This method is based on empirical observations showing that infiltration decreases exponentially from an initial maximum rate to some minimum rate over the course of a long rainfall event.

3.3 WATERSHED MODELING

Hydrologic analysis of the City's stormwater drainage system was performed using the Storm Water Management Model (SWMM) RUNOFF Block, which is included in the H_2OMAP SWMM modeling software. The SWMM RUNOFF block was designed to simulate the surface water runoff response of a drainage basin to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components.

The RUNOFF block was used to simulate the quantity of stormwater runoff that flows overland in each subbasin during a particular storm event. The RUNOFF block output data was generated by the model based on the input parameters detailed below.

3.3.1 SWMM Hydrologic Unit (Subcatchments)

Subcatchments are hydrologic units of land whose topography and drainage system elements direct surface runoff to a single discharge point. The City was divided up into more than 2,500 individual subcatchments and the appropriate outlet point was defined. The area of each subcatchment was determined with the use of development plans and contours of the City.

3.3.1.1 Design Hydrographs

Design hydrographs were determined using the SWMM Runoff Module of H_2OMAP SWMM, which is incorporated in the Tulare Stormwater model. The 10-year and 100-year, 24-hour storms were used in the analysis. The hyetographs were balanced so that 5, 10, 15, etc. minute intensities are nested symmetrically within the 24-hour storm. They were constructed (by the SWMM Runoff Module) from DDF data shown in Table 3.1.

3.3.1.2 Width of SWMM Hydrologic Unit (SWMM Subbasin)

The width of each SWMM Hydrologic unit, or SWMM subbasin was used by the model to estimate the flow from the furthest point in the drainage area to the outlet. Determining this physical width of overland flow is a difficult process as it depends on storage and shape effects of the subbasin. Therefore, it is commonly used as a calibration parameter to account for the impact of the drainage system within each subbasin on flow travel time. However, due to inadequate data for calibrating the runoff from each subbasin, subbasin width was not considered as a calibration parameter in this analysis. Instead, the width was estimated first by determining the maximum length of overland flow and dividing the area by this length. This method is recommended in the SWMM User's Manual.

3.3.1.3 Ground Slope

Ground slopes were determined using the City's elevation data and ArcView GIS. An average overland flow path slope is required for each basin within SWMM Runoff. This value was automatically determined through intersection of subbasin areas with the Digital Elevation Model (DEM) derived from the City elevation data points, 1-foot contours, and survey data. The elevation grid was intersected with the subbasins and the slope of each grid cell within the subbasin was calculated. Using the number of cells within each subbasin, the average basin slope was calculated. To verify this procedure, subbasin slopes for selected subbasins were manually estimated using available ground contour elevations and following SWMM guidelines.

3.3.1.4 Directly Connected Impervious Area

SWMM Runoff requires initial percent Directly Connected Impervious Area (DCIA) values to estimate the volume of runoff. DCIA refers to the impervious areas that are directly connected to stormwater conveyance systems, such as stream channels and storm sewers, with no opportunity for infiltration. Transportation features (roads, bridges and highways) typically contribute the highest amounts of direct stormwater runoff to a storm sewer system.

3.3.1.5 Manning's n-Value

The overland flow travel time is affected by the type of surface cover. For each SWMM unit, roughness coefficients will be input into the model for both pervious and impervious surfaces. The roughness coefficients will be based on the types of ground cover as shown in Table 3.3.

3.3.1.6 Depression Storage in Pervious and Impervious Areas

Depression storage is a volume that must be filled prior to the occurrence of runoff on pervious and impervious areas and is often used as a calibration parameter. Depression storage is input into the model as an average depth over the entire drainage area. Because this value is difficult to estimate, trial depression storage values were initially input for pervious and impervious portions of each SWMM hydrologic unit using values in the

SWMM User's Manual and then adjusted, where necessary, during model comparison with other hydrologic models.

3.3.1.7 Infiltration Parameters

Infiltration into the soil in pervious areas was estimated for each subbasin by the model using the Horton equation. This is one of the earliest and most widely used infiltration equations. This method assumes that infiltration begins at some rate and exponentially decreases until it reaches a constant rate. Because the Horton parameters vary depending on soil type, soil maps were examined to determine the soil type within each drainage area. Weighted average soil properties were determined for each SWMM model subbasin based on the amount of each hydrologic soil group in the subbasin, and typical soil properties for each group.

Table 3.3 Parameters for Overland Flow
Storm Drainage System Master Plan
City of Tulare

Surface	Overland Manning's n	Distance/Range (ft)
Pavement - smooth	0.02	50-200
Pavement - rough/cracked	0.05	50-200
Bare soil - newly graded areas	0.10	100-300
Range - heavily grazed	0.15	100-300
Turf - 1-2 in/lawns/golf courses	0.20	100-300
Turf - 2-4 in/parks/medians/pasture	0.30	200-500
Turf - 2-6 in natural grassland	0.40	200-500
Residential Landscaping	0.60	100-300
Few trees - natural grass undergrowth	0.50	300-600
Scattered trees - weed/shrub undergrowth	0.60	300-600
Numerous trees - dense undergrowth	0.80	300-600

Note:
1. Manning's n for shallow flow depths is not the same as Manning's n for channels.

Four hydrologic soil groups are used. The soils are classified on the basis of water intake at the end of long duration storms after prior wetting, an opportunity for swelling, and without the proactive effects of vegetation. The hydrologic soil groups are:

A: Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well to excessively drained sands or gravels. These soils have a high rate of water transmission.

B: Soils having moderate infiltration rates when thoroughly wetted and consisting of moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission.

C: Soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes the downward movement of water or soils with moderately fine to fine texture. These soils have a slow rate of water transmission.

D: Soils having very slow infiltration rates when thoroughly wetted and consisting chiefly of clay soils with high swelling potential, soils with permanent high water table, soils with claypan or clay layer at or near the surface, and shallow soils over nearly impervious material. These soils have a very slow rate of water transmission.

Each soil group is associated with the typical infiltration soil properties as listed in Table 3.4. By determining the percentages of each hydrologic soil group within a subbasin, maximum and minimum infiltration rates were calculated. The constant decay rate for Horton infiltration analysis was set to 0.0015 per second. Figure 3.2 shows the hydrologic soil groups within the City, which are based on data provided by the Natural Resources Conservation Service (NRCS).

Table 3.4 Infiltration Rates for NRCS Hydrologic Soil Groups
Storm Drainage System Master Plan
City of Tulare

Soil Group	Maximum Infiltration Rate (in/hr)	Minimum Infiltration Rate (in/hr)
A	2.0	0.065
B	1.5	0.050
C	1.0	0.035
D	0.5	0.020

3.3.1.8 Gutter Flow

A triangular street cross section was used to determine flow velocity and travel times for street gutter flow. Input data required to model gutters are gutter slope, street cross slope, and Manning's "n" coefficient. The modeling software uses a typical contributing area, representative of the beginning of street flow, to determine flow depths in the gutters.

3.3.1.9 Pipe Flow

Manning's equation for pipe flow was used to determine travel time for flow through pipes. The modeling software calculates pipe travel time using entered values for slope, diameter, and Manning's n. To determine flow depths, a typical contributing area representative of the first upstream street inlets is used.

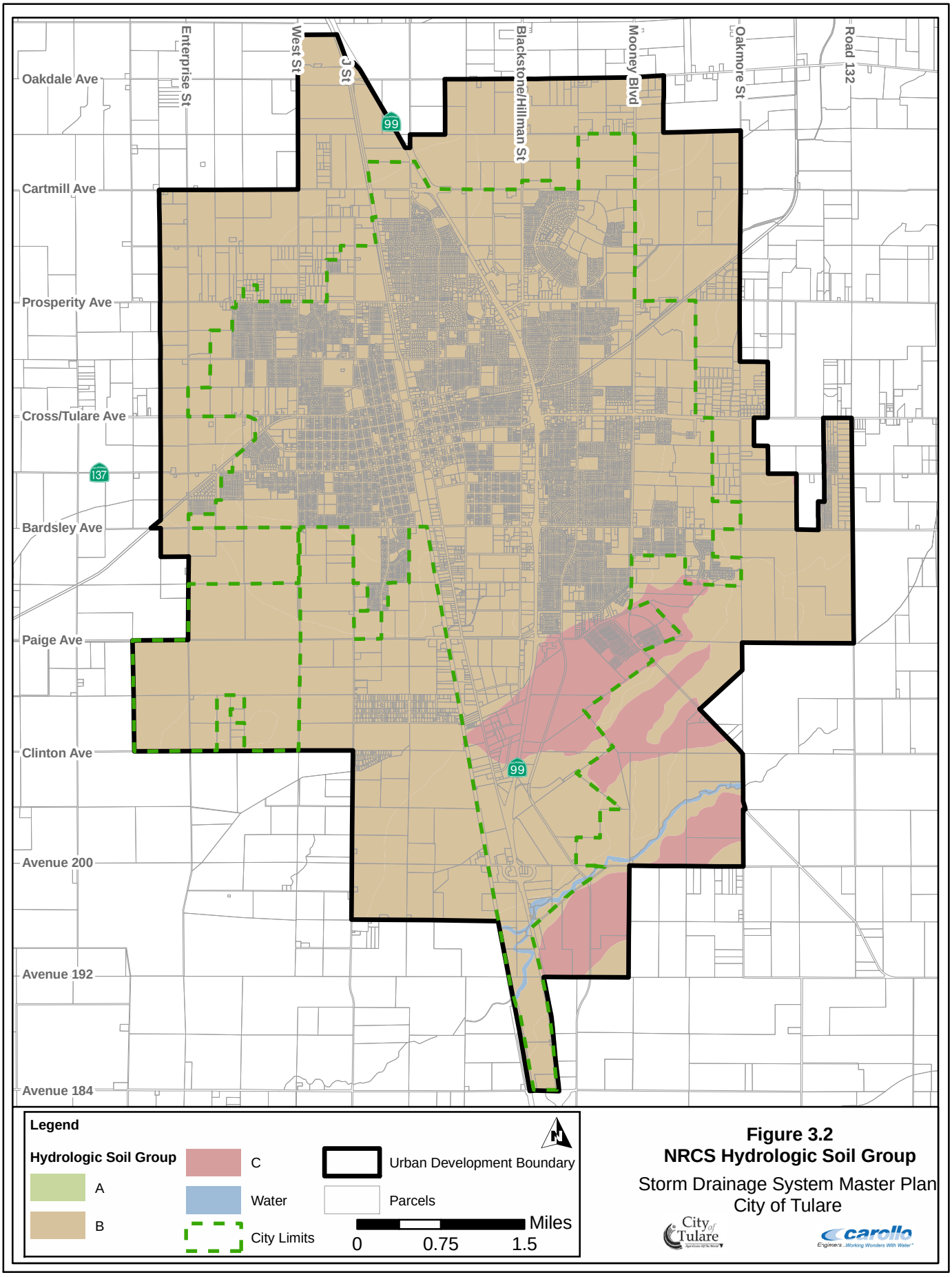


Figure 3.2
NRCS Hydrologic Soil Group
Storm Drainage System Master Plan
City of Tulare

3.3.1.10 Channel Flow

Manning's equation for open channel flow was used to derive travel time, velocity, flow, and width relationships for channels. The modeling software calculates ditch or channel travel time using entered values of slope, width, bank side slope, and Manning's n. The modeling software required input of a typical contributing area to determine depth of flow.

3.3.1.11 Relevant Assumptions

The Federal Emergency Management Agency (FEMA) 100-year water surface elevations were used where available, as the downstream control for all facilities where FEMA flood profiles are available.

3.4 PLANNING AND EVALUATION CRITERIA SUMMARY

The City's storm drainage system was evaluated based on the planning and evaluation criteria in this chapter. The criteria are summarized in Table 3.5.

Table 3.5 Planning and Evaluation Criteria Summary
Storm Drainage System Master Plan
City of Tulare

Design Storm

To evaluate storm sewer conveyance facilities, a 24-hour 10-year event was used.

To evaluate the combined capacity of streets, retention/detention ponds, and pipes, a 24-hour 100-year event was used.

Precipitation Depth-Duration-Frequency

Depth-Duration-Frequency Data
Storm Drainage Master Plan
City of Tulare

	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr	48-hr
2-yr	0.16	0.21	0.25	0.34	0.45	0.55	0.62	0.76	0.92	1.13	1.38
5-yr	0.23	0.31	0.36	0.48	0.64	0.79	0.89	1.09	1.34	1.65	2.03
10-yr	0.31	0.4	0.46	0.6	0.77	0.95	1.07	1.32	1.63	2.01	2.48
25-yr	0.39	0.5	0.57	0.73	0.93	1.15	1.3	1.61	1.99	2.47	3.05
50-yr	0.46	0.58	0.66	0.83	1.05	1.3	1.47	1.83	2.26	2.8	3.47
100-yr	0.53	0.66	0.75	0.93	1.16	1.44	1.63	2.03	2.52	3.13	3.88

Intensity-Duration-Frequency Data
Storm Drainage Master Plan
City of Tulare

	5-min	10-min	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr	48-hr
2-yr	1.92	1.28	1.01	0.67	0.45	0.27	0.21	0.13	0.08	0.05	0.03
5-yr	2.76	1.84	1.45	0.96	0.64	0.39	0.3	0.18	0.11	0.07	0.04
10-yr	3.72	2.4	1.85	1.19	0.77	0.47	0.36	0.22	0.14	0.08	0.05
25-yr	4.68	2.98	2.29	1.46	0.93	0.58	0.43	0.27	0.17	0.1	0.06
50-yr	5.52	3.47	2.65	1.67	1.05	0.65	0.49	0.3	0.19	0.12	0.07
100-yr	6.36	3.96	3.00	1.86	1.16	0.72	0.54	0.34	0.21	0.13	0.08

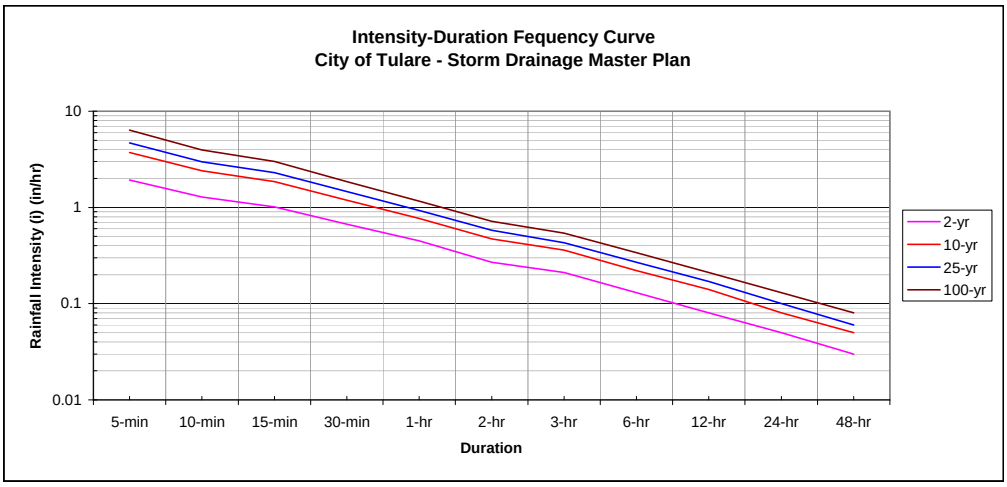


Table 3.5 Planning and Evaluation Criteria Summary
Storm Drainage System Master Plan
City of Tulare

Soil Imperviousness

Land Use Category	Effective Percent Impervious	Non-Effective Percent Impervious	Runoff Coefficients - C 2-Yr to 10 Yr Frequency Design[1]
Residential Designations			
Rural Residential	35%	15%	0.10-0.30
Rural Estate	35%	15%	0.25-0.40
Low Density Residential	35%	15%	0.30-0.50
Medium Density Residential	50%	5%	0.40-0.60
High Density Residential	60%	0%	0.60-0.75
Commercial Designations			
Neighborhood Commercial	95%	0%	0.50-0.70
Community Commericial	95%	0%	0.70-0.95
Regional Commercial	95%	0%	0.70-0.95
Service Commericial	95%	0%	0.70-0.95
Central Business District	95%	0%	0.70-0.95
Entertainment Commercial	65%	0%	0.70-0.95
Office Commercial	95%	0%	0.50-0.70
Industrial Designations			
Light Industrial (Existing)	70%	0%	0.50-0.80
Heavy Industrial (Existing)	70%	0%	0.60-0.90
Light Industrial (Future)	10%	0%	0.50-0.80
Heavy Industrial (Future)	10%	0%	0.60-0.90
Other Designations			
Public/Quasi-Public	Varies	0%	0.50-0.70
Parks and Recreation	2%	0%	0.10-0.25
Open Space	1%	0%	0.10-0.30
Reserve Designations			
Village	45%	15%	0.30-0.50
Residential Reserve	45%	15%	0.30-0.50
Commercial Reserve	95%	0%	0.70-0.95
Industrial Reserve	70%	0%	0.60-0.90

1. Runoff coefficients are provided in ranges and depend on rainfall frequency. If a watershed has varying land use types a weighted average C based on the actual percentage of lawns, streets, roofs, etc. These values should be altered when higher storm frequencies are used. Source: ASCE and WPCF (1969).

Design Hydrographs

The Design Hydrographs were determined using the SWMM RUNOFF Block of H_2OMAP SWMM software for the 10-year and 100-year 24-hour storms with 5-minute time steps.

Lag Time

Lag time was calculated by the travel time component

Lag time = To + Tg + Tp + Tc
where:
To = Overland flow travel time
Tg = Gutter flow travel time
Tp = Pipe flow travel time
Tc = Channel flow travel time

Overland Flow

Parameters for Overland Flow:

Surface	Overland Manning's n	Distance/Range
Pavement - smooth	0.02	50-200
Pavement - rough/cracked	0.05	50-200
Bare soil - newly graded areas	0.1	100-300
Range - heavily grazed	0.15	100-300
Turf - 1-2 in/lawn/golf courses	0.2	100-300
Turf - 2-4 in/park/medians/pasture	0.3	200-500
Turf - 2-6 in natural grassland	0.4	200-500
Residential Landscaping	0.6	100-300
Few trees - natural grass undergrowth	0.5	300-600
Scattered trees - weed/shrub undergrowth	0.6	300-600
Numerous trees - dense undergrowth	0.8	300-600

EXISTING SYSTEM FACILITIES AND HYDRAULIC MODEL

This chapter presents an overview of the City of Tulare's (City) storm drainage facilities. The chapter also describes the development of the City's storm drainage hydrologic and hydraulic models. These models were used for identifying existing system deficiencies and for recommending capital improvements.

4.1 SYSTEM OVERVIEW

The existing storm drainage system collects and conveys surface water runoff throughout the City to City-owned stormwater basins and pump stations for retention or discharge to Tulare Irrigation District (TID) owned facilities, where applicable.

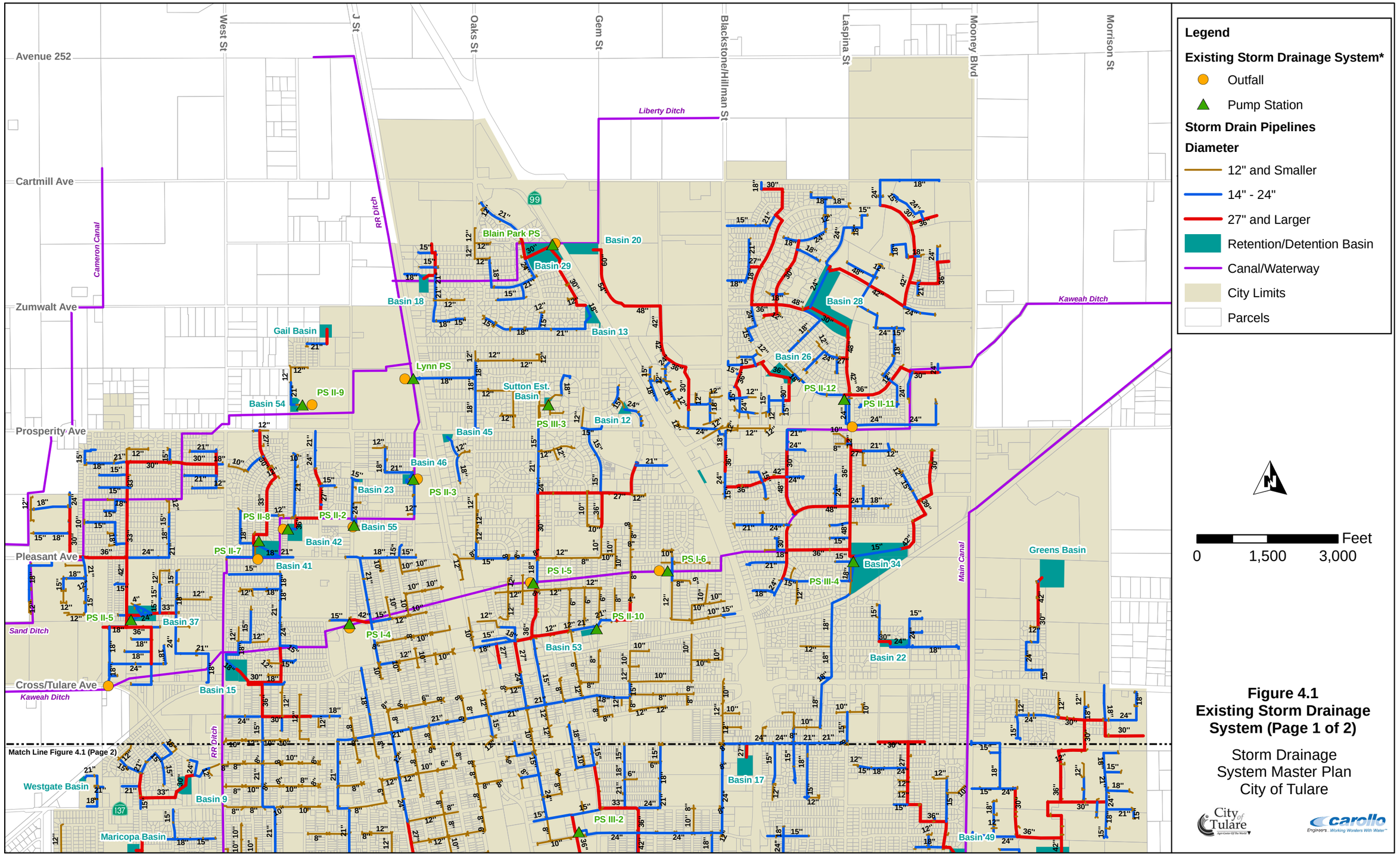
The existing storm drainage system shown on Figure 4.1 is composed of neighborhood collection systems, detention basins, retention basins, pump stations, and storm drains. Detention basins provide temporary storage of stormwater runoff, including associated disposal facilities, which consist of pump stations, storm pipes, and TID outfalls in the City's case. Retention basins, on the other hand, do not have any means of disposing of stored stormwater runoff other than percolation and evaporation.

Stormwater is disposed of by percolation and/or by discharge to TID pipelines, canals, and ditches. Discharge to the TID facilities is permitted under an agreement between TID and the City (Appendix B). In general, approval from TID is required prior to discharge to TID facilities, with the exception of certain City owned pump stations, which are permitted to discharge automatically to TID facilities. Figure 4.1 also shows the location of the City storm drain outfalls. Stormwater is discharged through the outfalls either automatically or after a major storm event with TID approval, depending on the pump station.

4.2 EXISTING SYSTEM DRAINAGE AREAS

As part of this master planning study, the City was divided into 32 subbasins, as shown on Figure 4.2. Each subbasin has a system of conveyance facilities to collect and dispose runoff. Depending on the subbasin, stormwater runoff is either conveyed to retention or detention basins or is discharged directly into TID owned facilities (Town Ditch, Railroad Ditch, Kaweah Ditch/Pipeline, and Main Canal). Following a major storm event, stormwater collected in the City's detention basins is discharged into TID owned facilities. TID approval must be obtained prior to this type of discharge.

A description of each subbasin and the existing drainage facilities within each subbasin is provided below.



Legend

Existing Storm Drainage System*

- Outfall
- Pump Station

Storm Drain Pipelines

Diameter

- 12" and Smaller
- 14" - 24"
- 27" and Larger
- Retention/Detention Basin
- Canal/Waterway
- City Limits
- Parcels

N

0 1,500 3,000 Feet

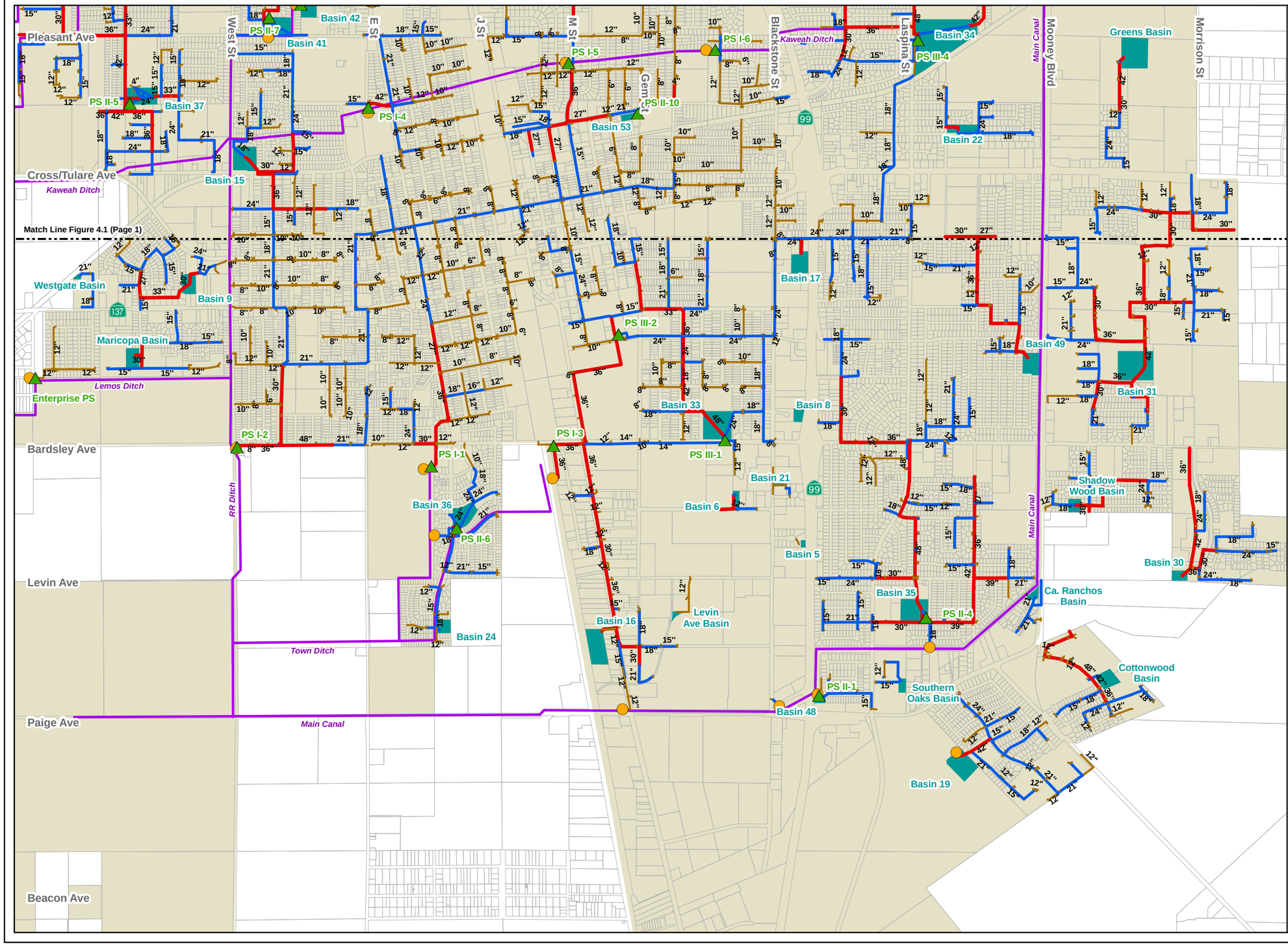
Figure 4.1
Existing Storm Drainage System (Page 1 of 2)

Storm Drainage
System Master Plan
City of Tulare

City of Tulare

carollo Engineers...Working Wonders With Water™

*As of January 2009



Legend

Existing Storm Drainage System*

- Outfall
- Pump Station

Storm Drain Pipelines

Diameter

- 12" and Smaller
- 14" - 24"
- 27" and Larger
- Retention/Detention Basin
- Canal/Waterway
- City Limits
- Parcels

Feet

0 1,500 3,000

Figure 4.1
Existing Storm Drainage System (Page 2 of 2)

Storm Drainage
System Master Plan
City of Tulare

*As of January 2009

Subbasin	Acres
Academy	136
California	88
Chevy Chase	31
Cypress Park	585
Del Lago	595
Delwood	88
Downtown	2,266
Enterprise	166
Evergreen	95
Gail	34
Horizon	182
Industrial	2,237
Kern	33
Lynn	125
Maple	214
Mountain View	580
North Oak	147
Northridge	41
Palm Ranch	393
Parkwood Meadows No. 1	89
Parkwood Meadows No. 2	29
Pleasant Oak	423
Prosperity Manor	56
Prosperity West	89
Southeast	314
Southern Oaks	20
Southwood	37
Sunrise	106
Terrace Park	175
The Greens	77
The Grove	33
Westgate	87
Total	**9,570**

Legend

Existing Storm Drainage System*

- Outfall
- Pump Station
- Storm Drains
- Retention/Detention Basin
- Existing Drainage Subbasin
- Canal/Waterway
- City Limits
- Parcels

Miles: 0 0.4 0.8

Figure 4.2
Existing System Subbasins

Storm Drainage System Master Plan
City of Tulare

*As of January 2009

4.2.1 Academy Subbasin

The Academy subbasin, located on the east side of the City, is mainly a low-density residential land use area with light industrial and commercial development along the southern and eastern portions of the subbasin, respectively. Stormwater collected in the relatively small Academy subbasin is conveyed to Basin No. 22, which is a 14.8-acre-foot (acre-ft) retention basin.

4.2.2 California Subbasin

The California subbasin is the most northern subbasin that borders the east side of J Street. A 21-inch diameter storm drain along Alcott Street collects the stormwater from the predominantly low-density residential land use area and conveys it to Basin No. 18, which is a 10-acre-ft retention basin.

4.2.3 Chevy Chase Subbasin

The Chevy Chase subbasin runs along the west side of Highway 99 and is located southeast of the North Oak subbasin. Stormwater runoff from this small subbasin is conveyed to Basin No. 12, which is a 5.1 acre-ft retention basin.

4.2.4 Cypress Park Subbasin

The Cypress Park subbasin is a predominantly residential land use area located in the southeast section of the City. This large subbasin is currently served by a detention basin and pump station that discharges to the Main Canal. A 48-inch diameter storm drain in Dalton Street collects stormwater from the northern and western portions of the subbasin and a 30-inch diameter storm drain in Cypress Avenue collects the stormwater from the southern and eastern portions of the subbasin. The stormwater collected in both storm drains is conveyed through 48-inch diameter drainage pipelines to Basin No. 35, which is a 60.7-acre-ft detention basin. With TID approval, stormwater from Basin No. 35 is discharged into the Main Canal via the 5 cubic feet per second (cfs) Pump Station II-4.

4.2.5 Del Lago Subbasin

The Del Lago subbasin is a large residential and commercial development area located in the northeast corner of the City. A 48-inch diameter storm drain in Corvina Avenue currently drains the west portion of the subbasin and a 48-inch diameter storm drain in Bella Oaks Drive serves the eastern portion of the subbasin. These storm drains, as well as a 24-inch diameter stormpipe in Cabernet Drive, collect the subbasin's stormwater and convey it to Basin No. 28, which is a 57 acre-ft detention basin in Del Lago Park. The stormwater collected in this detention basin is routed south along Laspina Street in a 42-inch diameter storm drain to the 3.5 cfs Pump Stations II-12, which discharges the stormwater to a 42-inch diameter TID storm drain pipe which ultimately flows to the Kaweah Ditch by gravity.

The Del Lago subbasin also drains a small commercial area located southwest of the residential land use areas within the subbasin. Stormwater from this sub area is routed to Basin No. 26, which is a 14 acre-ft detention basin. The detained stormwater is then transmitted east along Paseo Del Lago to the 1.5 cfs Pump Station II-11, which conveys the stormwater to the 42-inch diameter TID storm drain pipe that drains to the Kaweah Ditch. Pump Stations II-11 and II-12 are interconnected in that they share a wet well with a concrete wall that separates the pumps associated with each pump station.

4.2.6 Delwood Subbasin

The Delwood subbasin is a residential land use area located in the center of the City. The subbasin's stormwater is collected into the 15-inch diameter storm drains in Delwood Street and conveyed to Pump Station I-6. This pump station, which has a current capacity of 4 cfs, discharges stormwater directly to the Kaweah Ditch. There are currently no detention or retention basins within this subbasin.

4.2.7 Downtown Subbasin

The Downtown subbasin is currently the largest subbasin within the City, and consists of a network of smaller, interconnected subbasins. The smaller subbasins were grouped into a large subbasin for simplicity and because the numerous interconnections cause the subbasins to act as one during a major storm event. This subbasin is generally lacking in storage and disposal capacity for a subbasin this size and poses the greatest risk of flooding in the City during a major storm event.

There are currently four pump stations within this subbasin that are permitted to discharge stormwater directly to TID facilities:

- Pump Station I-1 (14 cfs)
- Pump Station I-2 (14 cfs)
- Pump Station I-3 (24 cfs)
- Pump Station I-5 (20 cfs)

There are currently two retention basins within the Downtown subbasin:

- **Basin No. 15**. This 16.9 acre-ft retention basin collect stormwater runoff from the northwestern portion of the Downtown subbasin.
- **Basin No. 16**. This 30.3 acre-ft retention basin collects stormwater runoff from the industrial areas along K Street south of Bardsley Avenue.

There are currently three detention basins within the Downtown subbasin:

- **Basin No. 33**. This 19.3 acre-ft detention basin collects stormwater runoff from the southeastern portion of the Downtown subbasin. Stormwater from this basin is

pumped out to a 14-inch diameter storm pipeline via Pump Station III-1. Stormwater conveyed in PS III-1 is ultimately discharged into Town Ditch via Pump Station I-3.

- **Basin No. 53**. This temporary, 7.6 acre-ft detention basin serves a small portion of the northern area of the Downtown subbasin. Stormwater from this basin is pumped to a TID owned storm pipe via Pump Station II-10, which is a temporary storm pump station. Basin No. 53 will be abandoned upon construction of a new storm drain in Pine Street.
- **Sutton Estates Basin**. The Sutton Estates Basin is a 2.5 acre-ft detention basin that collects stormwater runoff from a very small area in the northern portion of the Downtown subbasin. Stormwater from the Sutton Estates Basin is discharged into a 12-inch diameter City storm drain pipe via the 1 cfs Pump Station III-3 and is ultimately discharged into a TID owned storm drain pipe via Pump Station I-5.

Additionally, the City is in the process of constructing two retention basins near the intersection of I Street and San Joaquin Avenue (Future City Basin No. 47). These basins will provide some needed storage capacity (approximately 25 acre-ft total at high water level) for the Downtown subbasin. Storm pipelines are also currently being constructed to convey stormwater runoff to these two basins.

4.2.8 Enterprise Subbasin

The Enterprise subbasin currently consists of two separate, predominantly residential, subbasins that will ultimately be combined into one. The western portion of the subbasin is served by a small County pump station (Enterprise Pump Station), whereas the eastern portion of the subbasin is served by the Maricopa Basin, which is a 7.3 acre-ft retention basin. The entire subbasin will ultimately be served by two new detention basins and a Class II pump station.

4.2.9 Evergreen Subbasin

The Evergreen subbasin is a predominantly residential land use area that is currently two separate subbasins that will ultimately be combined into one. Stormwater runoff within the western portion of the subbasin is stored in Basin No. 42, which is an 8.8 acre-ft detention basin. Stormwater from Basin No. 42 is ultimately discharged into the Railroad Ditch via the 5 cfs Pump Station II-8. TID approval is required prior to discharge.

Stormwater runoff from the eastern portion of the subbasin is stored in Basin No. 55, which is a temporary 0.5 acre-ft detention basin. Additionally, stormwater can surcharge into Basin No. 23, which is a temporary 0.7 acre-ft detention basin. Upon approval from TID, stormwater from Basin 55 is discharged into the Railroad Ditch via the 0.5 cfs Pump Station II-2. Ultimately, Basin No. 23 and No. 55 will be abandoned and all stormwater runoff within the Evergreen subbasin will be stored in Basin No. 41.

4.2.10 Gail Subbasin

The Gail subbasin is a small residential land use area that is located in the northwest region of the City. Flows from this subbasin are retained in the 8 acre-ft Gail Basin. The Gail subbasin will ultimately be expanded and a large new detention basin will replace the existing retention basin.

4.2.11 The Greens Subbasin

The Greens subbasin is a residential land use area served by a retention basin. Stormwater runoff in the western portion of the subbasin is conveyed through a 24-inch diameter storm drain that becomes a 30-inch and the 42-inch diameter storm drain to the Greens Basin, which is a 5.7 acre-ft retention basin. The eastern portion of this subbasin is currently undeveloped land.

4.2.12 The Grove Subbasin

The Grove subbasin is located east of the Prosperity Manor subbasin, on the west side of J Street. An 18-inch diameter storm drain in Perr Court conveys stormwater runoff to Basin No. 45, which is a 6.7 acre-ft retention basin.

4.2.13 Horizon Subbasin

The Horizon subbasin is a commercial land use area located in the northern region of the City. A 48-inch diameter storm drain, which drains into a 54-inch and then a 60-inch diameter storm drain, conveys stormwater runoff from the commercial development areas south of Corvina Avenue, including the Horizon Outlet Center, to Basin No. 20, which is a 42 acre-ft retention basin.

4.2.14 Industrial Subbasin

The Industrial subbasin is located in the southern portion of the City and serves predominately industrial land use areas. For this reason, the majority of stormwater runoff generated within the subbasin is collected in private onsite drainage facilities owned by the individual property owners. There are a few minor City owned retention systems within the subbasin, which collect primarily street drainage.

Because most of the existing and future stormwater runoff generated within this subbasin is/will be captured through the use of onsite drainage systems. Since most of the major streets within this subbasin have already been constructed, no future stormwater drainage facility recommendations are provided for this subbasin.

4.2.15 Kern Subbasin

The Kern subbasin is located south of Tulare Avenue on the east side of the City within a Tulare County island. Stormwater runoff for this small subbasin is collected into the subbasin’s storm drainage system facilities and conveyed to a pump station near the

intersection of Kern Avenue and Sylvia Street. The pump station discharges into the Main Canal.

Detailed record drawings were not available for this area. For this reason, no analysis was performed on the storm drainage facilities within this small, 33-acre subbasin.

4.2.16 Lynn Subbasin

The Lynn subbasin is primarily composed of residential development and is located in the north portion of the City. The Lynn drainage facilities collect the stormwater throughout the subbasin and convey it to an 18-inch diameter storm drain in Lynn Avenue, which conveys the stormwater to the approximately 5 cfs Lynn Pump Station, which is a Class I pump station constructed by Tulare County. The pump station discharges stormwater runoff from the Lynn subbasin into the Railroad Ditch west of J Street.

4.2.17 Maple Subbasin

The Maple subbasin is a predominantly residential land use area located on the west side of the railroad, south of the Prosperity Manor subbasin. The subbasin's stormwater is conveyed through a 42-inch diameter storm drain in Maple Avenue, west of E Street, to the 21 cfs Pump Station I-4, which is located near the intersection of Maple Avenue and D Street. Pump Station I-4 discharges into the Kaweah Ditch.

4.2.18 Mountain View Subbasin

The Mountain View subbasin is a predominantly residential land use area with some commercial areas. Flow from the northwestern portion of the subbasin is conveyed through a 36-inch diameter storm drain in Coelho Avenue and a 48-inch diameter storm drain in Laspina Street to Basin No. 34, which is a 102 acre-ft basin with a small retention zone and a larger detention zone. Stormwater runoff from the northeastern portion of the subbasin is conveyed through a 39-inch and 42-inch diameter storm pipe southwest to Basin No. 34.

Stormwater from Basin No. 34 is either percolated or pumped through the 1 cfs Pump Station III-4 to a 12-inch diameter pipe and then an 18-inch and 24-inch storm pipeline, where it is ultimately collected in Basin No. 17, which is an 8-acre-ft retention basin. Basin No. 17 also collects stormwater runoff from the southern portion of the Mountain View subbasin. There is a canal gate located just west of Basin No. 17, which could be utilized by the City to drawdown or bypass Basin No. 17, if necessary. For the purposes of this master plan, it was assumed that the canal gate would remain closed at all times.

4.2.19 North Oak Subbasin

The North Oak subbasin is a predominantly residential land use area that borders the west side of Highway 99. Located in the northern region of the City, this subbasin is served by two detention basins and a pump station. The North Oak drainage facilities collect the stormwater runoff for the majority of the subbasin and route it through a 30-inch diameter

storm drain near the intersection of Kennedy Avenue and M Street to Basin No. 29, which is a 7.3-acre-ft detention basin located at Blain Park. Stormwater from Basin No. 29 is pumped to Liberty Ditch by the Blain Park PS. TID approval is required before discharge.

The stormwater runoff from the southern portion of the subbasin is conveyed through a 21-inch diameter storm drain in Washington Avenue to Basin No. 13, which is a 7.7-acre-ft detention. Stormwater flows by gravity from Basin No. 13 through a 27-inch diameter stormpipe in Adams Street and is routed to Basin No. 29.

4.2.20 Northridge Subbasin

The Northridge subbasin is a small public land use area located in the northwest region of the City. A 21-inch diameter storm drain in Northridge Street collects the subbasin's stormwater runoff along Northridge Street and Gail Avenue and conveys it to Basin No. 54, which is a 5.3-acre-ft detention basin. Stormwater is pumped, with TID approval, from this basin to Sand Ditch via Pump Station II-9.

4.2.21 Palm Ranch Subbasin

The Palm Ranch subbasin is a large residential land use area located on the east side of the City. Flow from the northern and southern portions of the subbasin are conveyed through a 36-inch diameter storm drain in Alpine Avenue and a dirt road east of Nelder Grove Street and a 36-inch diameter storm drain in Kaiser Creek Avenue and Black Rock Street, respectively. The stormwater collected in the 36-inch diameter storm drains is conveyed through 42-inch diameter gravity drainage pipelines to Basin No. 31, which is a 43.7-acre-ft retention basin.

4.2.22 Parkwood Meadows No. 1 Subbasin

The Parkwood Meadows No. 1 subbasin is located in the south part of the City and is primarily a residential development area. Stormwater generated within this subbasin is conveyed to Basin No. 36, which is a 14.4 acre-ft detention basin. With approval from TID, stormwater from Basin No. 36 is pumped into Town Ditch via the 8.7 cfs Pump Station II-6.

4.2.23 Parkwood Meadows No. 2 Subbasin

The Parkwood Meadows No. 2 subbasin is located in the southern portion of the City just south of the Parkwood Meadows No. 1 subbasin. Basin No. 24, which is a 4.6-acre-ft retention basin, collects stormwater runoff generated within this subbasin.

4.2.24 Pleasant Oak Subbasin

The Pleasant Oak subbasin is a large, predominantly residential land use area located in the northwestern portion of the City. A 33-inch diameter storm drain in Milner Street that runs from Martinho Avenue to Pleasant Avenue collects the stormwater from the northern portion of the subbasin, and becomes a 42-inch diameter storm drain south of Pleasant

Avenue. 36-inch and 24-inch diameter storm drains in Pleasant Avenue collect the stormwater from the western and eastern portions of the subbasin and convey it to the 42-inch diameter storm drain in Millner Street. This storm drain collects stormwater from the subbasin and conveys it, by gravity, to Basin No. 37, which is a 52-acre-ft detention basin.

With approval from TID, stormwater from Basin No. 37 is pumped out of the detention basin by the 5 cfs Pump Station II-5, which discharges to Kaweah Ditch.

4.2.25 Prosperity Manor Subbasin

The Prosperity Manor subbasin, located just west of J Street in the northern portion of the City, is composed of residential, parks & recreation, and industrial land use areas. A 21-inch diameter storm drain along Stadium Avenue and an 18-inch diameter storm drain in H Street collect the stormwater from the northern and southern portions of the subbasin, and convey it to Basin No. 46, which is a 5 acre-ft detention basin. Stormwater from Basin No. 46 is pumped with TID approval to Railroad Ditch via Pump Station II-3.

4.2.26 Prosperity West Subbasin

The Prosperity West subbasin is primarily composed of residential development and served by a detention basin and pump station. The subbasin's stormwater is conveyed to Basin No. 41, which is an 11.7-acre-ft detention basin. With TID approval, stormwater from Basin No. 41 is pumped into the Railroad Ditch via Pump Station II-7.

4.2.27 Southeast Subbasin

Currently, the Southeast subbasin is comprised of four separate subbasins, which will ultimately be connected to drain to one common detention basin. Stormwater runoff from the southern portion of the existing basin are collected in the 16.5 acre-ft Cottonwood Basin, which is a temporary retention basin. Runoff from the northwestern portion of the subbasin is collected in the 4.1-acre-ft Shadow Wood Basin, which is a temporary retention basin. Runoff from a small area west of Mooney Boulevard and north of Foster Drive is collected in the 2.4-acre-ft California Ranchos Basin, which is a temporary retention basin. Runoff from the eastern portion of the existing subbasin is collected in Basin No. 30, which is a 21.5-acre-ft retention basin.

Ultimately, a stormwater runoff generated within this subbasin will be routed through Basin No. 30, which will be expanded and converted into a detention basin.

4.2.28 Southern Oaks

The Southern Oaks subbasin serves a small residential area in the southern portion of the City. Stormwater runoff from this subbasin is collected in the Southern Oaks Basin, which is a 4.8-acre-ft retention basin.

4.2.29 Southwood Subbasin

The Southwood subbasin is the area located northwest of the intersection of Paige Avenue and Highway 99. This small subbasin is mainly comprised of residential development, with vacant land slated for commercial development in the southern portion of the subbasin. Basin No. 48, which is a 2.2-acre-ft detention basin, provides stormwater detention for the subbasin. Pump Station II-1, which has a current capacity of 5 cfs, discharges stormwater from Basin No. 48 to the Main Canal. TID approval is required prior to discharge.

4.2.30 Sunrise Subbasin

The Sunrise subbasin is located in the southeast corner of the City. A 24-inch diameter storm drain in Sunrise Avenue collects the stormwater throughout the subbasin and routes it west along Shaver Lake Avenue in a 42-inch diameter storm drain to Basin No. 19, which is a 19.7-acre-ft retention basin.

4.2.31 Terrace Park Subbasin

The Terrace Park subbasin, located on the east side of the City, is a residential development area that currently drains into the 36-inch diameter storm drain in Latimer Street. This storm drain collects the stormwater from the subbasin and conveys it to Basin No. 49, which is an 8.3-acre-ft retention.

4.2.32 Westgate Subbasin

The Westgate subbasin is located on the west side of the City. A 33-inch diameter storm drain in Delaware Avenue serves the residential land use areas that comprise the majority of the subbasin. A 30-inch diameter storm drain serves the commercial land use areas in the northeast corner of the subbasin. The collected stormwater is conveyed to Basin No. 9, which is a 14.9-acre-ft retention basin.

Additionally, stormwater is retained in the Westgate Basin, which is a temporary 2.0-acre-ft retention basin located on the west side of the subbasin.

4.3 STORM DRAIN RETENTION/DETENTION BASINS

There are currently 28 retention and 18 detention basins located within the City to provide stormwater storage capacity. Table 4.1 summarizes the type, volume, current status, subbasin, and associated pump station, if applicable, for each retention and detention basin in the City.

Table 4.1 Existing Retention/Detention Basin Summary
Storm Drainage System Master Plan
City of Tulare

Basin Number	Location	Subbasin Name	Estimated Volume [1] (acre-ft)	Status (Permanent or Temporary)	Existing Basin Type	Associated Pump Station (Existing)
5	Batavia Ct, E. of Blackstone	Industrial	0.8	Permanent	Retention	--
6	Walnut, W. of Blackstone	Industrial	1.7	Permanent	Retention	--
8	Between Ash Ct and Hwy 99	Industrial	No Data Available	Permanent	Retention	--
9	Between Tulare/Inyo, west of West	Westgate	14.9	Permanent	Retention	--
12	Cherry Ct, N. of Prosperity	Chevy Chase	5.1	Permanent	Retention	--
13	N. Washington by Hwy 99	North Oak	7.7	Permanent	Detention	--
15	NE Corner Cross and West	Downtown	16.9	Permanent	Retention	--
16	W. of UPRR, N. of Paige	Downtown	30.3	Permanent	Retention	--
17	Orange, S of Kern by Hwy 99	Mountain View	7.5	Permanent	Retention	--
18	Alcott Circle & Dickens	California	10 [3]	Permanent	Retention	--
19	W. side of Sunrise Est	Sunrise	19.7	Permanent	Retention	--
20	Outlet Center Pond	Horizon	42 [3]	Permanent	Retention	--
21	Blackstone & Security Ct	Industrial	2.6 [2]	Permanent	Retention	--
22	Academy & Mt. View	Academy	14.8	Permanent	Retention	--
23	E and Ranier	Evergreen	0.7	Temporary	Detention	--
24	E St, N of Paige	Parkwood Meadows No. 2	4.6	Permanent	Retention	--
26	Del Lago Commercial Pond	Del Lago	14	Permanent	Detention	PS II-11
28	Corvina & Laspina	Del Lago	57	Permanent	Detention	PS II-12
29	Blain Park (N. M St)	North Oak	7.3	Permanent	Detention	Blain Park PS
30	Windmills (Morrison/Levin)	Southeast	21.5	Permanent	Retention	--
31	Cambridge/Palm Ranch	Palm Ranch	43.7	Permanent	Retention	--
33	Lincoln School Park	Downtown	19.3	Permanent	Detention	PS III-1
34	Live Oak Park	Mountain View	102	Permanent	Det/Ret	PS III-4
35	Cypress Park	Cypress Park	60.7	Permanent	Detention	PS II-4
36	E, South of Bardsley	Parkwood Meadows No. 1	14.4	Permanent	Detention	PS II-6
37	Pleasant Park	Pleasant Oak	52	Permanent	Detention	PS II-5
38	Willow Glen	Willow Glen	33.7 [2]	Permanent	Retention	--
41	Sacramento and Pleasant	Prosperity West	11.7	Permanent	Detention	PS II-7
42	N. of Pleasant, E. of Sac.	Evergreen	8.8	Permanent	Detention	PS II-8
45	S. of Prosperity, E. of "J"	The Grove	6.7	Permanent	Retention	--
46	"H" and Stadium	Prosperity Manor	5.0	Permanent	Detention	PS II-3
48	Manzanita/Hwy 99, N. of Paige	Southwood	2.2	Permanent	Detention	PS II-1
49	W. side of Mooney @ Stockham	Terrace Park	8.3	Permanent	Retention	--
53	Cross and Armory	Downtown	7.6	Temporary	Detention	PS II-10
54	Prosperity Sports Park	Northridge	5.3	Permanent	Detention	PS II-9
55	Saratoga and "E"	Evergreen	0.53 [2]	Temporary	Detention	PS II-2
Ca Ranchos	Mooney and Foster	Southeast	2.4 [2]	Temporary	Retention	--
Cottonwood	Foster and Tahoe	Southeast	16.5 [2]	Temporary	Retention	--
Gail Est.	SW. of Zumwalt and E	Gail	8.0 [2]	Temporary	Retention	--
The Greens	Seminole E. of Mooney	The Greens	5.7 [2]	Permanent	Retention	--
Levin Ave.	SE of Levin and O St	Industrial	0.71 [2]	Permanent	Retention	--
Maricopa	Maricopa and Santa Barbara	Enterprise	7.3 [2]	Temporary	Retention	--
O St.	O St. SO Chestnut	Industrial	6.3 [2]	Permenent	Retention	--
Shadow Wood	Azalea and Nedler Grove	Southeast	4.1 [2]	Temporary	Retention	--
S. Oaks	Poplar Ct. E. of Laspina	Southern Oaks	4.8 [2]	Permanent	Retention	--
Santa Fe West	E. Street, N. of Admiral	Gail	6.2 [2]	Temporary	Retention	--
Sutton Est.	N.E. of Mercedes & M Street	Downtown	2.5 [2]	Permanent	Detention	PS III-3
Westgate	Colorado St and Santa Fe Trails	Westgate	2.0 [2]	Temporary	Retention	--

Notes:
1. Volume estimates are provided by the City, except where noted.
2. City estimate not available. Approximated volume based on record drawings.
3. Volume calculated from record drawings.

4.4 STORM DRAIN PUMP STATIONS

There are currently 25 pump stations in the storm drainage system. The location of each pump station is shown on Figure 4.1. Table 4.2 presents a summary of each pump station including the subbasin in which it is located and pump design information.

Each of the City's pump stations was given a "Class" to identify the method of discharge into TID facilities. The pump stations are classified as Class I, Class II, or Class III. Class I pump stations (I-1 through I-7) automatically discharge stormwater into TID facilities. Class II pump stations (II-1 through II-12) require TID approval before discharging to TID facilities, and generally belong to storm drainage systems that only need to discharge to TID facilities when the volume of the storage within that system has reached capacity. Class III pump stations (III-1 through III-4) have no direct discharge capability into TID facilities, conveying storm flows to detention/retention basins or storm drainage pipes that are part of an adjacent storm drainage system.

4.5 EXISTING TID DISCHARGE LOCATIONS

Class I pump stations automatically discharge into TID facilities at eight locations, whereas Class II pump stations are capable of discharging into the TID facilities at 13 locations (Figure 4.1). These are the outfall locations illustrated on the figure. The destinations of the stormwater discharge are the Kaweah Ditch, Town Ditch, and Railroad Ditch. Although some of the City's detention systems discharge to the Main Canal and Liberty Ditch, the stormwater is ultimately routed to one of these three drainage disposal destinations. The permitted discharge into the TID facilities is not to exceed the amounts stipulated in the 2005 TID Agreement (Appendix B).

4.6 STORM DRAIN CONNECTIONS TO SANITARY SEWER

There are currently several locations within the City where direct storm drainage connections to the sanitary sewer system exist. Figure 4.3 illustrates these locations as well as the areas in the City where runoff currently drains to the sewer system. However, the City has been implementing projects to mitigate these direct connections. The remaining locations include:

- Laspina Street and Sonora Avenue
- Laspina Street and Kohn Avenue
- Laspina Street and Birch Avenue
- Laspina Street and Cheryl Avenue
- Tulare Avenue and Salida Street

Table 4.2 Existing System Pump Station Summary
Storm Drainage System Master Plan
City of Tulare

Pump Station	Location	Subbasin	Pumps From	Outfall (Storm Drainage Disposal Destination)	Pumping Capacity [1] (cfs)
Class I - Automatic Discharges into TID Facilities					
I-1	High School Farm	Downtown	SD Pipe	Town Ditch	14.0
I-2	Bardsley & West	Downtown	SD Pipe	Railroad Ditch	14.0
I-3	Bardsley & SPRR	Downtown	SD Pipe	Town Ditch	24.0
I-4	Maple & "D"	Maple	SD Pipe	Kaweah Ditch	21.0
I-5	College & "M"	Downtown	SD Pipe	Kaweah Ditch	20.0
I-6	Lyndale & Delwood	Delwood	SD Pipe	Kaweah Ditch	4.0
Lynn [2]	"J" and Lynn	Lynn	SD Pipe	Railroad Ditch	4.0
Enterprise [2]	Haven s/o Sonora	Enterprise	SD Pipe	Lemos Ditch	2.0
Class II - TID Approval Required Before Discharging to TID Facilities					
II-1	Manzanita & Tamarack	Southwood	Basin 48	Main Canal	2.0
II-2 [3]	Saratoga & "E"	Evergreen	Basin 55	Railroad Ditch	0.6
II-3	Stadium & "H"	Prosperity Manor	Basin 46	Railroad Ditch	1.0
II-4	Sundance & Cypress	Cypress Park	Basin 35	Main Canal	5.0
II-5	Milner & Omega	Pleasant Oak	Basin 37	Kaweah Ditch	5.0
II-6	Oakwood & "E"	Parkwood Meadows No. 1	Basin 36	Town Ditch	8.7
II-7	Pleasant & Belmont	Prosperity West	Basin 41	Railroad Ditch	4.5
II-8	Saratoga & "A"	Evergreen	Basin 42	Railroad Ditch	5.0
II-9	Sports Park	Northridge	Basin 54	Sand Ditch	7.0
II-10 [3]	Cross & Gem	Downtown	Basin 53	Kaweah Ditch	7.0
II-11	Laspina & Paseo del Lago	Del Lago	Basin 26	Kaweah Ditch	1.0
II-12	Laspina & Paseo del Lago	Del Lago	Basin 28	Kaweah Ditch	4.5
Blain Park [4]	Blain Park	North Oak	Basin 29	Liberty Ditch	2.0
Class III - No Direct Discharge to TID Facilities					
III-1	Lincoln School	Downtown	Basin 33	City Storm Drain Pipe	2.0
III-2	Dairymans	Downtown	SD Pipe	City Storm Drain Pipe	23.0
III-3	"M", n/o Prosperity	Downtown	Sutton Est. Basin	City Storm Drain Pipe	1.1
III-4	Live Oak	Mountain View	Basin 34	City Storm Drain Pipe	1.0

Notes:
1. Data provided by City Staff, except where noted.
2. This pump station was constructed by Tulare County, and was not included in the data table provided by the City. The pump station capacity was estimated based on the capacity of the influent storm pipelines.
3. Temporary pump station.
4. This pump station was not included in the data table provided by the City. Capacity is from record drawings.

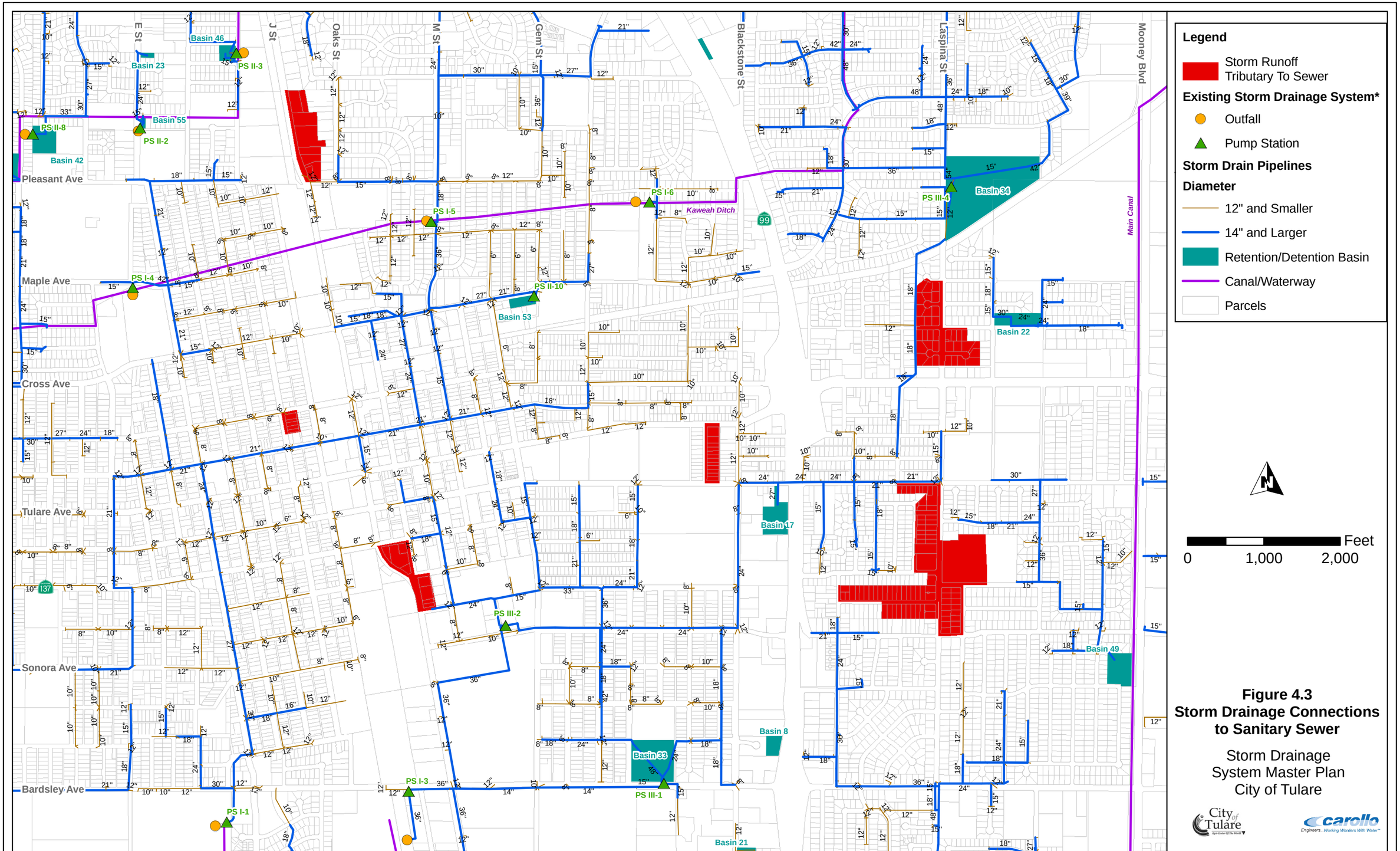


Figure 4.3
Storm Drainage Connections to Sanitary Sewer

Storm Drainage System Master Plan
City of Tulare

*As of January 2009

- Tulare Avenue and Salida Street
- J Street, in front of Alexander's Electric Motor Shop
- K Street and Owens Avenue
- Inyo Avenue and J Street
- Kern Avenue and Laspina Street
- Laspina Street and Academy Avenue
- San Joaquin Avenue and H Street

4.7 HYDROLOGIC AND HYDRAULIC MODELS

The storm drainage system was evaluated using H_2OMAP SWMM modeling software. H_2OMAP SWMM is a commercial version of EPA SWMM 5.0 software. The SWMM RUNOFF Block, which is included in H_2OMAP SWMM, was used to perform the hydrologic analysis.

H_2OMAP SWMM is a fully dynamic wastewater and storm water modeling and management software application. H_2OMAP SWMM can be used to model the entire land phase of the hydrologic cycle as applied to urban storm water and wastewater collection systems. The model can perform single event or long-term (continuous) rainfall-runoff simulations accounting for climate, soil, land use, and topographic conditions of the watershed. Once runoff quantity is simulated, and wastewater loads at receiving nodes are determined, the routing portion of H_2OMAP SWMM transports, using either steady flow routing, kinematic wave routing or dynamic wave routing, the flow through a conveyance system of pipes, channels, storage/treatment devices, pumps, and hydraulic regulators such as weirs and orifices. The model offers advanced Real-Time Control (RTC) scheme for the operational management of hydraulic structures.

4.7.1 Hydrology

Hydrologic analysis of the City's storm drainage system was performed using the SWMM RUNOFF Block, which is included in the H_2OMAP SWMM modeling software. The SWMM RUNOFF block was designed to simulate the surface water runoff response of a drainage basin to precipitation by representing the basin as an interconnected system of hydrologic and hydraulic components. Each model component represents a specific aspect of the rainfall-runoff processes occurring in a portion of the watershed. A component may represent the runoff occurring in a subbasin, the routing of flows down a stream channel, or the routing of flows through a detention basin. The model operates by reading an input data file that contains the parameters describing each component of the drainage basin, along with information describing how the various components work together to form the drainage

basin. The result of the modeling process was a tabulation of stream flow hydrographs at desired locations within the study area.

4.7.1.1 Model Components

Description of the model components requires the estimation of a set of parameters describing the hydrologic characteristics of the component. Parameters describing the various components of the model are based on land use, soils, vegetation, stream channels, and topography. For example, the land use in a subbasin will determine the percent of that subbasin that is impervious and the average condition of the drainage channels. These values, along with others describing additional components of the subbasin, are placed in a computer input data file that is read by the SWMM Runoff computer model and used as a basis for computation of the rainfall-runoff processes in the subbasin.

4.7.1.2 Runoff Hydrographs

SWMM Runoff mathematically creates a runoff hydrograph (time-series of runoff values) for each subbasin based on the input parameters for the subbasin and the specified precipitation. Subbasin runoff hydrographs are combined, where appropriate, and routed downstream using stream channel characteristics. This process of runoff computation, combination, and routing continues from the upstream end of the watershed to the downstream end.

4.7.1.3 SWMM Runoff Analysis

Existing land use for each drainage subbasin was determined using aerial photography maps. Future land use was extracted from the City's General Plan. SWMM Runoff used the kinematic wave procedure to calculate subbasin lag times.

4.7.2 Hydraulics

The H_2OMAP SWMM hydraulic model was used to simulate the hydraulic conditions in the City's storm drainage system. The computer hydraulic model was used to analyze the storm drainage system, to identify deficiencies, and to propose system improvements.

4.7.2.1 Flow Routing

Flow routing within a conduit link in H2OMAP SWMM is governed by the conservation of mass and momentum equations for gradually-varied unsteady flow (i.e., the St. Venant equations). The H_2OMAP SWMM user has a choice on the level of sophistication used to solve these equations:

- Steady Flow
- Kinematic Wave Routing
- Dynamic Wave Routing

The City's hydraulic model used Dynamic wave routing to analyze the storm drainage system. Dynamic wave routing solves the complete St. Venant flow equations and therefore produces the most accurate results. These equations consist of the continuity and momentum equations for conduits and a flow continuity equation at nodes.

Dynamic wave routing can account for channel storage, backwater, entrance/exit losses, flow reversal, and pressurized flow. Because it couples the solution for both water levels at nodes and flow in conduits it can be applied to any general network layout, even those containing multiple downstream diversions and loops. It is the method of choice for systems subjected to significant backwater effects due to downstream flow restrictions or flow regulation via weirs and orifices. This generality comes at a price of having to use much smaller time steps, on the order of a minute or less.

EVALUATION AND PROPOSED IMPROVEMENTS

This chapter presents the results of the capacity evaluation of the City of Tulare (City) storm drainage system. The chapter also presents improvements to mitigate existing system deficiencies and for servicing future growth. These improvements are recommended based on the system's technical requirements, cost effectiveness, and operational reliability.

5.1 FUTURE SYSTEM DRAINAGE AREAS

As the City expands to the Urban Development Boundary (UDB) by the year 2030, additional hydrologically distinct subbasins will be added to the storm drainage system, as illustrated in Figure 5.1. Each subbasin will have a system of conveyance facilities to collect and store stormwater runoff.

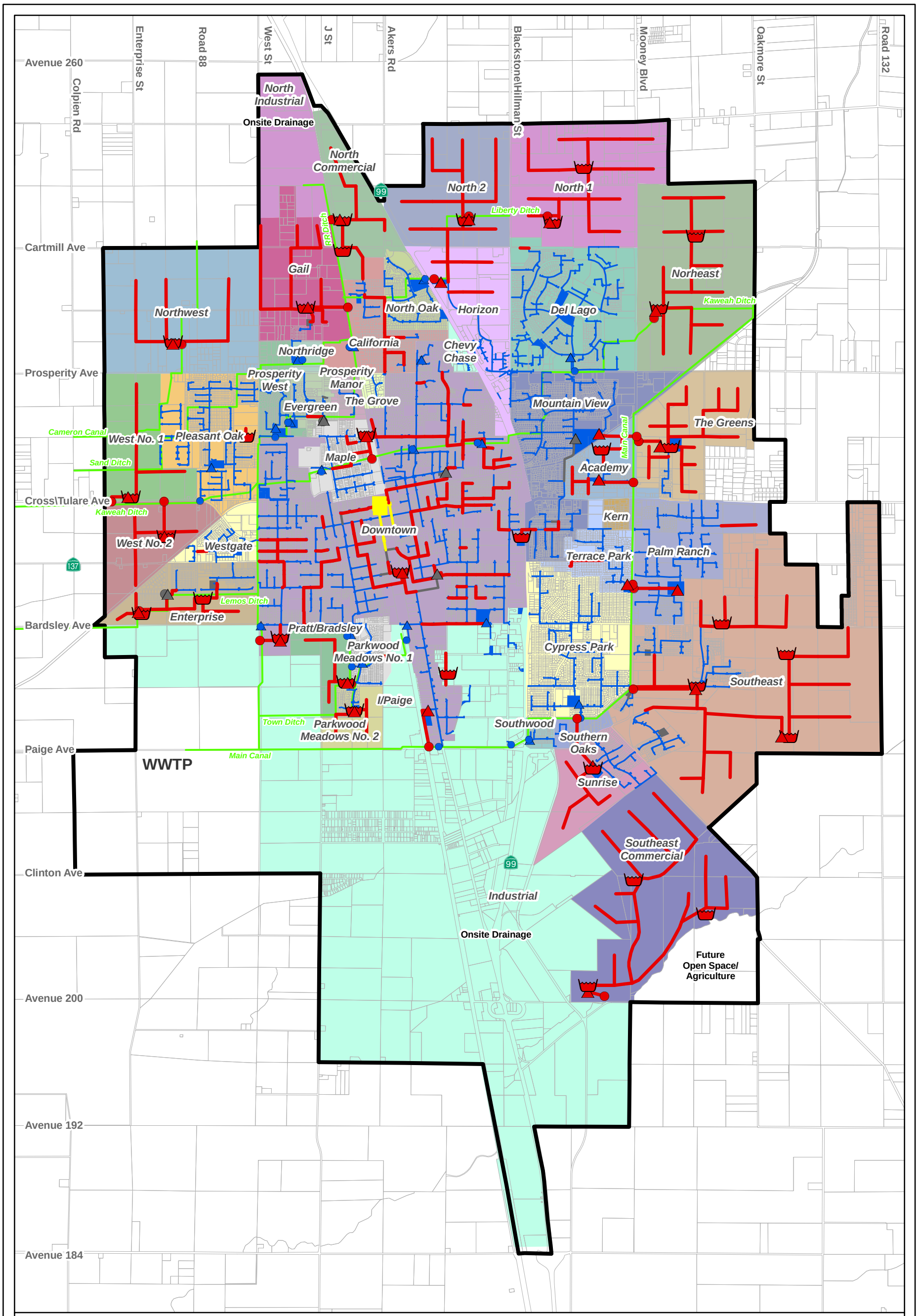
5.2 CAPACITY EVALUATION

The City's existing and future storm drainage systems were evaluated using the planning criteria established in Chapter 3 of this report. Initially, this evaluation consisted of running the hydraulic computer model under existing conditions. Areas in the City where flooding occurred in excess of one foot under the 100-year design storm were identified. Improvement projects to mitigate existing deficiencies were then developed. In general, the City's downtown storm drain facilities were found to be undersized and lacked storage/disposal facilities. For this reason, the majority of exiting system improvements are located within the Downtown Subbasin.

Following the evaluation of the City's existing storm drainage system, future storm facilities to service growth within the City limits and UDB were planned and sized. The model was then run under 100-year design storm conditions and the sizing of the proposed future conveyance and storage facilities were refined. The City's existing storm drainage system was then checked to identify areas within the City's existing system that lack the capacity to convey and dispose of 100-year runoff flows. Improvement projects to mitigate these future capacity deficiencies were then developed.

Improvement projects to remove storm drain connections to sanitary sewer were also identified as part of the analysis. Storm drain connections to the sanitary sewer can result in higher treatment costs at the wastewater treatment plant and increase the potential for sanitary sewer overflows (SSO) during a major storm event.

An analysis of the capacity of the Tulare Irrigation District (TID) canals was not performed as part of this master plan. The sizing of the future pump stations, which are all Class II pump stations, should be verified during the design phase to ensure that the discharge facility has the capacity to accept the pumping rate of the pump station.



Legend

Existing Storm Drainage System	Under Construction	Facilities To Abandon	Proposed Improvements	
Outfall	Storm Basins	Outfall	Pump Station	Canal/Waterway
Pump Station	Storm Drain	Pump Station	Storm Basin	Urban Development Boundary
Storm Drain		Storm Drain	Outfall	Parcels
Storm Basin		Storm Basin	Storm Drain	Future Drainage Subbasins

0 0.4 0.8 Miles

Figure 5.1
Future Drainage Subbasins

Storm Drainage
System Master Plan
City of Tulare

City of Tulare
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5.3 PROPOSED IMPROVEMENTS

The recommended improvements discussed in this section are needed to mitigate existing system deficiencies and provide capacity for future development. The improvements are quantified in the Capital Improvement Program (CIP), presented in the following chapter, and are shown on Figure 5.2 and listed in Table 5.1. It should be noted that developers are responsible for paying an equitable cost allocation for the infrastructures needed to extend service from their developments to the master plan facilities. Figure 5.3 provides a more detailed view of the improvements in the Downtown Subbasin.

5.3.1 Existing System Improvements

This section identifies the storm drainage infrastructure necessary to mitigate deficiencies within the exiting storm drainage system. In general, capacity deficiencies were identified in older areas of the City (i.e. Downtown Subbasin) where storage is currently unavailable or lacking. Many of the older storm drains within the City were sized to convey discharge from the City's Class I pump stations, which do not have enough pumping capacity to convey peak runoff generated within the system. The recommended improvements to mitigate existing deficiencies are summarized by subbasin below:

- **Academy Subbasin**
  - **Removal of Storm Drain Connections to Sanitary Sewer (A-1 through A-4)**. Construct a network of 12-inch through 24-inch storm drains to remove storm drain connections to the sanitary sewer system in the area near Laspina Street and Academy Avenue.
- **California Subbasin**
  - **Improvement No. C-1 through C-3**. Construct a new 36-inch diameter storm drain to relieve potential flooding conditions in the vicinity of Lynn Avenue and Oaks Street, which is currently serviced by the Lynn Pump Station. The 36-inch storm drain will redirect flows in excess of the Lynn Pump Station's pumping capacity to existing City Basin No. 18, which has excess storage capacity.
  - **Improvement No. C4 through C-9**. Replace a series of 12-inch through 18-inch diameter storm drains with 15-inch through 30-inch storm drains to further relieve potential flooding conditions in the California Subbasin.
- **Downtown Subbasin**
  - **Downtown Basin No. 1 (D-1, D-B1, D-PS1 and D-67)**. Construct a new 35-acre ft detention basin near Bardsley Avenue and West Street and a 10-cfs, Class II pump Station that conveys flow through an 18-inch force main to Railroad Ditch following a major storm.

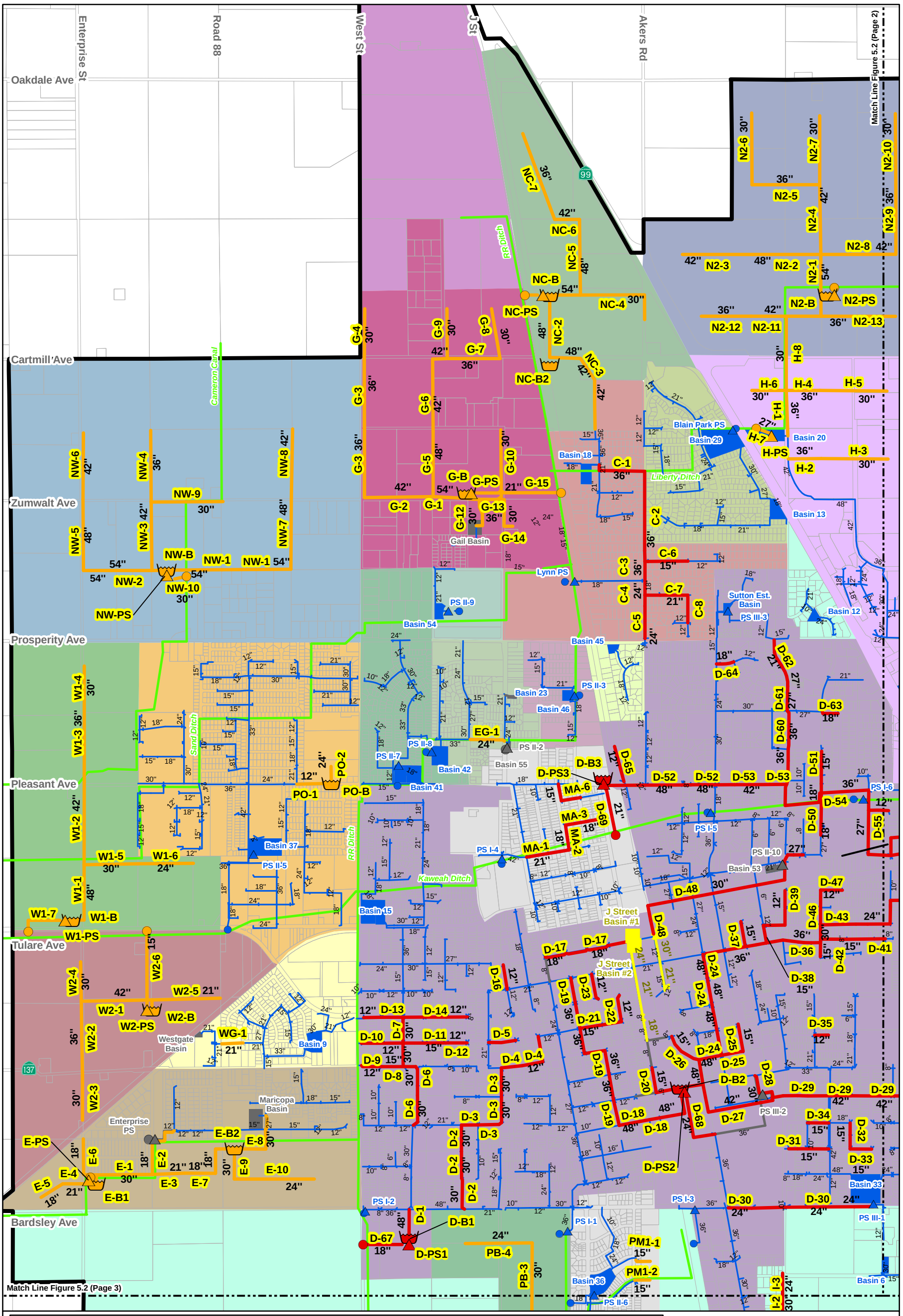

Figure 5.2
Proposed Improvements (Page 1 of 3)

Storm Drainage System Master Plan
City of Tulare

City of Tulare
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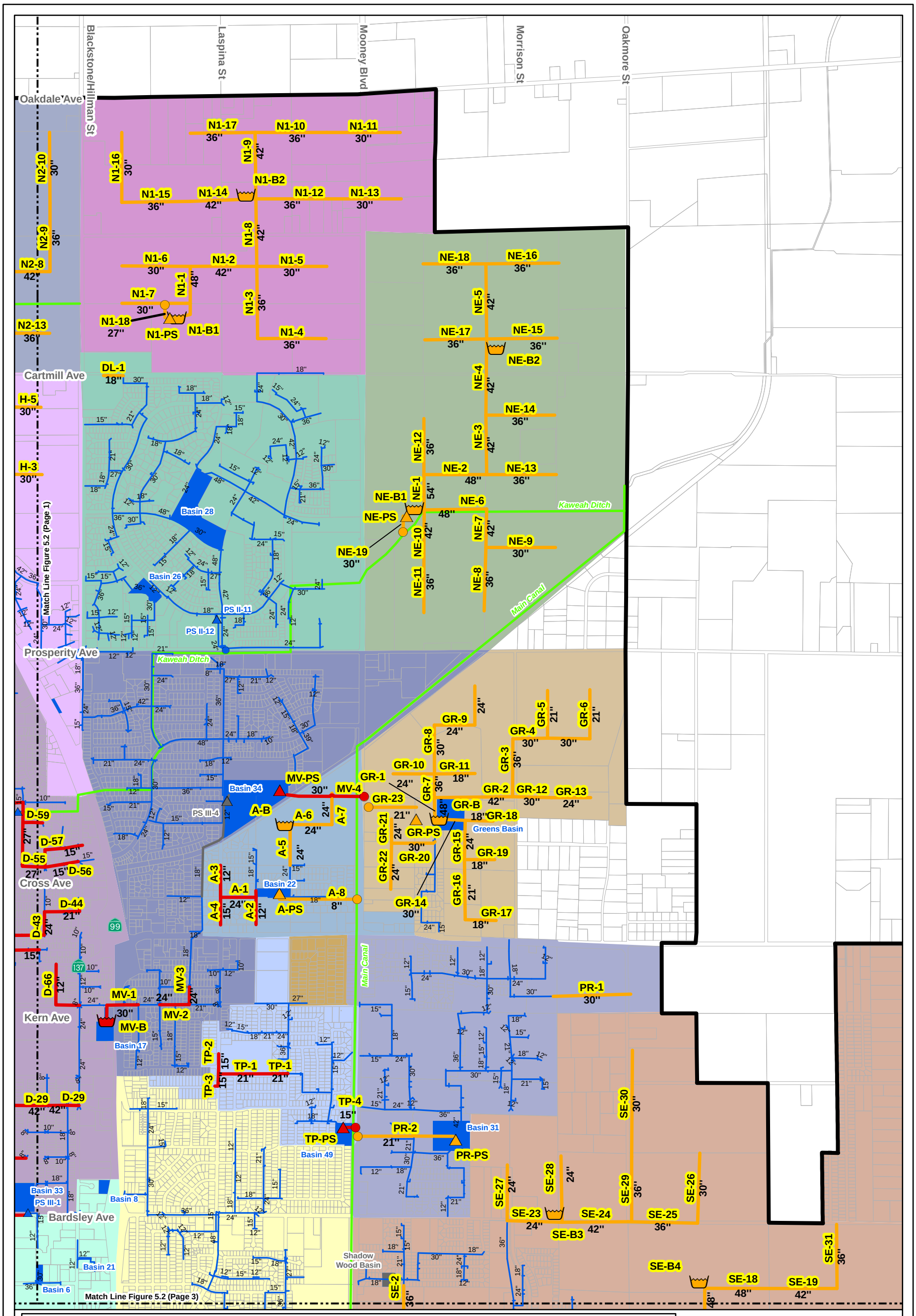

Figure 5.2
Proposed Improvements (Page 2 of 3)

Storm Drainage System Master Plan
City of Tulare

City of Tulare
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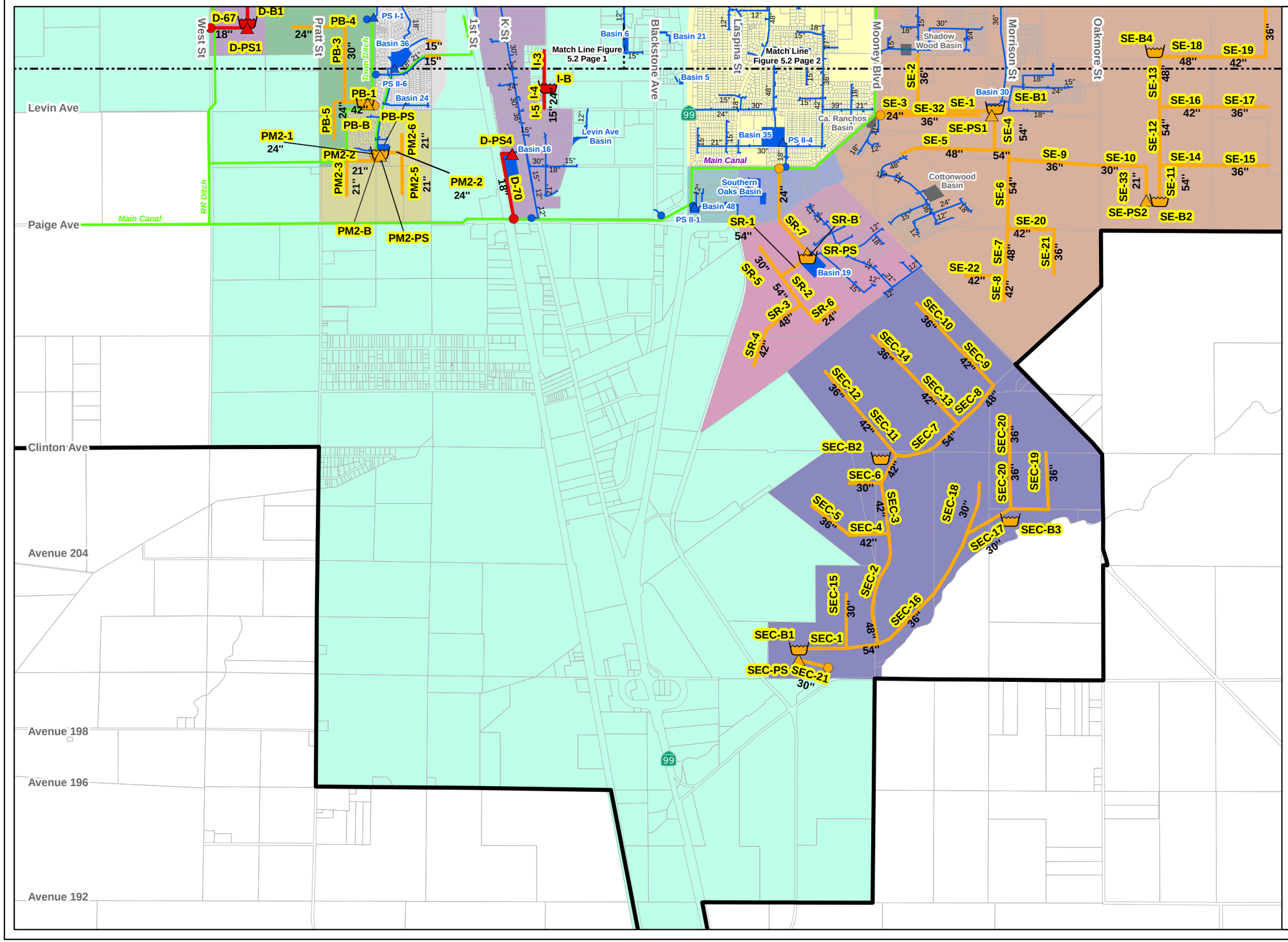

Legend

Existing Storm Drainage System
- Outfall
- Pump Station
- Storm Drain
- Storm Basin

Facilities To Abandon
- Outfall
- Pump Station
- Storm Drain
- Storm Basin

Existing System Improvements
- Pump Station
- Storm Basin
- Outfall
- Storm Drain

Future System Improvements
- Pump Station
- Storm Basin
- Outfall
- Storm Drain
- Canal/Waterway
- Future Drainage Subbasins
- Urban Development Boundary
- Parcels
- P-20 Proposed Improvement ID
- 12" Proposed Pipe Diameter
- 8" Existing Pipe Diameter

N

0 2,000 4,000 Feet

Figure 5.2
Proposed Improvements
(Page 3 of 3)

Storm Drainage
System Master Plan
City of Tulare

City of Tulare

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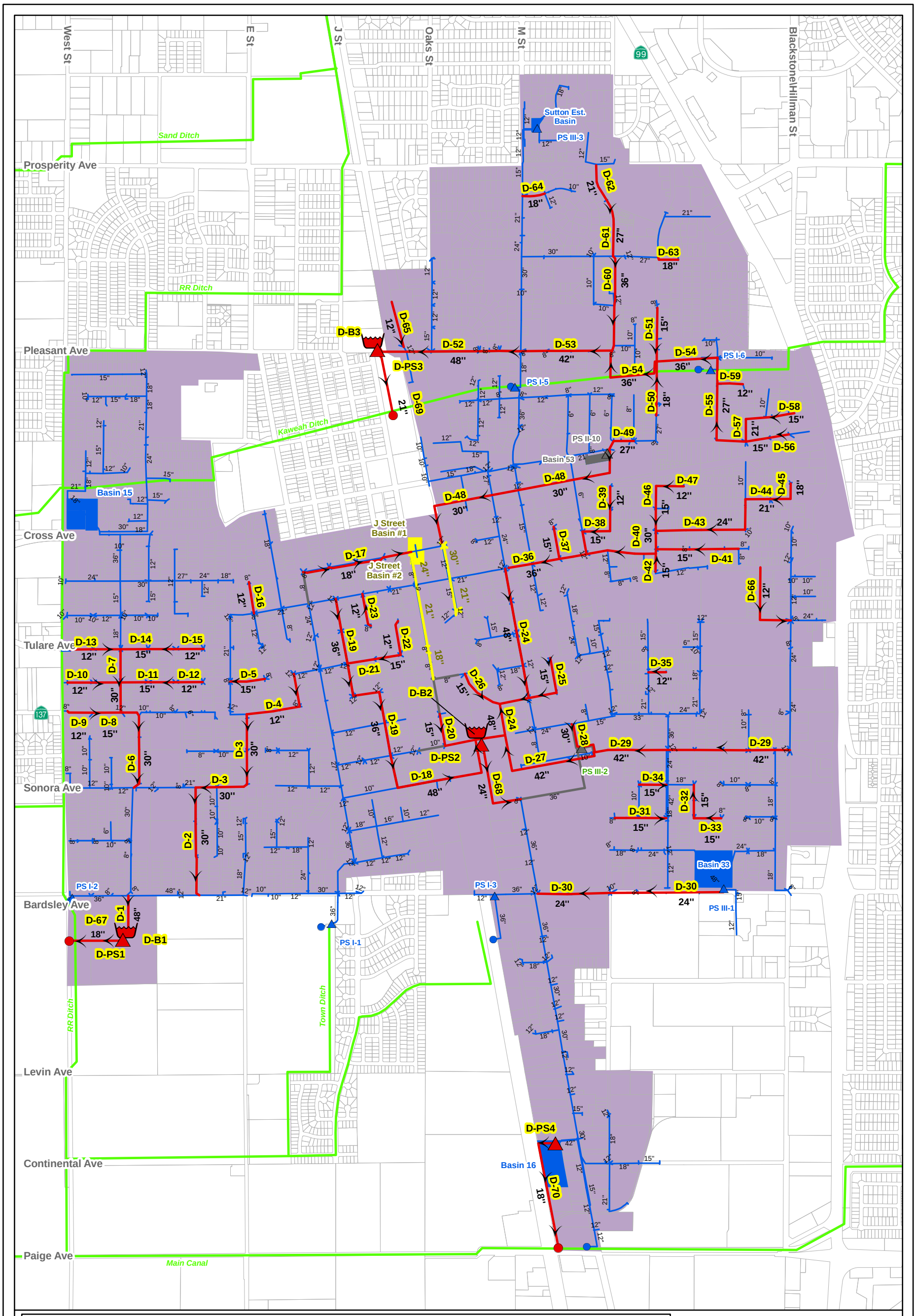

Legend

Downtown Storm Drainage System	Under Construction	Facilities To Abandon	Downtown Improvements	
Outfall	Storm Basins	Outfall	Outfall	Canal/Waterway
Pump Station	Storm Drain	Pump Station	Pump Station	Urban Development Boundary
Storm Drain		Storm Drain	Storm Basin	Parcels
Storm Basin		Storm Basin	Storm Drain	Downtown Subbasin
12" Existing Diameter			Flow Arrow	D-3 Improvement No
				30" Proposed Diameter

0 750 1,500 Feet

N

Figure 5.3
Proposed Downtown Storm Drain Improvements

Storm Drainage System Master Plan
City of Tulare

City of Tulare

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Table 5.1 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
Academy Subbasin									
A-1	Pipe	Academy Avenue	Mountain View St. to Laspina St.	X	X	--	24	New	800
A-2	Pipe	Mountain View Street	Academy Ave. to 200' n/o Highway 137	X	X	--	12	New	500
A-3	Pipe	Laspina Street	Academy Ave. to Eastgate Ave.	X	X	--	12	New	600
A-4	Pipe	Laspina Street	Academy Ave. to 200' n/o Highway 137	X	X	--	15	New	500
A-5	Pipe	Aronian Street	Eastgate Ave. to 800' n/o Eastgate Ave.			--	24	New	800
A-6	Pipe	800' n/o Eastgate Ave.	Aronian St. to 800' e/o Aronian St.			--	24	New	800
A-7	Pipe	Latimier Street	800' n/o Eastgate Ave. to 1,400' n/o Eastgate Ave.			--	24	New	600
A-8	Force Main	Academy Avenue	Basin 22 to Main Canal			--	8	New	1,500
A-B	Detention Basin	Aronian Street	Proposed Academy Basin			--	3 acre-ft	New	--
A-PS	Pump Station	Mountain View Street	Academy Pump Station (Class II discharge from Basin 22)			--	5.5 cfs	New	--
California Subbasin									
C-1	Pipe	Alcott St/Dickens Ave	100' n/o Dickens Ave to Oaks St	X		21/--	36	Replace/New	1,000
C-2	Pipe	Oaks Street	Dickens Ave to 150' s/o Sandra Ave	X		--	36	New	1,500
C-3	Pipe	Oaks Street	150' s/o Sandra Ave to Lynn Ave	X		12/18	36	Replace	600
C-4	Pipe	Oaks Street	Lynn Ave to Lois Ave	X		18	30	Replace	300
C-5	Pipe	Oaks Street	Lois Ave to Prosperity Ave	X		18	24	Replace	800
C-6	Pipe	Gail Avenue	Oaks St to 500' w/o M St	X		12	15	Replace	800
C-7	Pipe	Lois Avenue	Oaks St to Williams St	X		12	21	Replace	800
C-8	Pipe	Williams Street	Lois Ave to Berkeley Ave	X		12	15	Replace	500
Del Lago Subbasin									
DL-1	Pipe	Cartmill Avenue	800' e/o Hillman St to 300' e/o Hillman St			--	18	New	500
Downtown Subbasin									
D-1	Pipe	Sacramento Street	Bardsley Ave to Proposed Downtown Basin 1	X		--	48	New	500
D-2	Pipe	Cleveland St/Howard St	Bardlsey Ave to Sonora Ave	X		10/--	30	Replace/New	1,600
D-3	Pipe	Sonora Ave/Pratt St	Howard St to Inyo Ave	X		21	30	Replace	1,800
D-4	Pipe	Inyo Ave/D St	Pratt St to Kern Ave	X		8	12	Replace	1,300
D-5	Pipe	Kern Avenue	Pratt St to D St	X		8	15	Replace	500
D-6	Pipe	Sacramento Street	Sonora Ave to Inyo Ave	X		21	30	Replace	1,400
D-7	Pipe	Santa Clara Street	Inyo Ave to Tulare Ave	X		21	30	Replace	900
D-8	Pipe	Inyo Avenue	Santa Clara St to Los Angeles St	X		8	15	Replace	400
D-9	Pipe	Inyo Avenue	Los Angeles St to e/o West St	X		8	12	Replace	400
D-10	Pipe	Kern Avenue	Santa Clara St to e/o West St	X		8/10	12	Replace	800
D-11	Pipe	Kern Avenue	Santa Clara St to California St	X		10	15	Replace	800
D-12	Pipe	Kern Avenue	California St to A St	X		8	12	Replace	400
D-13	Pipe	Tulare Avenue	Santa Clara St to e/o West St	X		8/10	12	Replace	700
D-14	Pipe	Tulare Avenue	Santa Clara St to California St	X		10	15	Replace	800
D-15	Pipe	Tulare Avenue	California St to A St	X		8	12	Replace	400
D-16	Pipe	C Street	King Ave to San Jaoquin Ave	X		8	12	Replace	500
D-17	Pipe	San Joaquin Avenue	E St to I St	X		6/8	18	Replace	1,600
D-18	Pipe	Apline Avenue	Proposed Downtown Basin 2 to G St	X		8/--	48	Replace/New	1,300
D-19	Pipe	G St/F St	Apline Ave to King Ave	X		8/10	36	Replace	3,400
D-20	Pipe	I St/Sonora Ave	Proposed Downtown Basin 2 to Owens Ave	X		--	15	New	900
D-21	Pipe	Kern Avenue	F St to H St	X		6/10	15	Replace	800
D-22	Pipe	H Street	Kern Ave to Tulare Ave	X		8/10	12	Replace	500
D-23	Pipe	G Street	King Ave to Tulare Ave	X		8	12	Replace	500
D-24	Pipe	K St/L St	Proposed Downtown Basin 2 to King Avenue	X		10/15/24/--	48	Replace/New	3,300
D-25	Pipe	Owens Ave/M St	L St to Inyo Ave	X		8/10	15	Replace	1,000
D-26	Pipe	J St	Owens Ave to Inyo Ave	X	X	--	15	New	700
D-27	Pipe	MLK Jr. Avenue	K St to O St (to Abandon PS III-2)	X		--	42	New	1,800
D-28	Pipe	Land O Lakes Facility	Sonora Ave to PS III-2 (PS III-2 to be Abandoned, Pipeline Direction Reversed)	X		30	30	Replace	700
D-29	Pipe	MLK Jr. Avenue	N St to Blackstone St	X		24	42	Replace	2,900
D-30	Pipe	Bardsley Avenue	K St to PS III-1	X		14	24	Replace	2,700
D-31	Pipe	Cedar Avenue	Q St to O St	X		8	15	Replace	800
D-32	Pipe	R Street	Elm Ave to Cedar Ave	X		8	15	Replace	500
D-33	Pipe	Cedar Avenue	R St to S St	X		8	15	Replace	400
D-34	Pipe	Elm Avenue	Q St to P St	X		8	15	Replace	400
D-35	Pipe	Mariposa Avenue	Center St to 300' e/o Center St	X		8	12	Replace	300
D-36	Pipe	King Avenue	L St to Cherry St	X		18/21	36	Replace	2,200
D-37	Pipe	N Street	King Avenue to San Joaquin Ave	X		8	15	Replace	500
D-38	Pipe	O St/San Joaquin Ave	King Ave to Gem St	X		8/12	15	Replace	1,000
D-39	Pipe	Gem Street	San Joaquin Ave to Academy Ave	X		8	12	Replace	300
D-40	Pipe	Cherry Street	King Avenue to San Joaquin Ave	X		15	30	Replace	300
D-41	Pipe	Sycamore Avenue	Cherry St to Highland St	X		8	15	Replace	1,200
D-42	Pipe	Cherry Street	King Ave to Inyo Ave	X		8	15	Replace	300
D-43	Pipe	San Joaquin Ave/Highland St	Cherry St to Apricot Ave	X		10	24	Replace	1,700
D-44	Pipe	Apricot Avenue	Highland St to Blackstone St	X		10	21	Replace	700
D-45	Pipe	Blackstone Street	Apricot St to Academy St	X		10	18	Replace	200
D-46	Pipe	Cherry Street	San Joaquin Ave to Academy Ave	X		10	15	Replace	700
D-47	Pipe	Academy Avenue	Cherry St to 400' e/o Cherry St	X		10	12	Replace	400
D-48	Pipe	Pine Street	Basin 53 to J St (Pine Storm Drain and Abandon Basin 53 and PS II-10)	X		--	30	New	3,500
D-49	Pipe	Cross Avenue	Auburn St to Basin 53 (Abandon Basin 53 and PS II-10)	X		21	27	Replace	400
D-50	Pipe	Cherry Street	n/o Cross Ave to s/o Pleasant Ave	X		8	18	Replace	1,000
D-51	Pipe	Cherry Street	s/o Pleasant Ave to Terrace Ave	X		8	15	Replace	600
D-52	Pipe	Pleasant Avenue	Proposed Downtown Basin 3 to M St	X		15/--	48	Replace/New	2,300
D-53	Pipe	Pleasant Avenue	M St to Gem St	X		12	42	Replace	1,300
D-54	Pipe	Lyndale Ave/Bash Ave	Delwood St to Pleasant Ave	X		--	36	New	2,300
D-55	Pipe	Delwood St/Cross St	Highland St to Bash Ave	X		12	27	Replace	1,500
D-56	Pipe	Cross Avenue	Highland St to Blackstone St	X		10	15	Replace	600
D-57	Pipe	Highland St/Beverly Ave	Cross Ave to Bonita St	X		12/10	21	Replace	600
D-58	Pipe	Beverly Avenue	Bonita St to Blackstone St	X		10	15	Replace	400
D-59	Pipe	Windsor Avenue	Delwood St to Highland St	X		8	12	Replace	400
D-60	Pipe	Gem Street	Pleasant Ave to Merritt Ave	X		10/--	36	Replace/New	1,400
D-61	Pipe	Gem Street	Merritt Ave to 800'n.o Merritt Ave	X		15	27	Replace	800
D-62	Pipe	Gem Street	800' n/o Merritt Ave to Prosperity Ave	X		15	21	Replace	500
D-63	Pipe	Merritt Avenue	Cherry St to 300' e/o Cherry St	X		12	18	Replace	300
D-64	Pipe	Estate Avenue	M St to 300' e/o M St	X		12	18	Replace	300
D-65	Pipe	I Street	Pleasant Ave to 700' n/o Pleasant Avenue	X	X	--	12	New	700
D-66	Pipe	Salida St/Kern Ave	Inyo Ave to Blackstone St	X	X	--	12	New	1,200
D-67	Force Main	Bardsley Avenue	Force Main from Downtown Pump Station 1 (D-PS1)	X		--	18	New	700
D-68	Force Main	w/o J Street	Force Main from Downtown Pump Station 2 (D-PS2)	X		--	24	New	1,200

Table 5.1 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
D-69	Force Main	I Street	Force Main from Downtown Pump Station 3 (D-PS3)	X		--	21	New	1,000
D-70	Force Main	I Street	Force Main from Downtown Pump Station 4 (D-PS4)	X		--	18	New	1,800
D-B1	Detention Basin	Bardsley Avenue	Proposed Downtown Basin 1	X		--	35 acre-ft	New	--
D-B2	Detention Basin	w/o J Street	Proposed Downtown Basin 2	X		--	55 acre-ft	New	--
D-B3	Detention Basin	I Street	Proposed Downtown Basin 3	X		--	45 acre-ft	New	--
D-PS1	Pump Station	Bardsley Avenue	Downtown Pump Station 1 (Class II discharge from Downtown Basin 1)	X		--	10.0 cfs	New	--
D-PS2	Pump Station	w/o J Street	Downtown Pump Station 2 (Class III discharge from Downtown Basin 2)	X		--	14.0 cfs	New	--
D-PS3	Pump Station	I Street	Downtown Pump Station 3 (Class II discharge from Downtown Basin 3)	X		--	12.0 cfs	New	--
D-PS4	Pump Station	I Street	Downtown Pump Station 4 (Class II discharge from Basin 16)	X		--	8.0 cfs	New	--
Enterprise Subbasin									
E-1	Pipe	700' n/o Bardsley Ave	200' e/o Enterprise St to 1,400' e/o Enterprise St			--	30	New	1,200
E-2	Pipe	Haven Street	700' n/o Bardsley Ave to Sonora St			--	18	New	1,200
E-3	Pipe	700' n/o Bardsley Ave	1,400' e/o Enterprise St to 2,000' e/o Enterprise St			--	21	New	600
E-4	Pipe	700' n/o Bardsley Ave	Future City Basin 40 to Bardsley Ave			--	21	New	700
E-5	Pipe	n/o Bardsley Avenue	400' w/o Enterprise St to 800' w/o Enterprise St			--	18	New	600
E-6	Pipe	Enterprise Street	700' n/o Bardsley Ave to Sonora St			--	18	New	900
E-7	Pipe	700' n/o Bardsley Ave	Basin 39 (E-B2) 2,000' e/o Enterprise St.			--	18	New	1,300
E-8	Pipe	Maricopa St	Future City Basin 39 to Santa Barbara St			27	30	New/Replace	1,300
E-9	Pipe	2,400' w/o West St	300' s/o Sonora St to 900' s/o Sonora St			--	30	New	600
E-10	Pipe	900' s/o Sonora St	2,400' w/o West St to 900' w/o West St			--	24	New	1,500
E-11	Force Main	700' n/o Bardsley Ave	Force Main from Enterprise Pump Station (E-PS)			--	15	New	100
E-B1	Detention Basin	700' n/o Bardsley Ave	Future City Basin 40			--	20 acre-ft	New	--
E-B2	Detention Basin	300' s/o Sonora St	Future City Basin 39			--	15 acre-ft	New	--
E-PS	Pump Station	700' n/o Bardsley Ave	Enterprise Pump Station (Class II discharge from Basin 40)			--	5.0 cfs	New	--
Evergreen Subbasin									
EG-1	Pipe	Saratoga Avenue	A St. to E St.			--	24	New	700
Gail Subbasin									
G-1	Pipe	Zumwalt Ave	600' e/o Sacramento St to Sacramento St			--	54	New	600
G-2	Pipe	Zumwalt Ave	Sacramento St to West St			--	42	New	1,300
G-3	Pipe	West St	Zumwalt Ave to Cartmill Ave			--	36	New	2,500
G-4	Pipe	West St	Cartmill Ave to 1,200' n/o Cartmill Ave			--	30	New	1,300
G-5	Pipe	Sacramento Street	Zumwalt Ave to Elster Ave			--	48	New	1,200
G-6	Pipe	Sacramento Street	Elster Ave to Cartmill Ave			--	42	New	1,600
G-7	Pipe	Cartmill Avenue	Sacramento St to 1,000' e/o Sacramento St			--	36	New	1,000
G-8	Pipe	1,000' e/o Sacramento St	Cartmill Ave to 1,500' n/o Cartmill Ave			--	30	New	1,500
G-9	Pipe	Sacramento Street	Cartmill Ave to 1,400' n/o Cartmill Ave			--	30	New	1,400
G-10	Pipe	E Street	Zumwalt Ave to Elster Ave			--	30	New	1,400
G-11	Pipe	Zumwalt Ave	400' w/o E St to Future City Basin 43 (G-B)			--	42	New	300
G-12	Pipe	400' w/o E St	Gail Basin to Zumwalt Ave			--	30	New	600
G-13	Pipe	Zumwalt Ave	400' w/o E St to E St			--	36	New	400
G-14	Pipe	E Street	Zumwalt Ave to 500' s/o Zumwalt Ave			--	30	New	600
G-15	Force Main	Zumwalt Ave	Force Main from Gail Pump Station (G-PS)			--	21	New	1,600
G-B	Detention Basin	Zumwalt Ave	Future City Basin 43			--	50 acre-ft	New	--
G-PS	Pump Station	Zumwalt Ave	Gail Pump Station (Class II discharge from Basin 43)			--	13.0 cfs	New	--
The Greens Subbasin									
GR-1	Pipe	1,500' w/o Morrision St	The Greens Basin to 2,700' s/o Prosperity Avenue			--	48	New	500
GR-2	Pipe	2,700' s/o Prosperity Ave	1,500' w/o Morrison St to Morrison St			--	42	New	1,500
GR-3	Pipe	Morrison Street	2,700' s/o Prosperity Ave to 1,600' s/o Prosperity Ave			--	36	New	1,100
GR-4	Pipe	1,600' s/o Prosperity Ave	Morrison St to 1,400' e/o Morrison St			--	30	New	1,400
GR-5	Pipe	600' e/o Morrison St	1,600' s/o Prosperity Ave to 700' s/o Prosperity Ave			--	21	New	900
GR-6	Pipe	1,400' e/o Morrison St	1,600' s/o Prosperity Ave to 700' s/o Prosperity Ave			--	21	New	900
GR-7	Pipe	1,500' w/o Morrison St	2,700' s/o Prosperity Ave to 2,300' s/o Prosperity Ave			--	36	New	900
GR-8	Pipe	1,500' w/o Morrison St	2,300' s/o Prosperity Ave to 1,400' s/o Prosperity Ave			--	30	New	900
GR-9	Pipe	s/o Prosperity-w/o Morrison	w/o Morrison St to s/o Prosperity Ave			--	24	New	1,500
GR-10	Pipe	2,300' s/o Prosperity Ave	600' e/o Mooney Blvd to 1,400' e/o Mooney Blvd			--	24	New	800
GR-11	Pipe	2,300' s/o Prosperity Ave	1,500' w/o Morrison St to 700' w/o Morrison St			--	18	New	800
GR-12	Pipe	2,700' s/o Prosperity Ave	Morrison St to 700' e/o Morrison St			--	30	New	700
GR-13	Pipe	2,700' s/o Prosperity Ave	700 ' e/o Morrison St to 1,400' e/o Morrison St			--	24	New	700
GR-14	Pipe	2,200' n/o Tulare Ave	Greens Basin to 1,000' w/o Morrison St			--	30	New	500
GR-15	Pipe	1,000' w/o Morrison St	2,200' n/o Tulare Ave to 1,500' n/o Tulare Ave			--	24	New	700
GR-16	Pipe	1,000' w/o Morrison St	1,500' n/o Tulare Ave to 400' n/o Tulare Ave			--	21	New	1,100
GR-17	Pipe	400' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St			--	18	New	600
GR-18	Pipe	2,200' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St			--	18	New	600
GR-19	Pipe	1,500' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St			--	18	New	600
GR-20	Pipe	1,700' n/o Tulare Ave	1,400' e/o Mooney Blvd to 600' e/o Mooney Blvd			--	30	New	800
GR-21	Pipe	600' e/o Mooney Blvd	1,700' n/o Tulare Ave to 2,200' n/o Tulare Ave			--	24	New	500
GR-22	Pipe	600' e/o Mooney Blvd	1,700' n/o Tulare Ave to 800' n/o Tulare Ave			--	24	New	900
GR-23	Force Main	2,200' n/o Hwy 137	Force Main from The Greens Pump Station (GR-PS)			--	21	New	1,200
GR-B	Detention Basin	2,200' n/o Hwy 137	Proposed Expansion to the Greens Basin			6 acre-ft	45 acre-ft	Expand	--
GR-PS	Pump Station	2,200' n/o Hwy 137	The Greens Pump Station (Class II discharge fro the Greens Basin)			--	11.5 cfs	New	--
Horizon Subbasin									
H-1	Pipe	Gem Street	1,500' s/o Cartmill Ave to 600' s/o Cartmill Ave			--	36	New	900
H-2	Pipe	1,900' s/o Cartmill Ave	Gem St to 600' e/o Gem St			--	36	New	600
H-3	Pipe	1,900' s/o Cartmill Ave	600' e/o Gem St to 700' w/o Hillman St			--	30	New	1,300
H-4	Pipe	600' s/o Cartmill Ave	Gem St to 600' e/o Gem St			--	36	New	600
H-5	Pipe	600' s/o Cartmill Ave	600' e/o Gem St to 700' w/o Hillman St			--	30	New	1,300
H-6	Pipe	600' s/o Cartmill Ave	1,400' w/o Gem St to Gem St			--	30	New	1,400
H-7	Force Main	1,400' s/o Cartmill Ave	Force Main from Outlet Center Pump Station (H-PS)			--	27	New	250
H-8	Pipe	Gem Street	Overflow Pipe between Horizon and North 2 Subbasin			--	30	New	1,400
H-PS	Pump Station	1,400' s/o Cartmill Ave	Outlet Center Pump Station (Class II discharge from Outlet Center Basin)			--	22.0 cfs	New	--
Industrial Subbasin									
I-1	Pipe	O Street	O Street Basin to O Street	X		--	36	New	100
I-2	Pipe	O Street	s/o Chestnut Ave to Almond Ave	X		--	30	New	500
I-3	Pipe	O Street	Almond Ave to Walnut Ave	X		--	24	New	400
I-4	Pipe	O Street	s/o Chestnut Ave to n/o Levin Ave	X		--	24	New	200
I-5	Pipe	O Street	n/o Levin Ave to Levin Ave	X		--	15	New	300
I-B	Detention Basin	O Street	Future O Street Basin	X		--	6.3 acre-ft	New	--
Maple Subbasin									
MA-1	Pipe	Maple Avenue	E St to G St	X		12/15	21	Replace	800
MA-2	Pipe	G Street	Maple Ave to Beaumont Ave	X		10	18	Replace	500
MA-3	Pipe	Beaumont Avenue	G St to H St	X		10	18	Replace	400

Table 5.1 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
MA-4	Pipe	Beaumont Avenue	H St to I St	X		8	15	Replace	400
MA-5	Pipe	G Street	Pleasant Ave to Oakland Ave	X		10	15	Replace	300
MA-6	Pipe	Oakland Avenue	G St to H St	X		10	15	Replace	300
Mountain View Subbasin									
MV-1	Pipe	Kern Avenue	Basin 17 to Forrest St	X		24	30	Replace	900
MV-2	Pipe	Kern Avenue	Sruce St to Canby St	X		21	24	Replace	600
MV-3	Pipe	Canby Street	Kern Ave to Sequoia St	X		--	24	New	300
MV-4	Force Main	Live Oak Park	Force Main from Live Oak Pump Station (MV-PS)	X		--	30	New	1,500
MV-B	Retention Basin	Kern Avenue	Basin 17 Expansion	X		8 acre-ft	15 acre-ft	Expand	--
MV-PS	Pump Station	Live Oak Park	Live Oak Pump Station (Class II discharge from Basin 34 & Abandon PS III-4)	X		--	25.0 cfs	New	--
Northeast Subbasin									
NE-1	Pipe	1,100' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 1,900' s/o Cartmill Ave			--	54	New	1,000
NE-2	Pipe	1,900' s/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			--	48	New	1,200
NE-3	Pipe	2,300' e/o Mooney Blvd	1,900' s/o Cartmill Ave to 700' s/o Cartmill Ave			--	42	New	1,100
NE-4	Pipe	2,300' e/o Mooney Blvd	700' s/o Cartmill Ave to 600' n/o Cartmill Ave			--	42	New	1,300
NE-5	Pipe	2,300' e/o Mooney Blvd	600' n/o Cartmill Ave to 2,000' n/o Cartmill Ave			--	42	New	1,400
NE-6	Pipe	2,600' s/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			--	48	New	1,200
NE-7	Pipe	2,300' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 3,300' s/o Cartmill Ave			--	42	New	700
NE-8	Pipe	2,300' e/o Mooney Blvd	3,300' s/o Cartmill Ave to 700' n/o Prosperity Ave			--	36	New	1,200
NE-9	Pipe	3,300' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	30	New	1,300
NE-10	Pipe	1,100' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 3,300' s/o Cartmill Ave			--	42	New	800
NE-11	Pipe	1,100' e/o Mooney Blvd	3,300' s/o Cartmill Ave to 700' n/o Prosperity Ave			--	36	New	1,200
NE-12	Pipe	1,100' e/o Mooney Blvd	1,900' s/o Cartmill Ave to 700' s/o Cartmill Ave			--	36	New	1,100
NE-13	Pipe	1,900' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	36	New	1,300
NE-14	Pipe	700' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	36	New	1,300
NE-15	Pipe	600' n/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	36	New	1,300
NE-16	Pipe	2,000' n/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			--	36	New	1,400
NE-17	Pipe	600' n/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			--	36	New	1,200
NE-18	Pipe	2,000' n/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			--	36	New	1,200
NE-19	Force Main	2,600' n/o Prosperity Ave	Force Main from Northeast Pump Station (NE-PS)			--	30	New	300
NE-B1	Detention Basin	2,600' n/o Prosperity Ave	Proposed Northeast 1 Basin			--	85 acre-ft	New	--
NE-B2	Detention Basin	600' n/o Cartmill Ave	Proposed Northeast 2 Basin			--	17 acre-ft	New	--
NE-PS	Pump Station	2,600' n/o Prosperity Ave	Northeast Pump Station (Class II discharge from Northeast 1 Basin)			--	25.0 cfs	New	--
North 1 Subbasin									
N1-1	Pipe	2,000' e/o Hillman St	North 1 Basin 1 to 600' s/o Ave 252			--	48	New	1,500
N1-2	Pipe	600' s/o Ave 252	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd			--	42	New	1,300
N1-3	Pipe	2,000' w/o Mooney Blvd	600' s/o Ave 252 to 700' n/o Cartmill Ave			--	36	New	1,400
N1-4	Pipe	700' n/o Cartmill Ave	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			--	36	New	1,300
N1-5	Pipe	600' s/o Ave 252	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			--	30	New	1,300
N1-6	Pipe	600' s/o Ave 252	700' e/o Hillman St to			--	30	New	1,300
N1-7	Pipe	1,300' n/o Cartmill Ave	700' e/o Hillman St to 2,000' e/o Hillman St			--	30	New	1,300
N1-8	Pipe	2,000' w/o Mooney Blvd	600' s/o Ave 252 to 650' n/o Ave 252			--	42	New	1,300
N1-9	Pipe	2,000' w/o Mooney Blvd	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	36	New	1,300
N1-10	Pipe	650' s/o Oakdale Ave	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			--	36	New	1,300
N1-11	Pipe	650' s/o Oakdale Ave	700' w/o Mooney Blvd to 600' e/o Mooney Blvd			--	30	New	1,500
N1-12	Pipe	650' n/o Ave 252	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			--	36	New	1,300
N1-13	Pipe	650' n/o Ave 252	700' w/o Mooney Blvd to 600' e/o Mooney Blvd			--	30	New	1,400
N1-14	Pipe	650' n/o Ave 252	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd			--	42	New	1,200
N1-15	Pipe	650' n/o Ave 252	700' e/o Hillman St to 2,000' e/o Hillman St			--	36	New	1,300
N1-16	Pipe	700' e/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	30	New	1,300
N1-17	Pipe	650' s/o Oakdale Ave	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd			--	36	New	1,300
N1-18	Force Main	1,300' n/o Cartmill Ave	Force Main from North 1 Pump Station (N1-PS)			--	27	New	200
N1-B1	Detention Basin	1,300' n/o Cartmill Ave	Proposed North 1 Basin 1			--	55 acre-ft	New	--
N1-B2	Detention Basin	650' n/o Ave 252	Proposed North 1 Basin 2			--	25 acre-ft	New	--
N1-PS	Pump Station	1,300' n/o Cartmill Ave	North 1 Pump Station (Class II discharge from North 1 Basin 1)			--	20.0 cfs	New	--
North 2 Subbasin									
N2-1	Pipe	2,000' w/o Hillman St	650' n/o Cartmill Ave to 650' s/o Ave 252			--	54	New	1,300
N2-2	Pipe	650' s/o Ave 252	2,000' w/o Hillman St to 3,300' w/o Hillman St			--	48	New	1,300
N2-3	Pipe	650' s/o Ave 252	3,300' w/o Hillman St to 4,600' w/o Hillman St			--	42	New	1,300
N2-4	Pipe	2,000' w/o Hillman St	650' s/o Ave 252 to 650' n/o Ave 252			--	48	New	1,300
N2-5	Pipe	650' n/o Ave 252	2,000' w/o Hillman St to 3,300' w/o Hillman St			--	36	New	1,300
N2-6	Pipe	3,300' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	30	New	1,300
N2-7	Pipe	2,000' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	30	New	1,300
N2-8	Pipe	650' s/o Ave 252	2,000' w/o Hillman St to 650' w/o Hillman St			--	42	New	1,400
N2-9	Pipe	650' w/o Hillman St	650' s/o Ave 252 to 650' n/o Ave 252			--	36	New	1,300
N2-10	Pipe	650' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			--	30	New	1,300
N2-11	Pipe	650' n/o Cartmill Ave	2,000' w/o Hillman St to 3,300' w/o Hillman St			--	48	New	1,300
N2-12	Pipe	650' n/o Cartmill Ave	3,300' w/o Hillman St to 4,100' w/o Hillman St			--	42	New	800
N2-13	Pipe	650' n/o Cartmill Ave	2,000' w/o Hillman St to 650' w/o Hillman St			--	36	New	1,400
N2-14	Force Main	2,000' w/o Hillman St	Force Main from North 2 Pump Station (N2-PS)			--	27	New	200
N2-B	Detention Basin	2,000' w/o Hillman St	Proposed North 2 Basin			--	100 acre-ft	New	--
N2-PS	Pump Station	2,000' w/o Hillman St	North 2 Pump Station (Class II discharge from North 2 Basin)			--	25.0 cfs	New	--
North Commercial Subbasin									
NC-1	Pipe	1,100' n/o Cartmill Ave	300' e/o J St to 900' e/o J St			--	54	New	600
NC-2	Pipe	e/o J St	Cartmill Ave to n/o Cartmill Ave			--	48	New	1,720
NC-3	Pipe	800' e/o J St	Cartmill Ave to s/o Cartmill Ave			--	42	New	1,450
NC-4	Pipe	1,100' n/o Cartmill Ave	800' e/o J St to Oaks St			--	30	New	1,700
NC-5	Pipe	900' e/o J St	1,100' n/o Cartmill Ave to 2,500' n/o Cartmill Ave				48	New	1,400
NC-6	Pipe	2,500' n/o Cartmill Ave	1,100' e/o J St to 600' e/o J St				42	New	500
NC-7	Pipe	600' e/o J St	2,600' s/o Oakdale Ave to 900' s/o Oakdale Ave				36	New	1,700
NC-8	Force Main	1,100' n/o Cartmill Ave	Force Main from North Pump Commercial Station (NC-PS)			--	24	New	200
NC-B	Detention Basin	1,100' n/o Cartmill Ave	Proposed North Commercial Basin			--	40 acre-ft	New	--
NC-B2	Detention Basin	Highway 99	Grade separation pond			--	26 acre-ft	New	--
NC-PS	Pump Station	1,100' n/o Cartmill Ave	North Commercial PS (Class II discharge from North Commerc. Basin)			--	16.5 cfs	New	--
Northwest Subbasin									
NW-1	Pipe	Gail Street	Northwest Basin to 1,300' w/o West St			--	54	New	2,600
NW-2	Pipe	Gail Street	Northwest Basin to 1,300' e/o Enterprise St			--	54	New	1,300
NW-3	Pipe	1,300' e/o Enterprise St	Gail St to Zumwalt Ave			--	42	New	1,300
NW-4	Pipe	1,300' e/o Enterprise St	Zumwalt Ave to 1,300' n/o Zumwalt Ave			--	36	New	1,300
NW-5	Pipe	Enterprise Street	Gail St to Zumwalt Ave			--	48	New	1,300
NW-6	Pipe	Enterprise Street	Zumwalt Ave to 1,300' n/o Zumwalt Ave			--	42	New	1,200

Table 5.1 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
NW-7	Pipe	1,300' w/o West St	Gail St to Zumwalt Ave			--	48	New	1,400
NW-8	Pipe	1,300' w/o West St	Zumwalt Ave to 1,300' n/o Zumwalt Ave			--	42	New	1,300
NW-9	Pipe	Zumwalt Avenue	1,300' e/o Enterprise St to 2,600' e/o Enterprise St			--	30	New	1,300
NW-10	Force Main	Gail Street	Force Main from Northwest Pump Station (NW-PS)			--	30	New	200
NW-B	Detention Basin	Gail Street	Proposed Northwest Basin			--	90 acre-ft	New	--
NW-PS	Pump Station	Gail Street	Northwest Pump Station (Class II discharge from Northwest Basin)			--	28.0 cfs	New	--
Palm Ranch Subbasin									
PR-1	Pipe	s/o State Highway 137	1,500' w/o Oakmore St to Oakmore St			--	30	New	1,500
PR-2	Force Main	s/o Alpine Avenue	Palm Ranch Pump Station Force Main (PR-PS)			--	21	New	1,800
PR-PS	Pump Station	s/o Alpine Avenue	Palm Ranch Pump Station (Class II discharge from existing Basin 31)			--	11.5 cfs	New	--
Parkwood Meadows No. 1 Subbasin									
PM1-1	Pipe	Oakwood St Extension	Vetter St to 300' e/o Vetter St			--	15	New	300
PM1-2	Pipe	Old Town St Extension	Vetter St to 300' e/o Vetter St			--	15	New	300
Parkwood Meadows No. 2 Subbasin									
PM2-1	Pipe	E Street	Basin 24 to Lemonwood Ave			12	24	Replace	300
PM2-2	Pipe	Lemonwood Avenue	E St to 200' w/o Applewood St			--	21	New	700
PM2-3	Pipe	200' w/o Applewood St	Lemonwood St to 800' s/o Lemonwood St			--	21	New	800
PM2-4	Pipe	Peachwood Avenue	Basin 24 to 600' e/o E St			--	24	New	500
PM2-5	Pipe	600' e/o E St	Peachwood Ave to 650' n/o Paige Ave			--	21	New	1,000
PM2-6	Pipe	600' e/o E St	Peachwood Ave to 400' n/o Peachwood Ave			--	21	New	400
PM2-7	Force Main	E Street	Force Main from Parkwood Meadows 2 Pump Station (PM2-PS)			--	12	New	100
PM2-B	Detention Basin	E Street	Proposed Basin 24 Expansion			5 acre-ft	14 acre-ft	Expand	--
PM2-PS	Pump Station	E Street	Parkwood Meadows 2 Pump Station (Class II discharge from Basin 24)			--	3.5 cfs	New	--
Pleasant Oak Subbasin									
PO-1	Pipe	Pleasant Avenue	Denair St to 700' e/o Denair St			--	12	New	700
PO-2	Pipe	w/o West Street	Pleasant Ave to 500' n/o Pleasant Ave			--	21	New	500
PO-B	Detention Basin	Pleasant Avenue	Pleasant Oak Basin			--	3 acre-ft	New	--
Pratt/Bardsley Subbasin									
PB-1	Pipe	200' n/o Dogwood Ave	600' e/o Pratt St to 1,100' e/o Pratt St			--	42	New	500
PB-2	Pipe	600' e/o Pratt St	200' n/o Dogwood Ave to 1,500' n/o Dogwood Avenue			--	36	New	1,300
PB-3	Pipe	600' e/o Pratt St	1,500' n/o Dogwood Avenue to 600' s/o Bardsley Ave			--	30	New	1,300
PB-4	Pipe	600' s/o Bardsley Ave	600' e/o Pratt St to 700' w/o Pratt St			--	24	New	1,300
PB-5	Pipe	300' e/o Pratt St	600' s/o Dogwood Ave to 1,500' n/o Dogwood Ave			--	24	New	1,100
PB-6	Force Main	200' n/o Dogwood Ave	Force Main from West/Paige Pump Station (WP-PS)			--	12	New	200
PB-B	Detention Basin	200' n/o Dogwood Ave	Proposed West/Paige Basin			--	15 acre-ft	New	--
PB-PS	Pump Station	200' n/o Dogwood Ave	West/Paige Pump Station (Class II discharge from West/Paige Basin)			--	4.0 cfs	New	--
Southeast Subbasin									
SE-1	Pipe	Levin Avenue	Basin 30 to 700' w/o Basin 30			--	36	New	1,800
SE-2	Pipe	Nelder Grove Street	Levin Ave to Azalea Ave			--	36	New	1,300
SE-3	Pipe	Levin Avenue	900' e/o Mooney Blvd to Mooney Blvd			--	24	New	900
SE-4	Pipe	Morrison Street	Basin 30 to 1,000' s/o Levin Ave			--	54	New	1,000
SE-5	Pipe	Foster Dr Extension	Dover Canyon St to Morrison St			--	48	New	2,200
SE-6	Pipe	Morrison Street	1,000' s/o Levin Ave to 3,200' s/o Levin Ave			--	54	New	2,200
SE-7	Pipe	Morrison Street	3,200' s/o Levin Ave to 4,300' s/o Levin Ave			--	48	New	1,100
SE-8	Pipe	Morrison Street	4,300' s/o Levin Ave to 4,900' s/o Levin Ave			--	42	New	600
SE-9	Pipe	1,200 s/o Levin Ave	Morrison St to 2,200' e/o Morrison St			--	36	New	2,200
SE-10	Pipe	1,200 s/o Levin Ave	2,200' e/o Morrison St to the College of the Sequoias PS (SE-PS2)			--	30	New	1,100
SE-11	Pipe	3,900' e/o Morrison St	College of the Sequoias Basin to 1,200' s/o Levin Ave			--	54	New	800
SE-12	Pipe	3,900' e/o Morrison St	1,200' s/o Levin Ave to Levin Ave Extension			--	54	New	1,400
SE-13	Pipe	3,900' e/o Morrison St	Levin Ave Extension to 1,200' n/o Levin Ave Extension			--	48	New	1,200
SE-14	Pipe	1,200 s/o Levin Ave	3,900' e/o Morrison St to 2,700' w/o Road 132			--	42	New	1,300
SE-15	Pipe	1,200 s/o Levin Ave	2,700' w/o Road 132 to 1,400' w/o Road 132			--	36	New	1,300
SE-16	Pipe	Levin Avenue Extension	3,900' e/o Morrison St to 2,700' w/o Road 132			--	42	New	1,200
SE-17	Pipe	Levin Avenue Extension	2,700' w/o Road 132 to 1,400' w/o Road 132			--	36	New	1,300
SE-18	Pipe	1,200' n/o Levin Ave Ext	3,900' e/o Morrison St to 2,700' w/o Road 132			--	48	New	1,300
SE-19	Pipe	1,200' n/o Levin Ave Ext	2,700' w/o Road 132 to 1,400' w/o Road 132			--	42	New	1,100
SE-20	Pipe	3,200' s/o Levin Ave	Morrison St to 1,100' e/o Morrison St			--	42	New	1,100
SE-21	Pipe	1,100' e/o Morrison St	3,200' s/o Levin Ave to 4,300' s/o Levin Ave			--	36	New	1,100
SE-22	Pipe	4,300' s/o Levin Ave	Morrison St to 900' w/o Morrison St			--	42	New	900
SE-23	Pipe	Bardsley Avenue	Morrison St to 1,000' e/o Morrison St			--	24	New	1,000
SE-24	Pipe	Bardsley Avenue	1,000' e/o Morrison St to Oakmore St			--	42	New	1,200
SE-25	Pipe	Bardsley Avenue	Oakmore St to 1,300' e/o Oakmore St			--	36	New	1,300
SE-26	Pipe	Bardsley Avenue	1,300' e/o Oakmore St to 2,600' e/o Oakmore St			--	30	New	1,300
SE-27	Pipe	Morrison Street	Bardsley Ave to 1,000' n/o Bardsley Ave			--	24	New	1,000
SE-28	Pipe	1,000' e/o Morrison St	Bardsley Ave to 1,100' n/o Bardsley Ave			--	24	New	1,100
SE-29	Pipe	Oakmore Street	Bardsley Ave to 1,100' n/o Bardsley Ave			--	36	New	1,300
SE-30	Pipe	Oakmore Street	1,100' n/o Bardsley Ave to 3,100' n/o Bardsley Ave			--	30	New	2,000
SE-31	Pipe	1,400' w/o Road 132	1,200' n/o Levin Ave Ext to Bardsley Ave			--	36	New	1,200
SE-32A	Force Main	Levin Avenue	Dual Force Main for Southeast Pump Station (SE-PS1)			--	21	New	2,300
SE-32B	Force Main	Levin Avenue	Dual Force Main for Southeast Pump Station (SE-PS1)			--	21	New	2,300
SE-33	Force Main	1,200' s/o Levin Ave	Force Main for College of the Sequoias Pump Station (SE-PS2)			--	21	New	600
SE-B1	Detention Basin	Levin Avenue	Proposed Expansion of Basin 30			--	100 acre-ft	Expand	--
SE-B2	Detention Basin	1,200' s/o Levin Ave	Proposed College of the Sequoias Basin 1			--	55 acre-ft	New	--
SE-B3	Detention Basin	Bardsley Avenue	Proposed Southeast Basin			--	20 acre-ft	New	--
SE-B4	Detention Basin	1,200' n/o Levin Ave Ext	Proposed College of the Sequoias Basin 2			--	12 acre-ft	New	--
SE-PS1	Pump Station	Levin Avenue	Southeast Pump Station (Class II discharge from Basin 30)			--	30.0 cfs	New	--
SE-PS2	Pump Station	1,200' s/o Levin Ave	College of the Sequoias Pump Station (Class III, pumps following storm)			--	14.0 cfs	New	--
Southeast Commercial Subbasin									
SEC-1	Pipe	500' n/o Elk Bayou	SEC-B1 to 4,600' w/o Road 124			--	54	New	3,000
SEC-2	Pipe	4,600' w/o Road 124	500' n/o Elk Bayou to 1,900' n/o Elk Bayou			--	48	New	1,400
SEC-3	Pipe	4,600' w/o Road 124	1,900' n/o Elk Bayou to 4,100' n/o Elk Bayou			--	42	New	2,200
SEC-4	Pipe	3,400' n/o Hosfield	4,600' w/o Road 124 to 5,900' w/o Road 124			--	42	New	1,300
SEC-5	Pipe	3,400' ne/o Laspina St	2,600' nw/o Elk Bayou to 3,700' nw/o Elk Bayou			--	36	New	1,100
SEC-6	Pipe	4,600' n/o Hosfield	4,600' w/o Road 124 to 5,900' w/o Road 124			--	30	New	1,300
SEC-7	Pipe	5,900' se/o Foster Dr	3,100' sw/o Road 124 to 1,900' sw/o Road 124			--	54	New	1,200
SEC-8	Pipe	5,900' se/o Foster Dr	1,900' sw/o Road 124 to 700' sw/o Road 124			--	48	New	1,200
SEC-9	Pipe	700' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr			--	42	New	1,300
SEC-10	Pipe	700' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr			--	36	New	1,100
SEC-11	Pipe	3,100' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr			--	42	New	1,300
SEC-12	Pipe	3,100' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr			--	36	New	1,100
SEC-13	Pipe	1,900' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr			--	42	New	1,300

Table 5.1 Proposed Improvements
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)
SEC-14	Pipe	1,900' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr			--	36	New	1,100
SEC-15	Pipe	6,100' w/o Road 124	700' n/o Hosfield to 2,000' n/o Hosfield			--	30	New	1,300
SEC-16	Pipe	500' n/o Elk Bayou	4,600' w/o Road 124 to 3,400' w/o Road 124			--	36	New	1,900
SEC-17	Pipe	500' n/o Elk Bayou	3,400' w/o Road 124 to 2,100' w/o Road 124			--	30	New	1,300
SEC-18	Pipe	3,400' w/o Road 124	500' n/o Elk Bayou to 1,800' n/o Elk Bayou			--	30	New	1,300
SEC-19	Pipe	n/o Elk Bayou-w/o Road 124	SEC-B3 to 5,300' n/o Hosfield			--	36	New	2,200
SEC-20	Pipe	2,100' w/o Road 124	SEC-B3 to 6,200' n/o Hosfield			--	36	New	2,200
SEC-21A	Force Main	n/o Hosfield	Dual Force Main for Southeast Commercial Pump Station (SEC-PS)			--	21	New	300
SEC-21B	Force Main	n/o Hosfield	Dual Force Main for Southeast Commercial Pump Station (SEC-PS)			--	21	New	300
SEC-B1	Detention Basin	n/o Hosfield	Proposed Southeast Commercial Basin 1			--	115 acre-ft	New	--
SEC-B2	Detention Basin	5,900' se/o Foster Dr	Proposed Southeast Commercial Basin 2			--	35 acre-ft	New	--
SEC-B3	Detention Basin	2,200' w/o Road 124	Proposed Southeast Commercial Basin 3			--	25 acre-ft	New	--
SEC-PS	Pump Station	n/o Hosfield	Southeast Commercial PS (Class II discharge from SE Commercial Basin 1)			--	30.0 cfs	New	--
Sunrise Subbasin									
SR-1	Pipe	1,200' se/o Foster Dr	1,600' sw/o Sunrise St to Basin 19			--	54	New	800
SR-2	Pipe	1,600' sw/o Sunrise St	1,200' se/o Foster Dr to 2,000' se/o Foster Dr			--	54	New	800
SR-3	Pipe	1,100' se/o Laspina St	1,600' sw/o Sunrise St to 2,600' sw/o Sunrise St			--	48	New	1,000
SR-4	Pipe	700' se/o Laspina St	2,600' sw/o Sunrise St to 3,600' sw/o Laspina St			--	42	New	900
SR-5	Pipe	1,600' sw/o Sunrise St	1,400' se/o Foster Dr to 500' se/o Foster Dr			--	30	New	900
SR-6	Pipe	1,600' sw/o Sunrise St	2,700' se/o Foster Dr to 2,200' se/o Foster Dr			--	24	New	1,200
SR-7	Force Main	w/o Elsinore Street	Force Main from Sunrise Pump Station (SR-PS)			--	21	New	2,200
SR-B	Detention Basin	w/o Elsinore Street	Expand Existing Basin 19			20 acre-ft	55 acre-ft	Expand	--
SR-PS	Pump Station	w/o Elsinore Street	Sunrise Pump Station (Class II discharge from Basin 19)			--	14.0 cfs	New	--
Terrace Park Subbasin									
TP-1	Pipe	Kohn Avenue	Aronian St to Laspina St	X	X	--	21	Replace/New	1,300
TP-2	Pipe	Laspina Street	Kohn Ave to 400' n/o Kohn Ave	X	X	--	15	New	400
TP-3	Pipe	Laspina Street	Kohn Ave to Sonora Ave	X	X	--	15	New	300
TP-4	Force Main	Marvin Avenue	Force Main for Terrace Park Pump Station (TP-PS)	X		--	15	New	200
TP-PS	Pump Station	Marvin Avenue	Terrace Park Pump Station (Class II discharge from Basin 49)	X		--	5.0 cfs	New	--
West No. 1 Subbasin									
W1-1	Pipe	Enterprise Street	Tulare Ave to 1,200' n/o Tulare Ave			--	48	New	1,200
W1-2	Pipe	Enterprise Street	1,200' n/o Tulare Ave to Pleasant Ave			--	42	New	1,500
W1-3	Pipe	Enterprise Street	Pleasant Ave to 1,400' n/o Pleasant Ave			--	36	New	1,400
W1-4	Pipe	Enterprise Street	1,300' s/o Prosperity Ave to 500' s/o Prosperity Ave			--	30	New	800
W1-5	Pipe	1,200' n/o Tulare Ave	Enterprise St to 1,100' e/o Enterpise St			--	30	New	1,100
W1-6	Pipe	1,200' n/o Tulare Ave	1,100' e/o Enterprise St to 2,100' e/o Enterprise St			--	24	New	1,000
W1-7	Force Main	Tulare Avenue	Force Main from West No. 1 Pump Station (W1-PS)			--	15	New	800
W1-B	Detention Basin	Enterprise Street	Proposed West No. 1 Basin			--	30 acre-ft	New	--
W1-PS	Pump Station	Enterprise Street	West No. 1 Pump Station (Class II discharge from West No. 1 Basin)			--	7.5 cfs	New	--
West No. 2 Subbasin									
W2-1	Pipe	1,300' s/o Tulare Ave	1,300' e/o Enterprise St to Enterprise St			--	42	New	1,300
W2-2	Pipe	Enterprise Street	1,300' s/o Tulare Ave to Inyo Ave			--	36	New	1,400
W2-3	Pipe	Enterprise Street	Inyo Ave to 800' s/o Inyo Ave			--	30	New	800
W2-4	Pipe	Enterprise Street	1,300' s/o Tulare Ave to 600' s/o Tulare Ave			--	30	New	700
W2-5	Pipe	1,300' s/o Tulare Ave	1,300' e/o Enterprise St to 2,600' e/o Enterprise St			--	21	New	1,300
W2-6	Force Main	1,300' e/o Enterprise St	Force Main from West No. 2 Pump Station (W2-PS)			--	15	New	1,300
W2-B	Detention Basin	1,300' e/o Enterprise St	Proposed West No. 2 Basin			--	30 acre-ft	New	--
W2-PS	Pump Station	1,300' e/o Enterprise St	West No. 2 Pump Station (Class II discharge from West No. 2 Basin)			--	7.5 cfs	New	--
Westgate Subbasin									
WG-1	Pipe	n/o Inyo Ave	Connection between existing 21" storm drains			--	21	New	380

- **Improvement No. D-2 and D-3**. Replace a 10-inch storm drain on Cleveland Street and a 21-inch storm drain on Sonora Ave with a 30-inch storm drain to convey stormwater southwest to Bardsley Avenue and the proposed Downtown Basin No. 1 (D-B1).
- I**mprovement No. D-6 and D-7**. Replace a 21-inch storm drain on Sacramento Street and Santa Clara Street with a 30-inch storm drain.
- **Downtown Basin No. 2 (D-B2, D-PS2, and D-68)**. Construct a new 55-acre ft detention basin near Sonora Avenue and K Street and a 14-cfs, Class III pump Station that conveys flow through an 24-inch force main to a 36-inch storm drain on K Street following the storm.
- **Improvement No. D-18 and D-1**9. Replace a series of 8-inch and 10-inch storm drains along E Street, F Street, and Alpine Avenue with a 36-inch and 48-inch storm drain to convey excess flows from the 24-inch storm drain on King Avenue to the proposed Downtown Basin No. 2 (D-B2).
- **Improvement No. D-24**. Replace a series of 10-inch through 24-inch storm drains along K Street and L Street with a 48-inch diameter storm drain to convey excess flows from the 24-inch storm drain on King Avenue to the proposed Downtown Basin No. 2 (D-B2).
- **Improvement No. D-27 through D-29**. Abandon existing Pump Station III-2 and redirect flows to the proposed Downtown Basin No. 2 (D-B2) through a 30-inch and 42-inch storm drain. Additionally, replace the 24-inch storm drain on MLK Jr. Avenue with a 42-inch storm drain.
- **Improvement No. D-30**. Replace a 14-inch diameter storm drain Bardsley Avenue from Pump Station III-1 to K Street. This pipeline has been prone to flooding in the past.
- **Improvement No. D-36 and D-40**. Replace 18-inch and 21-inch storm drains on King Avenue with a 36-inch storm drain from L Street to Cherry Street. Flow from this storm drain is split between the new basins on I Street and San Joaquin Avenue or to the proposed Downtown Basin No. 2 (D-B2).
- **Improvement No. D-43 through D-45**. Replace a series of 10-inch storm drains near San Joaquin Avenue and Highway 99 with 18-inch through 24-inch storm drains.
- **Pine Street Storm Drain (D-48 and D-49)**. Abandon Basin No. 53 and Pump Station II-10 and redirect flows to the new basins near I Street and San Joaquin Avenue via the planned 30-inch Pine Street storm drain.
- **Downtown Basin No. 3 (D-B3, D-PS3, D-69)**. Construct a new 45-acre ft detention basin near J Street and Pleasant Avenue and a 12-cfs, Class II pump Station that conveys flow through an 18-inch force main to the Kaweah Ditch following the storm.

- **Improvement No. D-52 through D-54**. Construct a new 42-inch and 48-inch storm drain from Delwood Street to the proposed Downtown Basin No. 3 (D-B3) to relieve potential flooding conditions in the area near Lyndale and Delwood Avenue. This storm drain redirects a portion of flow that would otherwise be conveyed through Pump Station I-6.
- **Improvement No. D-55 and D-57**. To further relieve potential flooding in the vicinity of Lyndale Avenue and Delwood Street, replace a series of 10-inch and 12-inch storm drains on Delwood Street, Cross Street, Highland Street, and Beverly Avenue with 21-inch and 27-inch storm drains.
- **Improvement No. D-60 through D-62**. Construct a series of 21-inch through 36-inch storm drains on Gem Street from Prosperity Avenue to Pleasant Avenue.
- **Downtown Pump Station No. 4 (D-PS4, D-70)**. Construct a new, 8 cfs Class II pump station and 18-inch force main to convey stormwater from existing City Basin No. 16 to the Main Canal.
- **Removal of Storm Drain Connections to Sanitary Sewer (D-26, D-65, D-66)**. Construct 12-inch and 15-inch storm drains to remove storm drain connections to the sanitary sewer.
- **Miscellaneous Small Diameter Replacements (D-4 through D-5, D-8 through D-17, D-20 through D-23, D-25, D-31 through D-35, D-37 through D-39, D-41, D-42, D-46, D-47, D-50, D-51, D-56, D-58, D-59, D-63, D-64**). This master plan also identifies several projects to replace smaller diameter storm drains. These projects are given a lower priority than the major pipeline projects identified above.

- **Industrial Subbasin**
  - **Improvement No. I-1 through I-5, I-B.** Construct a series of 15-inch through 36-inch storm drains and a 6.3 acre-ft retention basin to service a small portion of the Industrial Subbasin. Design of this storm drain network is complete, but has not yet been constructed.

- **Maple Subbasin**
  - **Improvement No. MA-1 through MA-6**. Replace a series of 8-inch through 15-inch storm drains with 15-inch through 21-inch storm drains to alleviate potential flooding within the existing Maple Subbasin.

- **Mountain View Subbasin**
  - **Improvement No. MV-1 through MV-3, MV-B**. Replace a series of 21-inch and 24-inch diameter storm drain on Kern Avenue and Canby Street with 24-inch and 30-inch diameter storm drains. Additionally, it is recommended that a small section of 10-inch storm drain on Sequoia Avenue west of Canby Street be

- **Improvement No. MV-4 and MV-PS**. Abandon existing City Pump Station III-4 and construct a new, 25 cfs, Class II pump station to convey stormwater from existing City Basin No. 34 through a 30-inch diameter force main to the Main Canal. The existing Pump Station III-4 is a known source of flooding issues downstream.

- **Terrace Park Subbasin**
  - **Improvement No. TP-4 and TP-PS**. Construct a new, 7.5 cfs, Class II pump station that conveys flow from existing City Basin No. 49 through a 15-inch force main to the Main Canal for disposal.
  - **Removal of Storm Drain Connections to Sanitary Sewer (TP-1 through TP-3)**. Construct a 15-inch and 21-inch storm drain to remove storm drain connections to the sanitary sewer near Laspina Street and Kohn Avenue.

5.3.2 Future System Improvements

This section identifies the storm drainage infrastructure necessary to service future growth within the UDB. Future system improvements include several new hydrologically distinct subbasins, as well as the expansion of existing subbasins. All future subbasins are assumed to be serviced by a detention basin and Class II pump station, where possible, or a retention basin. In some cases, Class III pump stations are recommended at detention basins that pump after a major storm event. These pump stations are located in areas where there is no feasible TID discharge point in the vicinity. A brief summary of the proposed improvements to service future growth is provided by subbasin below:

- **Academy Subbasin**
  - **Improvement No. A-5 through A-8, A-B, and A-PS**. Construct a new 24-inch storm drain and a small, 3 acre-ft detention basin to convey stormwater runoff from the area south of Pine Street and west of Mooney Boulevard to the existing City Basin No. 22. It is also recommended that a new, 5.5 cfs Class II pump station and an existing 15-inch dry force main be connected to pump stormwater from Basin No. 22 to the Main Canal.

- **Del Lago Subbasin**
  - **Improvement No. DL-1**. Construct a new 18-inch storm drain on Cartmill Avenue to extend service to a small area near the intersection of Blackstone Street and Cartmill Avenue.

- **Enterprise Subbasin**
  - **Improvement No. E-1 through E-11, E-B1, E-B2, and E-PS**. Construct a network of 18-inch through 30-inch diameter storm drains to expand the existing Enterprise Subbasin. Future City Basin No. 39 (15 acre-ft) will be

constructed south of Sonora Avenue near Gemini Street to capture stormwater peaks, while future City Basin No. 40 (20 acre-ft) will be constructed near Enterprise Street south of Alpine Avenue to store and dispose of stormwater runoff following the storm event. A 5.0 cfs, Class II pump station will also be constructed to convey stormwater from Basin No. 40 through a 15-inch diameter force main to the Lemos Ditch.

- **Evergreen Subbasin**
  - **Improvement No. EG-1**. Abandon existing City Basin No. 55 and construct a new, 24-inch diameter storm drain on Saratoga Avenue to convey future stormwater flows to City Basin No. 42.
- **Gail Subbasin**
  - **Improvement No. G-1 through G-15, G-B, and G-PS**. Construct a network of 30-inch through 54-inch diameter storm drains to expand the existing Gail Subbasin. It is also recommended that a new, 50-acre-ft detention basin be constructed to replace the two existing temporary retention basins, and that a 11.5 cfs, Class II pump station be constructed that conveys stormwater flow through a 21-inch force main to Sand Ditch for disposal.
- **The Greens Subbasin**
  - **Improvement No. GR-1 through G-23, GR-B, and GR-PS**. Construct a network of 18-inch through 48-inch diameter storm drains to expand the existing The Greens Subbasin. It is also recommended that the existing Greens Basin be expanded to a capacity of 45-acre-ft. The pump station associated with the detention basin expansion is a 11.5 cfs, Class II pump station that conveys stormwater flow through a 21-inch force main to the Main Canal for disposal.
- **Horizon Subbasin**
  - **Improvement No. H-1 through H-8, and H-PS**. Construct a network of 30-inch through 36-inch diameter storm drains to expand the existing Horizon Subbasin. It is recommended that a new, 30-inch diameter overflow storm drain be constructed to convey peak stormwater flows from the horizon subbasin to the future north 2 subbasin. Additionally, it is recommended that a new, 22 cfs, Class II pump station be constructed that conveys stormwater flows from the Outlet Center Basin through a 27-inch diameter force main to the Liberty Ditch for disposal.
- **Northeast Subbasin**
  - **Improvement No. NE-1 through NE-19, NE-B1, NE-B2, and NE-PS**. Construct a network of 30-inch through 54-inch diameter storm drains to service the area east of Mooney Boulevard and north of Prosperity Avenue. The subbasin will be serviced by a 17-acre-ft detention basin south of Cartmill

Avenue to store peak runoff and a larger, 85-acre-ft detention basin. The pump station associated with the 85-acre-ft detention basin is a 25 cfs, Class II pump station that conveys flow through a 30-inch force main to the Kaweah Ditch for disposal.

- **North 1 Subbasin**
  - **Improvement No. N1-1 through N1-18, N1-B1, N1-B2, and N1-PS**. Construct a network of 30-inch through 48-inch diameter storm drains to service the area north of Cartmill Avenue and east of Blackstone Street. The subbasin will be serviced by a 25-acre-ft detention basin to store peak runoff and a larger, 55-acre-ft detention basin. The pump station associated with the 55-acre-ft detention basin is a 20 cfs, Class II pump station that conveys flow through a 27-inch force main to the Liberty Ditch for disposal.
- **North 2 Subbasin**
  - **Improvement No. N2-1 through N2-14, N2-B, and N2-PS**. Construct a network of 30-inch through 54-inch diameter storm drains to service the area north of Cartmill Avenue, west of Blackstone Street, and east of Highway 99. The subbasin will be serviced by a 100-acre-ft detention basin and a 25 cfs, Class II pump station that conveys flow through a 27-inch force main to the Liberty Ditch for disposal.
- **North Commercial Subbasin**
  - **Improvement No. NC-1 through NC-8, NC-B, NC-B2 and NC-PS**. Construct a network of 30-inch through 54-inch diameter storm drains to service the commercial land use areas between J Street and Highway 99, north of Elster Avenue. The subbasin will be serviced by a 40-acre-ft detention basin and a 16.5 cfs, Class II pump station that conveys flow through a 24-inch force main to the Railroad Ditch for disposal. A portion of stormwater conveyed in this subbasin will also be stored in a 26-ac-ft detention basin as part of the future grade separation by-pass (NC-B2) near Highway 99 and Cartmill Avenue.
- **Northwest Subbasin**
  - **Improvement No. NW-1 through NW-10, NW-B, and NW-PS**. Construct a network of 30-inch through 54-inch diameter storm drains to service the area north of Gail Avenue and west of West Street. The subbasin will be serviced by a 90-acre-ft detention basin and a 28 cfs, Class II pump station that conveys flow through a 30-inch force main to the Cameron Canal for disposal.
- **Palm Ranch Subbasin**
  - **Improvement No. PR-1, PR-2, and PR-PS**. Construct a new 30-inch storm drain south of State Highway 137 to extend service to a small area east of the existing Palm Ranch Subbasin. It is also recommended that a new, 11.5 cfs, Class II pump station be constructed that conveys flows from the existing City

Basin No. 31 through a 21-inch diameter force main to the Main Canal for disposal.

- **Parkwood Meadows No. 1 Subbasin**
  - **Improvement No. PM1-1 and PM1-2**. Construct two short lengths of 15-inch storm drain to extend service to a small residential area east of the existing Parkwood Meadows No. 1 Subbasin.
- **Parkwood Meadows No. 2 Subbasin**
  - **Improvement No. PM2-1 through PM2-7, PM2 -B, and PM2-PS**. Construct a series of 21-inch and 24-inch storm drains to expand the existing Parkwood Meadows No. 2 Subbasin south. As part of this extension, it is recommended that existing City Basin No. 24 be expanded to a capacity of 14-acre-ft and a new, 3.5 cfs, Class II pump station be constructed that convey stormwater through a 12-inch force main to the Town Ditch for disposal.
- **Pleasant Oak Subbasin**
  - **Improvement No. PO-1, PO-2, and PO-B**. Construct a new 12-inch and 21-inch storm drain in the Pleasant Oak Subbasin to extend service to a small existing county island. Due to downstream flow restrictions, it is recommended that a small, 3-acre-ft detention basin be constructed to store peak runoff generated within the county island.
- **Pratt/Bardsley Subbasin**
  - **Improvement No. PB-1 through PB-6, PB-B, and PB-PS.** Construct a series of 24-inch through 42-inch storm drains to provide service to an area west of the Parkwood Meadows Subbasins. The subbasin will be served by a 15-ac-ft detention basin and a 4 cfs, Class II pump station, which will convey stormwater through a 12-inch force main to the railroad ditch for disposal.
- **Southeast Subbasin**
  - **Improvement No. SE-1 through SE-9, SE-20 through SE-22, SE-32, SE-B1, and SE-PS1**. Expand existing City Basin No. 30 to 100-acre-ft to provide a large, regional detention basin and construct a large, 30 cfs, Class II pump station which conveys stormwater flow through a dual 21-inch force main to the Main Canal for disposal. Associated with the expanded regional basin are several large storm drains required to extend to several existing developments.
  - **Improvement No. SE-23 through SE-30, and SE-B3**. Construct a series of 24-inch through 42-inch diameter storm drains to convey stormwater runoff generated within the area north of the existing Windmill Park development. A new, 20-acre-ft detention basin is also required to store peak runoff generated within this area.
  - **College of the Sequoias (SE-10 through SE-19, SE-31, SE-33, SE-B2, SE-B4 and SE-PS2)**. Construct a network of 36-inch through 54-inch diameter

storm drains to service the future College of Sequoias campus. It is recommended that a new, 55-acre-ft detention basin be constructed to service the campus and that a 14 cfs, Class III pump station be constructed to convey stormwater flows from the College of the Sequoias Basin through a 21-inch force main to be disposed of through the regional City Basin No. 30. The pump station should be operated following a major storm event, when there is enough capacity in Basin No. 30 to accommodate the College of Sequoias flow. In addition, it is recommended that a small, 12-ac-ft detention basin be constructed to store peak runoff.

- **Southeast Commercial Subbasin**
  - **Improvement No. SEC-1 through SEC-21, SEC-B1 through SEC-B3, and SEC-PS**. Construct a series of 30-inch through 54-inch storm drains to service a commercial area in the southwest portion of the City. The subbasin will be served by a large, 115-ac-ft detention basin, as well as two smaller 35-ac-ft and 25-ac-ft detention basins to store peak runoff. Stormwater from the 115-ac-ft detention basin will be disposed through a 30 cfs, Class II pump station and dual 21-inch force mains to the Elk Bayou. If permission to discharge to Elk Bayou cannot be obtained, then the subbasin should be serviced by a retention basin.
- **Sunrise Subbasin**
  - **Improvement No. SR-1 through SR-7, SR-B, and SR-PS**. Construct a series of 24-inch through 54-inch storm drains to expand the existing Sunrise Subbasin to service a commercial land use area southwest of the existing Sunrise Subbasin. Associated with these improvements is the expansion of the existing Basin No. 19 to 55-acre-ft and the construction of a new, 14 cfs, Class II pump station that conveys flow through a 21-inch force main to the Main Canal for disposal.
- **West No. 1 Subbasin**
  - **Improvement No. W1-1 through W1-7, W1-B, and W1-PS**. Construct a series of 24-inch through 48-inch storm drains to service the area west of the Pleasant Oak Subbasin, north of Avenue 232, and south of Prosperity Avenue. The subbasin will be served by a 30-acre-ft detention basin and a 7.5 cfs, Class II pump station that conveys flow through a 15-inch force main to the Kaweah Ditch for disposal.
- **West No. 2 Subbasin**
  - **Improvement No. W2-1 through W2-6, W2-B, and W2-PS**. Construct a series of 21-inch through 42-inch storm drains to service the area west of Soults Drive and south of Avenue 232. The subbasin will be served by a 30-acre-ft detention basin and a 7.5 cfs, Class II pump station that conveys flow through a 15-inch force main to the Kaweah Ditch for disposal.

- **Westgate Subbasin**
  - Install a 21-inch storm drain to connect a small portion of the Westgate subbasin to the eastern portion of the subbasin and abandon the existing Westgate retention basin.

5.4 PROJECT PRIORITIZATION

The master plan CIP provides a breakdown of recommended improvement projects by phase. The CIP phases are:

- Phase I: 2009-2011;
- Phase II: 2012-2015;
- Phase III: 2016-2020;
- Phase IV: 2021-2025;
- Phase V: 2026-2030.

Improvement projects to correct existing deficiencies should be implemented by the City as soon as possible. Due to budget and time constraints, however, it may not be feasible for the City to implement all existing system improvement projects within the first or second CIP phase. In order to provide guidance to the City in identifying the most critical improvements, the recommended improvement projects were prioritized based on the severity of the existing or expected deficiency. Projects given highest priority should be implemented as soon as possible, whereas projects given a lower priority can likely be pushed back to later CIP phases.

Improvement projects needed to service future growth will be constructed at the time a specific development comes on line. Therefore, the phasing of future improvements is subject to change dependant upon the rate of growth in the City.

The priorities are described below:

- **Existing Higher Priority** - Major conveyance or storage facilities necessary to mitigate potential flooding conditions in a large tributary area.
- **Existing Lower Priority** - Facilities required to mitigate potential flooding conditions in localized areas. These improvements are not considered major conveyance or storage facilities.
- **Future Development Related** - Storm drainage facilities required to service future growth.

Table 5.2 provides a summary of the proposed improvement by project prioritization.

Table 5.2 Project Prioritization
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Proposed Size/Diam. (in)	Project Prioritzation		
					Existing Lower Priority	Existing Higher Priority	Future Development Related
Academy Subbasin							
A-1	Pipe	Academy Avenue	Mountain View St. to Laspina St.	24		X	
A-2	Pipe	Mountain View Street	Academy Ave. to 200' n/o Highway 137	12		X	
A-3	Pipe	Laspina Street	Academy Ave. to Eastgate Ave.	12		X	
A-4	Pipe	Laspina Street	Academy Ave. to 200' n/o Highway 137	15		X	
A-5	Pipe	Aronian Street	Eastgate Ave. to 800' n/o Eastgate Ave.	24			X
A-6	Pipe	800' n/o Eastgate Ave.	Aronian St. to 800' e/o Aronian St.	24			X
A-7	Pipe	Latimier Street	800' n/o Eastgate Ave. to 1,400' n/o Eastgate Ave.	24			X
A-8	Force Main	Academy Avenue	Basin 22 to Main Canal	8			X
A-B	Detention Basin	Aronian Street	Proposed Academy Basin	3 acre-ft			X
A-PS	Pump Station	Mountain View Street	Academy Pump Station (Class II discharge from Basin 22)	5.5 cfs			X
California Subbasin							
C-1	Pipe	Alcott St/Dickens Ave	100' n/o Dickens Ave to Oaks St	36		X	
C-2	Pipe	Oaks Street	Dickens Ave to 150' s/o Sandra Ave	36		X	
C-3	Pipe	Oaks Street	150' s/o Sandra Ave to Lynn Ave	36		X	
C-4	Pipe	Oaks Street	Lynn Ave to Lois Ave	30		X	
C-5	Pipe	Oaks Street	Lois Ave to Prosperity Ave	24		X	
C-6	Pipe	Gail Avenue	Oaks St to 500' w/o M St	15	X		
C-7	Pipe	Lois Avenue	Oaks St to Williams St	21	X		
C-8	Pipe	Williams Street	Lois Ave to Berkeley Ave	15	X		
Del Lago Subbasin							
DL-1	Pipe	Cartmill Avenue	800' e/o Hillman St to 300' e/o Hillman St	18			X
Downtown Subbasin							
D-1	Pipe	Sacramento Street	Bardsley Ave to Proposed Downtown Basin 1	48		X	
D-2	Pipe	Cleveland St/Howard St	Bardlsey Ave to Sonora Ave	30		X	
D-3	Pipe	Sonora Ave/Pratt St	Howard St to Inyo Ave	30		X	
D-4	Pipe	Inyo Ave/D St	Pratt St to Kern Ave	12		X	
D-5	Pipe	Kern Avenue	Pratt St to D St	15	X		
D-6	Pipe	Sacramento Street	Sonora Ave to Inyo Ave	30		X	
D-7	Pipe	Santa Clara Street	Inyo Ave to Tulare Ave	30		X	
D-8	Pipe	Inyo Avenue	Santa Clara St to Los Angeles St	15	X		
D-9	Pipe	Inyo Avenue	Los Angeles St to e/o West St	12	X		
D-10	Pipe	Kern Avenue	Santa Clara St to e/o West St	12	X		
D-11	Pipe	Kern Avenue	Santa Clara St to California St	15	X		
D-12	Pipe	Kern Avenue	California St to A St	12	X		
D-13	Pipe	Tulare Avenue	Santa Clara St to e/o West St	12	X		
D-14	Pipe	Tulare Avenue	Santa Clara St to California St	15	X		
D-15	Pipe	Tulare Avenue	California St to A St	12	X		
D-16	Pipe	C Street	King Ave to San Jaoquin Ave	12	X		
D-17	Pipe	San Joaquin Avenue	E St to I St	18	X		
D-18	Pipe	Apline Avenue	Proposed Downtown Basin 2 to G St	48		X	
D-19	Pipe	G St/F St	Apline Ave to King Ave	36		X	
D-20	Pipe	I St/Sonora Ave	Proposed Downtown Basin 2 to Owens Ave	15	X		
D-21	Pipe	Kern Avenue	F St to H St	15	X		
D-22	Pipe	H Street	Kern Ave to Tulare Ave	12	X		
D-23	Pipe	G Street	King Ave to Tulare Ave	12	X		
D-24	Pipe	K St/L St	Proposed Downtown Basin 2 to King Avenue	48		X	
D-25	Pipe	Owens Ave/M St	L St to Inyo Ave	15	X		
D-26	Pipe	J St	Owens Ave to Inyo Ave	15	X		
D-27	Pipe	MLK Jr. Avenue	K St to O St (to Abandon PS III-2)	42		X	
D-28	Pipe	Land O Lakes Facility	Sonora Ave to PS III-2 (PS III-2 to be Abandoned, Pipeline Direction Reversed)	30		X	
D-29	Pipe	MLK Jr. Avenue	N St to Blackstone St	42		X	
D-30	Pipe	Bardsley Avenue	K St to PS III-1	24	X		
D-31	Pipe	Cedar Avenue	Q St to O St	15	X		
D-32	Pipe	R Street	Elm Ave to Cedar Ave	15	X		
D-33	Pipe	Cedar Avenue	R St to S St	15	X		
D-34	Pipe	Elm Avenue	Q St to P St	15	X		
D-35	Pipe	Mariposa Avenue	Center St to 300' e/o Center St	12	X		
D-36	Pipe	King Avenue	L St to Cherry St	36		X	
D-37	Pipe	N Street	King Avenue to San Joaquin Ave	15	X		
D-38	Pipe	O St/San Joaquin Ave	King Ave to Gem St	15	X		
D-39	Pipe	Gem Street	San Joaquin Ave to Academy Ave	12	X		
D-40	Pipe	Cherry Street	King Avenue to San Joaquin Ave	30		X	
D-41	Pipe	Sycamore Avenue	Cherry St to Highland St	15	X		
D-42	Pipe	Cherry Street	King Ave to Inyo Ave	15	X		
D-43	Pipe	San Joaquin Ave/Highland St	Cherry St to Apricot Ave	24		X	
D-44	Pipe	Apricot Avenue	Highland St to Blackstone St	21		X	
D-45	Pipe	Blackstone Street	Apricot St to Academy St	18	X		
D-46	Pipe	Cherry Street	San Joaquin Ave to Academy Ave	15	X		
D-47	Pipe	Academy Avenue	Cherry St to 400' e/o Cherry St	12	X		
D-48	Pipe	Pine Street	Basin 53 to J St (Pine Storm Drain and Abandon Basin 53 and PS II-10)	30		X	
D-49	Pipe	Cross Avenue	Auburn St to Basin 53 (Abandon Basin 53 and PS II-10)	27		X	
D-50	Pipe	Cherry Street	n/o Cross Ave to s/o Pleasant Ave	18	X		
D-51	Pipe	Cherry Street	s/o Pleasant Ave to Terrace Ave	15	X		
D-52	Pipe	Pleasant Avenue	Proposed Downtown Basin 3 to M St	48		X	
D-53	Pipe	Pleasant Avenue	M St to Gem St	42		X	
D-54	Pipe	Lyndale Ave/Bash Ave	Delwood St to Pleasant Ave	36		X	
D-55	Pipe	Delwood St/Cross St	Highland St to Bash Ave	27		X	
D-56	Pipe	Cross Avenue	Highland St to Blackstone St	15	X		
D-57	Pipe	Highland St/Beverly Ave	Cross Ave to Bonita St	21	X		
D-58	Pipe	Beverly Avenue	Bonita St to Blackstone St	15	X		
D-59	Pipe	Windsor Avenue	Delwood St to Highland St	12	X		
D-60	Pipe	Gem Street	Pleasant Ave to Merritt Ave	36		X	
D-61	Pipe	Gem Street	Merritt Ave to 800'n.o Merritt Ave	27		X	
D-62	Pipe	Gem Street	800' n/o Merritt Ave to Prosperity Ave	21		X	
D-63	Pipe	Merritt Avenue	Cherry St to 300' e/o Cherry St	18	X		
D-64	Pipe	Estate Avenue	M St to 300' e/o M St	18	X		
D-65	Pipe	I Street	Pleasant Ave to 700' n/o Pleasant Avenue	12	X		
D-66	Pipe	Salida St/Kern Ave	Inyo Ave to Blackstone St	12	X		
D-67	Force Main	Bardsley Avenue	Force Main from Downtown Pump Station 1 (D-PS1)	18		X	
D-68	Force Main	w/o J Street	Force Main from Downtown Pump Station 2 (D-PS2)	24		X	

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Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Proposed Size/Diam. (in)	Project Prioritzation		
					Existing Lower Priority	Existing Higher Priority	Future Development Related
D-69	Force Main	I Street	Force Main from Downtown Pump Station 3 (D-PS3)	21		X	
D-70	Force Main	I Street	Force Main from Downtown Pump Station 4 (D-PS4)	18	X		
D-B1	Detention Basin	Bardsley Avenue	Proposed Downtown Basin 1	35 acre-ft		X	
D-B2	Detention Basin	w/o J Street	Proposed Downtown Basin 2	55 acre-ft		X	
D-B3	Detention Basin	I Street	Proposed Downtown Basin 3	45 acre-ft		X	
D-PS1	Pump Station	Bardsley Avenue	Downtown Pump Station 1 (Class II discharge from Downtown Basin 1)	10.0 cfs		X	
D-PS2	Pump Station	w/o J Street	Downtown Pump Station 2 (Class III discharge from Downtown Basin 2)	14.0 cfs		X	
D-PS3	Pump Station	I Street	Downtown Pump Station 3 (Class II discharge from Downtown Basin 3)	12.0 cfs		X	
D-PS4	Pump Station	I Street	Downtown Pump Station 4 (Class II discharge from Basin 16)	8.0 cfs	X		
Enterprise Subbasin							
E-1	Pipe	700' n/o Bardsley Ave	200' e/o Enterprise St to 1,400' e/o Enterprise St	30			X
E-2	Pipe	Haven Street	700' n/o Bardsley Ave to Sonora St	18			X
E-3	Pipe	700' n/o Bardsley Ave	1,400' e/o Enterprise St to 2,000' e/o Enterprise St	21			X
E-4	Pipe	700' n/o Bardsley Ave	Future City Basin 40 to Bardsley Ave	21			X
E-5	Pipe	n/o Bardsley Avenue	400' w/o Enterprise St to 800' w/o Enterprise St	18			X
E-6	Pipe	Enterprise Street	700' n/o Bardsley Ave to Sonora St	18			X
E-7	Pipe	700' n/o Bardsley Ave	Basin 39 (E-B2) 2,000' e/o Enterprise St.	18			X
E-8	Pipe	Maricopa St	Future City Basin 39 to Santa Barbara St	30			X
E-9	Pipe	2,400' w/o West St	300' s/o Sonora St to 900' s/o Sonora St	30			X
E-10	Pipe	900' s/o Sonora St	2,400' w/o West St to 900' w/o West St	24			X
E-11	Force Main	700' n/o Bardsley Ave	Force Main from Enterprise Pump Station (E-PS)	15			X
E-B1	Detention Basin	700' n/o Bardsley Ave	Future City Basin 40	20 acre-ft			X
E-B2	Detention Basin	300' s/o Sonora St	Future City Basin 39	15 acre-ft			X
E-PS	Pump Station	700' n/o Bardsley Ave	Enterprise Pump Station (Class II discharge from Basin 40)	5.0 cfs			X
Evergreen Subbasin							
EG-1	Pipe	Saratoga Avenue	A St. to E St.	24			X
Gail Subbasin							
G-1	Pipe	Zumwalt Ave	600' e/o Sacramento St to Sacramento St	54			X
G-2	Pipe	Zumwalt Ave	Sacramento St to West St	42			X
G-3	Pipe	West St	Zumwalt Ave to Cartmill Ave	36			X
G-4	Pipe	West St	Cartmill Ave to 1,200' n/o Cartmill Ave	30			X
G-5	Pipe	Sacramento Street	Zumwalt Ave to Elster Ave	48			X
G-6	Pipe	Sacramento Street	Elster Ave to Cartmill Ave	42			X
G-7	Pipe	Cartmill Avenue	Sacramento St to 1,000' e/o Sacramento St	36			X
G-8	Pipe	1,000' e/o Sacramento St	Cartmill Ave to 1,500' n/o Cartmill Ave	30			X
G-9	Pipe	Sacramento Street	Cartmill Ave to 1,400' n/o Cartmill Ave	30			X
G-10	Pipe	E Street	Zumwalt Ave to Elster Ave	30			X
G-11	Pipe	Zumwalt Ave	400' w/o E St to Future City Basin 43 (G-B)	42			X
G-12	Pipe	400' w/o E St	Gail Basin to Zumwalt Ave	30			X
G-13	Pipe	Zumwalt Ave	400' w/o E St to E St	36			X
G-14	Pipe	E Street	Zumwalt Ave to 500' s/o Zumwalt Ave	30			X
G-15	Force Main	Zumwalt Ave	Force Main from Gail Pump Station (G-PS)	21			X
G-B	Detention Basin	Zumwalt Ave	Future City Basin 43	50 acre-ft			X
G-PS	Pump Station	Zumwalt Ave	Gail Pump Station (Class II discharge from Basin 43)	13.0 cfs			X
The Greens Subbasin							
GR-1	Pipe	1,500' w/o Morrision St	The Greens Basin to 2,700' s/o Prosperity Avenue	48			X
GR-2	Pipe	2,700' s/o Prosperity Ave	1,500' w/o Morrison St to Morrison St	42			X
GR-3	Pipe	Morrison Street	2,700' s/o Prosperity Ave to 1,600' s/o Prosperity Ave	36			X
GR-4	Pipe	1,600' s/o Prosperity Ave	Morrison St to 1,400' e/o Morrison St	30			X
GR-5	Pipe	600' e/o Morrison St	1,600' s/o Prosperity Ave to 700' s/o Prosperity Ave	21			X
GR-6	Pipe	1,400' e/o Morrison St	1,600' s/o Prosperity Ave to 700' s/o Prosperity Ave	21			X
GR-7	Pipe	1,500' w/o Morrison St	2,700' s/o Prosperity Ave to 2,300' s/o Prosperity Ave	36			X
GR-8	Pipe	1,500' w/o Morrison St	2,300' s/o Prosperity Ave to 1,400' s/o Prosperity Ave	30			X
GR-9	Pipe	s/o Prosperity-w/o Morrison	w/o Morrison St to s/o Prosperity Ave	24			X
GR-10	Pipe	2,300' s/o Prosperity Ave	600' e/o Mooney Blvd to 1,400' e/o Mooney Blvd	24			X
GR-11	Pipe	2,300' s/o Prosperity Ave	1,500' w/o Morrison St to 700' w/o Morrison St	18			X
GR-12	Pipe	2,700' s/o Prosperity Ave	Morrison St to 700' e/o Morrison St	30			X
GR-13	Pipe	2,700' s/o Prosperity Ave	700 ' e/o Morrison St to 1,400' e/o Morrison St	24			X
GR-14	Pipe	2,200' n/o Tulare Ave	Greens Basin to 1,000' w/o Morrison St	30			X
GR-15	Pipe	1,000' w/o Morrison St	2,200' n/o Tulare Ave to 1,500' n/o Tulare Ave	24			X
GR-16	Pipe	1,000' w/o Morrison St	1,500' n/o Tulare Ave to 400' n/o Tulare Ave	21			X
GR-17	Pipe	400' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St	18			X
GR-18	Pipe	2,200' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St	18			X
GR-19	Pipe	1,500' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St	18			X
GR-20	Pipe	1,700' n/o Tulare Ave	1,400' e/o Mooney Blvd to 600' e/o Mooney Blvd	30			X
GR-21	Pipe	600' e/o Mooney Blvd	1,700' n/o Tulare Ave to 2,200' n/o Tulare Ave	24			X
GR-22	Pipe	600' e/o Mooney Blvd	1,700' n/o Tulare Ave to 800' n/o Tulare Ave	24			X
GR-23	Force Main	2,200' n/o Hwy 137	Force Main from The Greens Pump Station (GR-PS)	21			X
GR-B	Detention Basin	2,200' n/o Hwy 137	Proposed Expansion to the Greens Basin	45 acre-ft			X
GR-PS	Pump Station	2,200' n/o Hwy 137	The Greens Pump Station (Class II discharge fro the Greens Basin)	11.5 cfs			X
Horizon Subbasin							
H-1	Pipe	Gem Street	1,500' s/o Cartmill Ave to 600' s/o Cartmill Ave	36			X
H-2	Pipe	1,900' s/o Cartmill Ave	Gem St to 600' e/o Gem St	36			X
H-3	Pipe	1,900' s/o Cartmill Ave	600' e/o Gem St to 700' w/o Hillman St	30			X
H-4	Pipe	600' s/o Cartmill Ave	Gem St to 600' e/o Gem St	36			X
H-5	Pipe	600' s/o Cartmill Ave	600' e/o Gem St to 700' w/o Hillman St	30			X
H-6	Pipe	600' s/o Cartmill Ave	1,400' w/o Gem St to Gem St	30			X
H-7	Force Main	1,400' s/o Cartmill Ave	Force Main from Outlet Center Pump Station (H-PS)	27			X
H-8	Pipe	Gem Street	Overflow Pipe between Horizon and North 2 Subbasin	30			X
H-PS	Pump Station	1,400' s/o Cartmill Ave	Outlet Center Pump Station (Class II discharge from Outlet Center Basin)	22.0 cfs			X
Industrial Subbasin							
I-1	Pipe	O Street	O Street Basin to O Street	36	X		
I-2	Pipe	O Street	s/o Chestnut Ave to Almond Ave	30	X		
I-3	Pipe	O Street	Almond Ave to Walnut Ave	24	X		
I-4	Pipe	O Street	s/o Chestnut Ave to n/o Levin Ave	24	X		
I-5	Pipe	O Street	n/o Levin Ave to Levin Ave	15	X		
I-B	Detention Basin	O Street	Future O Street Basin	6.3 acre-ft	X		
Maple Subbasin							
MA-1	Pipe	Maple Avenue	E St to G St	21	X		
MA-2	Pipe	G Street	Maple Ave to Beaumont Ave	18	X		
MA-3	Pipe	Beaumont Avenue	G St to H St	18	X		

Table 5.2 Project Prioritization
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Proposed Size/Diam. (in)	Project Prioritzation		
					Existing Lower Priority	Existing Higher Priority	Future Development Related
MA-4	Pipe	Beaumont Avenue	H St to I St	15		X	
MA-5	Pipe	G Street	Pleasant Ave to Oakland Ave	15		X	
MA-6	Pipe	Oakland Avenue	G St to H St	15		X	
Mountain View Subbasin							
MV-1	Pipe	Kern Avenue	Basin 17 to Forrest St	30		X	
MV-2	Pipe	Kern Avenue	Sruce St to Canby St	24		X	
MV-3	Pipe	Canby Street	Kern Ave to Sequoia St	24		X	
MV-4	Force Main	Live Oak Park	Force Main from Live Oak Pump Station (MV-PS)	30	X		
MV-B	Retention Basin	Kern Avenue	Basin 17 Expansion	15 acre-ft	X		
MV-PS	Pump Station	Live Oak Park	Live Oak Pump Station (Class II discharge from Basin 34 & Abandon PS III-4)	25.0 cfs	X		
Northeast Subbasin							
NE-1	Pipe	1,100' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 1,900' s/o Cartmill Ave	54			X
NE-2	Pipe	1,900' s/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd	48			X
NE-3	Pipe	2,300' e/o Mooney Blvd	1,900' s/o Cartmill Ave to 700' s/o Cartmill Ave	42			X
NE-4	Pipe	2,300' e/o Mooney Blvd	700' s/o Cartmill Ave to 600' n/o Cartmill Ave	42			X
NE-5	Pipe	2,300' e/o Mooney Blvd	600' n/o Cartmill Ave to 2,000' n/o Cartmill Ave	42			X
NE-6	Pipe	2,600' s/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd	48			X
NE-7	Pipe	2,300' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 3,300' s/o Cartmill Ave	42			X
NE-8	Pipe	2,300' e/o Mooney Blvd	3,300' s/o Cartmill Ave to 700' n/o Prosperity Ave	36			X
NE-9	Pipe	3,300' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St	30			X
NE-10	Pipe	1,100' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 3,300' s/o Cartmill Ave	42			X
NE-11	Pipe	1,100' e/o Mooney Blvd	3,300' s/o Cartmill Ave to 700' n/o Prosperity Ave	36			X
NE-12	Pipe	1,100' e/o Mooney Blvd	1,900' s/o Cartmill Ave to 700' s/o Cartmill Ave	36			X
NE-13	Pipe	1,900' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St	36			X
NE-14	Pipe	700' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St	36			X
NE-15	Pipe	600' n/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St	36			X
NE-16	Pipe	2,000' n/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St	36			X
NE-17	Pipe	600' n/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd	36			X
NE-18	Pipe	2,000' n/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd	36			X
NE-19	Force Main	2,600' n/o Prosperity Ave	Force Main from Northeast Pump Station (NE-PS)	30			X
NE-B1	Detention Basin	2,600' n/o Prosperity Ave	Proposed Northeast 1 Basin	85 acre-ft			X
NE-B2	Detention Basin	600' n/o Cartmill Ave	Proposed Northeast 2 Basin	17 acre-ft			X
NE-PS	Pump Station	2,600' n/o Prosperity Ave	Northeast Pump Station (Class II discharge from Northeast 1 Basin)	25.0 cfs			X
North 1 Subbasin							
N1-1	Pipe	2,000' e/o Hillman St	North 1 Basin 1 to 600' s/o Ave 252	48			X
N1-2	Pipe	600' s/o Ave 252	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd	42			X
N1-3	Pipe	2,000' w/o Mooney Blvd	600' s/o Ave 252 to 700' n/o Cartmill Ave	36			X
N1-4	Pipe	700' n/o Cartmill Ave	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd	36			X
N1-5	Pipe	600' s/o Ave 252	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd	30			X
N1-6	Pipe	600' s/o Ave 252	700' e/o Hillman St to	30			X
N1-7	Pipe	1,300' n/o Cartmill Ave	700' e/o Hillman St to 2,000' e/o Hillman St	30			X
N1-8	Pipe	2,000' w/o Mooney Blvd	600' s/o Ave 252 to 650' n/o Ave 252	42			X
N1-9	Pipe	2,000' w/o Mooney Blvd	650' n/o Ave 252 to 650' s/o Oakdale Ave	36			X
N1-10	Pipe	650' s/o Oakdale Ave	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd	36			X
N1-11	Pipe	650' s/o Oakdale Ave	700' w/o Mooney Blvd to 600' e/o Mooney Blvd	30			X
N1-12	Pipe	650' n/o Ave 252	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd	36			X
N1-13	Pipe	650' n/o Ave 252	700' w/o Mooney Blvd to 600' e/o Mooney Blvd	30			X
N1-14	Pipe	650' n/o Ave 252	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd	42			X
N1-15	Pipe	650' n/o Ave 252	700' e/o Hillman St to 2,000' e/o Hillman St	36			X
N1-16	Pipe	700' e/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave	30			X
N1-17	Pipe	650' s/o Oakdale Ave	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd	36			X
N1-18	Force Main	1,300' n/o Cartmill Ave	Force Main from North 1 Pump Station (N1-PS)	27			X
N1-B1	Detention Basin	1,300' n/o Cartmill Ave	Proposed North 1 Basin 1	55 acre-ft			X
N1-B2	Detention Basin	650' n/o Ave 252	Proposed North 1 Basin 2	25 acre-ft			X
N1-PS	Pump Station	1,300' n/o Cartmill Ave	North 1 Pump Station (Class II discharge from North 1 Basin 1)	20.0 cfs			X
North 2 Subbasin							
N2-1	Pipe	2,000' w/o Hillman St	650' n/o Cartmill Ave to 650' s/o Ave 252	54			X
N2-2	Pipe	650' s/o Ave 252	2,000' w/o Hillman St to 3,300' w/o Hillman St	48			X
N2-3	Pipe	650' s/o Ave 252	3,300' w/o Hillman St to 4,600' w/o Hillman St	42			X
N2-4	Pipe	2,000' w/o Hillman St	650' s/o Ave 252 to 650' n/o Ave 252	48			X
N2-5	Pipe	650' n/o Ave 252	2,000' w/o Hillman St to 3,300' w/o Hillman St	36			X
N2-6	Pipe	3,300' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave	30			X
N2-7	Pipe	2,000' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave	30			X
N2-8	Pipe	650' s/o Ave 252	2,000' w/o Hillman St to 650' w/o Hillman St	42			X
N2-9	Pipe	650' w/o Hillman St	650' s/o Ave 252 to 650' n/o Ave 252	36			X
N2-10	Pipe	650' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave	30			X
N2-11	Pipe	650' n/o Cartmill Ave	2,000' w/o Hillman St to 3,300' w/o Hillman St	48			X
N2-12	Pipe	650' n/o Cartmill Ave	3,300' w/o Hillman St to 4,100' w/o Hillman St	42			X
N2-13	Pipe	650' n/o Cartmill Ave	2,000' w/o Hillman St to 650' w/o Hillman St	36			X
N2-14	Force Main	2,000' w/o Hillman St	Force Main from North 2 Pump Station (N2-PS)	27			X
N2-B	Detention Basin	2,000' w/o Hillman St	Proposed North 2 Basin	100 acre-ft			X
N2-PS	Pump Station	2,000' w/o Hillman St	North 2 Pump Station (Class II discharge from North 2 Basin)	25.0 cfs			X
North Commercial Subbasin							
NC-1	Pipe	1,100' n/o Cartmill Ave	300' e/o J St to 900' e/o J St	54			X
NC-2	Pipe	e/o J St	Cartmill Ave to n/o Cartmill Ave	48			X
NC-3	Pipe	800' e/o J St	Cartmill Ave to s/o Cartmill Ave	42			X
NC-4	Pipe	1,100' n/o Cartmill Ave	800' e/o J St to Oaks St	30			X
NC-5	Pipe	900' e/o J St	1,100' n/o Cartmill Ave to 2,500' n/o Cartmill Ave	48			X
NC-6	Pipe	2,500' n/o Cartmill Ave	1,100' e/o J St to 600' e/o J St	42			X
NC-7	Pipe	600' e/o J St	2,600' s/o Oakdale Ave to 900' s/o Oakdale Ave	36			X
NC-8	Force Main	1,100' n/o Cartmill Ave	Force Main from North Pump Commercial Station (NC-PS)	24			X
NC-B	Detention Basin	1,100' n/o Cartmill Ave	Proposed North Commercial Basin	40 acre-ft			X
NC-B2	Detention Basin	Highway 99	Grade separation pond	26 acre-ft			X
NC-PS	Pump Station	1,100' n/o Cartmill Ave	North Commercial PS (Class II discharge from North Commerc. Basin)	16.5 cfs			X
Northwest Subbasin							
NW-1	Pipe	Gail Street	Northwest Basin to 1,300' w/o West St	54			X
NW-2	Pipe	Gail Street	Northwest Basin to 1,300' e/o Enterprise St	54			X
NW-3	Pipe	1,300' e/o Enterprise St	Gail St to Zumwalt Ave	42			X
NW-4	Pipe	1,300' e/o Enterprise St	Zumwalt Ave to 1,300' n/o Zumwalt Ave	36			X
NW-5	Pipe	Enterprise Street	Gail St to Zumwalt Ave	48			X
NW-6	Pipe	Enterprise Street	Zumwalt Ave to 1,300' n/o Zumwalt Ave	42			X

Table 5.2 Project Prioritization
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Proposed Size/Diam. (in)	Project Prioritzation		
					Existing Lower Priority	Existing Higher Priority	Future Development Related
NW-7	Pipe	1,300' w/o West St	Gail St to Zumwalt Ave	48			X
NW-8	Pipe	1,300' w/o West St	Zumwalt Ave to 1,300' n/o Zumwalt Ave	42			X
NW-9	Pipe	Zumwalt Avenue	1,300' e/o Enterprise St to 2,600' e/o Enterprise St	30			X
NW-10	Force Main	Gail Street	Force Main from Northwest Pump Station (NW-PS)	30			X
NW-B	Detention Basin	Gail Street	Proposed Northwest Basin	90 acre-ft			X
NW-PS	Pump Station	Gail Street	Northwest Pump Station (Class II discharge from Northwest Basin)	28.0 cfs			X
Palm Ranch Subbasin							
PR-1	Pipe	s/o State Highway 137	1,500' w/o Oakmore St to Oakmore St	30			X
PR-2	Force Main	s/o Alpine Avenue	Palm Ranch Pump Station Force Main (PR-PS)	21			X
PR-PS	Pump Station	s/o Alpine Avenue	Palm Ranch Pump Station (Class II discharge from existing Basin 31)	11.5 cfs			X
Parkwood Meadows No. 1 Subbasin							
PM1-1	Pipe	Oakwood St Extension	Vetter St to 300' e/o Vetter St	15			X
PM1-2	Pipe	Old Town St Extension	Vetter St to 300' e/o Vetter St	15			X
Parkwood Meadows No. 2 Subbasin							
PM2-1	Pipe	E Street	Basin 24 to Lemonwood Ave	24			X
PM2-2	Pipe	Lemonwood Avenue	E St to 200' w/o Applewood St	21			X
PM2-3	Pipe	200' w/o Applewood St	Lemonwood St to 800' s/o Lemonwood St	21			X
PM2-4	Pipe	Peachwood Avenue	Basin 24 to 600' e/o E St	24			X
PM2-5	Pipe	600' e/o E St	Peachwood Ave to 650' n/o Paige Ave	21			X
PM2-6	Pipe	600' e/o E St	Peachwood Ave to 400' n/o Peachwood Ave	21			X
PM2-7	Force Main	E Street	Force Main from Parkwood Meadows 2 Pump Station (PM2-PS)	12			X
PM2-B	Detention Basin	E Street	Proposed Basin 24 Expansion	14 acre-ft			X
PM2-PS	Pump Station	E Street	Parkwood Meadows 2 Pump Station (Class II discharge from Basin 24)	3.5 cfs			X
Pleasant Oak Subbasin							
PO-1	Pipe	Pleasant Avenue	Denair St to 700' e/o Denair St	12			X
PO-2	Pipe	w/o West Street	Pleasant Ave to 500' n/o Pleasant Ave	21			X
PO-B	Detention Basin	Pleasant Avenue	Pleasant Oak Basin	3 acre-ft			X
Pratt/Bardsley Subbasin							
PB-1	Pipe	200' n/o Dogwood Ave	600' e/o Pratt St to 1,100' e/o Pratt St	42			X
PB-2	Pipe	600' e/o Pratt St	200' n/o Dogwood Ave to 1,500' n/o Dogwood Avenue	36			X
PB-3	Pipe	600' e/o Pratt St	1,500' n/o Dogwood Avenue to 600' s/o Bardsley Ave	30			X
PB-4	Pipe	600' s/o Bardsley Ave	600' e/o Pratt St to 700' w/o Pratt St	24			X
PB-5	Pipe	300' e/o Pratt St	600' s/o Dogwood Ave to 1,500' n/o Dogwood Ave	24			X
PB-6	Force Main	200' n/o Dogwood Ave	Force Main from West/Paige Pump Station (WP-PS)	12			X
PB-B	Detention Basin	200' n/o Dogwood Ave	Proposed West/Paige Basin	15 acre-ft			X
PB-PS	Pump Station	200' n/o Dogwood Ave	West/Paige Pump Station (Class II discharge from West/Paige Basin)	4.0 cfs			X
Southeast Subbasin							
SE-1	Pipe	Levin Avenue	Basin 30 to 700' w/o Basin 30	36			X
SE-2	Pipe	Nelder Grove Street	Levin Ave to Azalea Ave	36			X
SE-3	Pipe	Levin Avenue	900' e/o Mooney Blvd to Mooney Blvd	24			X
SE-4	Pipe	Morrison Street	Basin 30 to 1,000' s/o Levin Ave	54			X
SE-5	Pipe	Foster Dr Extension	Dover Canyon St to Morrison St	48			X
SE-6	Pipe	Morrison Street	1,000' s/o Levin Ave to 3,200' s/o Levin Ave	54			X
SE-7	Pipe	Morrison Street	3,200' s/o Levin Ave to 4,300' s/o Levin Ave	48			X
SE-8	Pipe	Morrison Street	4,300' s/o Levin Ave to 4,900' s/o Levin Ave	42			X
SE-9	Pipe	1,200 s/o Levin Ave	Morrison St to 2,200' e/o Morrison St	36			X
SE-10	Pipe	1,200 s/o Levin Ave	2,200' e/o Morrison St to the College of the Sequoias PS (SE-PS2)	30			X
SE-11	Pipe	3,900' e/o Morrison St	College of the Sequoias Basin to 1,200' s/o Levin Ave	54			X
SE-12	Pipe	3,900' e/o Morrison St	1,200' s/o Levin Ave to Levin Ave Extension	54			X
SE-13	Pipe	3,900' e/o Morrison St	Levin Ave Extension to 1,200' n/o Levin Ave Extension	48			X
SE-14	Pipe	1,200 s/o Levin Ave	3,900' e/o Morrison St to 2,700' w/o Road 132	42			X
SE-15	Pipe	1,200 s/o Levin Ave	2,700' w/o Road 132 to 1,400' w/o Road 132	36			X
SE-16	Pipe	Levin Avenue Extension	3,900' e/o Morrison St to 2,700' w/o Road 132	42			X
SE-17	Pipe	Levin Avenue Extension	2,700' w/o Road 132 to 1,400' w/o Road 132	36			X
SE-18	Pipe	1,200' n/o Levin Ave Ext	3,900' e/o Morrison St to 2,700' w/o Road 132	48			X
SE-19	Pipe	1,200' n/o Levin Ave Ext	2,700' w/o Road 132 to 1,400' w/o Road 132	42			X
SE-20	Pipe	3,200' s/o Levin Ave	Morrison St to 1,100' e/o Morrison St	42			X
SE-21	Pipe	1,100' e/o Morrison St	3,200' s/o Levin Ave to 4,300' s/o Levin Ave	36			X
SE-22	Pipe	4,300' s/o Levin Ave	Morrison St to 900' w/o Morrison St	42			X
SE-23	Pipe	Bardsley Avenue	Morrison St to 1,000' e/o Morrison St	24			X
SE-24	Pipe	Bardsley Avenue	1,000' e/o Morrison St to Oakmore St	42			X
SE-25	Pipe	Bardsley Avenue	Oakmore St to 1,300' e/o Oakmore St	36			X
SE-26	Pipe	Bardsley Avenue	1,300' e/o Oakmore St to 2,600' e/o Oakmore St	30			X
SE-27	Pipe	Morrison Street	Bardsley Ave to 1,000' n/o Bardsley Ave	24			X
SE-28	Pipe	1,000' e/o Morrison St	Bardsley Ave to 1,100' n/o Bardsley Ave	24			X
SE-29	Pipe	Oakmore Street	Bardsley Ave to 1,100' n/o Bardsley Ave	36			X
SE-30	Pipe	Oakmore Street	1,100' n/o Bardsley Ave to 3,100' n/o Bardsley Ave	30			X
SE-31	Pipe	1,400' w/o Road 132	1,200' n/o Levin Ave Ext to Bardsley Ave	36			X
SE-32A	Force Main	Levin Avenue	Dual Force Main for Southeast Pump Station (SE-PS1)	21			X
SE-32B	Force Main	Levin Avenue	Dual Force Main for Southeast Pump Station (SE-PS1)	21			X
SE-33	Force Main	1,200' s/o Levin Ave	Force Main for College of the Sequoias Pump Station (SE-PS2)	21			X
SE-B1	Detention Basin	Levin Avenue	Proposed Expansion of Basin 30	100 acre-ft			X
SE-B2	Detention Basin	1,200' s/o Levin Ave	Proposed College of the Sequoias Basin 1	55 acre-ft			X
SE-B3	Detention Basin	Bardsley Avenue	Proposed Southeast Basin	20 acre-ft			X
SE-B4	Detention Basin	1,200' n/o Levin Ave Ext	Proposed College of the Sequoias Basin 2	12 acre-ft			X
SE-PS1	Pump Station	Levin Avenue	Southeast Pump Station (Class II discharge from Basin 30)	30.0 cfs			X
SE-PS2	Pump Station	1,200' s/o Levin Ave	College of the Sequoias Pump Station (Class III, pumps following storm)	14.0 cfs			X
Southeast Commercial Subbasin							
SEC-1	Pipe	500' n/o Elk Bayou	SEC-B1 to 4,600' w/o Road 124	54			X
SEC-2	Pipe	4,600' w/o Road 124	500' n/o Elk Bayou to 1,900' n/o Elk Bayou	48			X
SEC-3	Pipe	4,600' w/o Road 124	1,900' n/o Elk Bayou to 4,100' n/o Elk Bayou	42			X
SEC-4	Pipe	3,400' n/o Hosfield	4,600' w/o Road 124 to 5,900' w/o Road 124	42			X
SEC-5	Pipe	3,400' ne/o Laspina St	2,600' nw/o Elk Bayou to 3,700' nw/o Elk Bayou	36			X
SEC-6	Pipe	4,600' n/o Hosfield	4,600' w/o Road 124 to 5,900' w/o Road 124	30			X
SEC-7	Pipe	5,900' se/o Foster Dr	3,100' sw/o Road 124 to 1,900' sw/o Road 124	54			X
SEC-8	Pipe	5,900' se/o Foster Dr	1,900' sw/o Road 124 to 700' sw/o Road 124	48			X
SEC-9	Pipe	700' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr	42			X
SEC-10	Pipe	700' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr	36			X
SEC-11	Pipe	3,100' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr	42			X
SEC-12	Pipe	3,100' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr	36			X
SEC-13	Pipe	1,900' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr	42			X

Table 5.2 Project Prioritization
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Proposed Size/Diam. (in)	Project Prioritzation		
					Existing Lower Priority	Existing Higher Priority	Future Development Related
SEC-14	Pipe	1,900' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr	36			X
SEC-15	Pipe	6,100' w/o Road 124	700' n/o Hosfield to 2,000' n/o Hosfield	30			X
SEC-16	Pipe	500' n/o Elk Bayou	4,600' w/o Road 124 to 3,400' w/o Road 124	36			X
SEC-17	Pipe	500' n/o Elk Bayou	3,400' w/o Road 124 to 2,100' w/o Road 124	30			X
SEC-18	Pipe	3,400' w/o Road 124	500' n/o Elk Bayou to 1,800' n/o Elk Bayou	30			X
SEC-19	Pipe	n/o Elk Bayou-w/o Road 124	SEC-B3 to 5,300' n/o Hosfield	36			X
SEC-20	Pipe	2,100' w/o Road 124	SEC-B3 to 6,200' n/o Hosfield	36			X
SEC-21A	Force Main	n/o Hosfield	Dual Force Main for Southeast Commercial Pump Station (SEC-PS)	21			X
SEC-21B	Force Main	n/o Hosfield	Dual Force Main for Southeast Commercial Pump Station (SEC-PS)	21			X
SEC-B1	Detention Basin	n/o Hosfield	Proposed Southeast Commercial Basin 1	115 acre-ft			X
SEC-B2	Detention Basin	5,900' se/o Foster Dr	Proposed Southeast Commercial Basin 2	35 acre-ft			X
SEC-B3	Detention Basin	2,200' w/o Road 124	Proposed Southeast Commercial Basin 3	25 acre-ft			X
SEC-PS	Pump Station	n/o Hosfield	Southeast Commercial PS (Class II discharge from SE Commercial Basin 1)	30.0 cfs			X
Sunrise Subbasin							
SR-1	Pipe	1,200' se/o Foster Dr	1,600' sw/o Sunrise St to Basin 19	54			X
SR-2	Pipe	1,600' sw/o Sunrise St	1,200' se/o Foster Dr to 2,000' se/o Foster Dr	54			X
SR-3	Pipe	1,100' se/o Laspina St	1,600' sw/o Sunrise St to 2,600' sw/o Sunrise St	48			X
SR-4	Pipe	700' se/o Laspina St	2,600' sw/o Sunrise St to 3,600' sw/o Laspina St	42			X
SR-5	Pipe	1,600' sw/o Sunrise St	1,400' se/o Foster Dr to 500' se/o Foster Dr	30			X
SR-6	Pipe	1,600' sw/o Sunrise St	2,700' se/o Foster Dr to 2,200' se/o Foster Dr	24			X
SR-7	Force Main	w/o Elsinore Street	Force Main from Sunrise Pump Station (SR-PS)	21			X
SR-B	Detention Basin	w/o Elsinore Street	Expand Existing Basin 19	55 acre-ft			X
SR-PS	Pump Station	w/o Elsinore Street	Sunrise Pump Station (Class II discharge from Basin 19)	14.0 cfs			X
Terrace Park Subbasin							
TP-1	Pipe	Kohn Avenue	Aronian St to Laspina St	21		X	
TP-2	Pipe	Laspina Street	Kohn Ave to 400' n/o Kohn Ave	15		X	
TP-3	Pipe	Laspina Street	Kohn Ave to Sonora Ave	15		X	
TP-4	Force Main	Marvin Avenue	Force Main for Terrace Park Pump Station (TP-PS)	15	X		
TP-PS	Pump Station	Marvin Avenue	Terrace Park Pump Station (Class II discharge from Basin 49)	5.0 cfs	X		
West No. 1 Subbasin							
W1-1	Pipe	Enterprise Street	Tulare Ave to 1,200' n/o Tulare Ave	48			X
W1-2	Pipe	Enterprise Street	1,200' n/o Tulare Ave to Pleasant Ave	42			X
W1-3	Pipe	Enterprise Street	Pleasant Ave to 1,400' n/o Pleasant Ave	36			X
W1-4	Pipe	Enterprise Street	1,300' s/o Prosperity Ave to 500' s/o Prosperity Ave	30			X
W1-5	Pipe	1,200' n/o Tulare Ave	Enterprise St to 1,100' e/o Enterpise St	30			X
W1-6	Pipe	1,200' n/o Tulare Ave	1,100' e/o Enterprise St to 2,100' e/o Enterprise St	24			X
W1-7	Force Main	Tulare Avenue	Force Main from West No. 1 Pump Station (W1-PS)	15			X
W1-B	Detention Basin	Enterprise Street	Proposed West No. 1 Basin	30 acre-ft			X
W1-PS	Pump Station	Enterprise Street	West No. 1 Pump Station (Class II discharge from West No. 1 Basin)	7.5 cfs			X
West No. 2 Subbasin							
W2-1	Pipe	1,300' s/o Tulare Ave	1,300' e/o Enterprise St to Enterprise St	42			X
W2-2	Pipe	Enterprise Street	1,300' s/o Tulare Ave to Inyo Ave	36			X
W2-3	Pipe	Enterprise Street	Inyo Ave to 800' s/o Inyo Ave	30			X
W2-4	Pipe	Enterprise Street	1,300' s/o Tulare Ave to 600' s/o Tulare Ave	30			X
W2-5	Pipe	1,300' s/o Tulare Ave	1,300' e/o Enterprise St to 2,600' e/o Enterprise St	21			X
W2-6	Force Main	1,300' e/o Enterprise St	Force Main from West No. 2 Pump Station (W2-PS)	15			X
W2-B	Detention Basin	1,300' e/o Enterprise St	Proposed West No. 2 Basin	30 acre-ft			X
W2-PS	Pump Station	1,300' e/o Enterprise St	West No. 2 Pump Station (Class II discharge from West No. 2 Basin)	7.5 cfs			X
Westgate Subbasin							
WG-1	Pipe	n/o Inyo Ave	Connection between existing 21" storm drains	21.0 cfs			X

5.4.1 Highest Priority Improvements

Of the higher priority improvements to the existing system, certain projects were identified as the most crucial to mitigate existing deficiencies. These projects are required to mitigate potential flooding in the Downtown Subbasin, which was found to be the most severely deficient subbasin in the City. Two major groups of projects were identified. These include the facilities necessary to convey stormwater runoff to the proposed Downtown Basin No. 1 (D-B1) and Downtown Basin No. 2 (D-B2):

- **Downtown Basin No. 1 (D-1 through D-3, D-67, D-B1, and D-PS1)**. This group of improvements is required to provide storage capacity to the southwestern portion of the Downtown Subbasin. Improvements D-2 and D-3 provide a means of conveying stormwater runoff from certain areas of the Downtown Subbasin to the proposed Downtown Basin No. 1 (D-B1).
- **Downtown Basin No. 2 (D-18 through D-19, D-24, D-36, D-68, D-B2, and D-PS2)**. These improvements are the most critical improvements to provide needed storage capacity to the central portion of the Downtown Subbasin. Improvements D-19. D-24, and D-36 are the most critical pipelines associated with the Downtown Basin No. 2 (D-B2) and will convey peak runoff to it.
- **Removal of Storm Drain Connections to Sanitary Sewer (A-1 through A-4, D-26, D-65, D-66, TP-1 through TP-3)**. In recent years, the City has implemented several improvement projects to remove storm drain connections to the sanitary sewer collection system. There are still several areas in the City where direct connections to the sewer still exist. Projects to remove these connections should be given high priority, because these areas pose a risk for sanitary sewer overflows.

The construction of the two aforementioned detention basins and associated piping should provide the most relief to the City against flooding during a major storm. For this reason, these projects should be given the highest priority of the proposed improvement projects.

5.5 TID COORDINATION

As mentioned in this report, the City's storm drainage system is dependant on TID canals for discharge of storm water after it has been collected in the City's storm drainage system. Therefore, it is imperative that the City and TID coordinate in order for the systems to work well together. To achieve this objective, TID Staff has been involved in all phases of this master plan.

There are two areas where coordination between the City and TID can improve the maintenance and operation of the storm drain system. The first is managing nuisance water discharge to TID facilities during periods of the year when TID performs maintenance of its canals. Nuisance water is typically caused from landscape over watering and other non-

storm based runoff. The second would be better coordination between the City and TID during March and April when TID is conducting their pre-irrigation deliveries.

5.5.1 Maintenance Periods

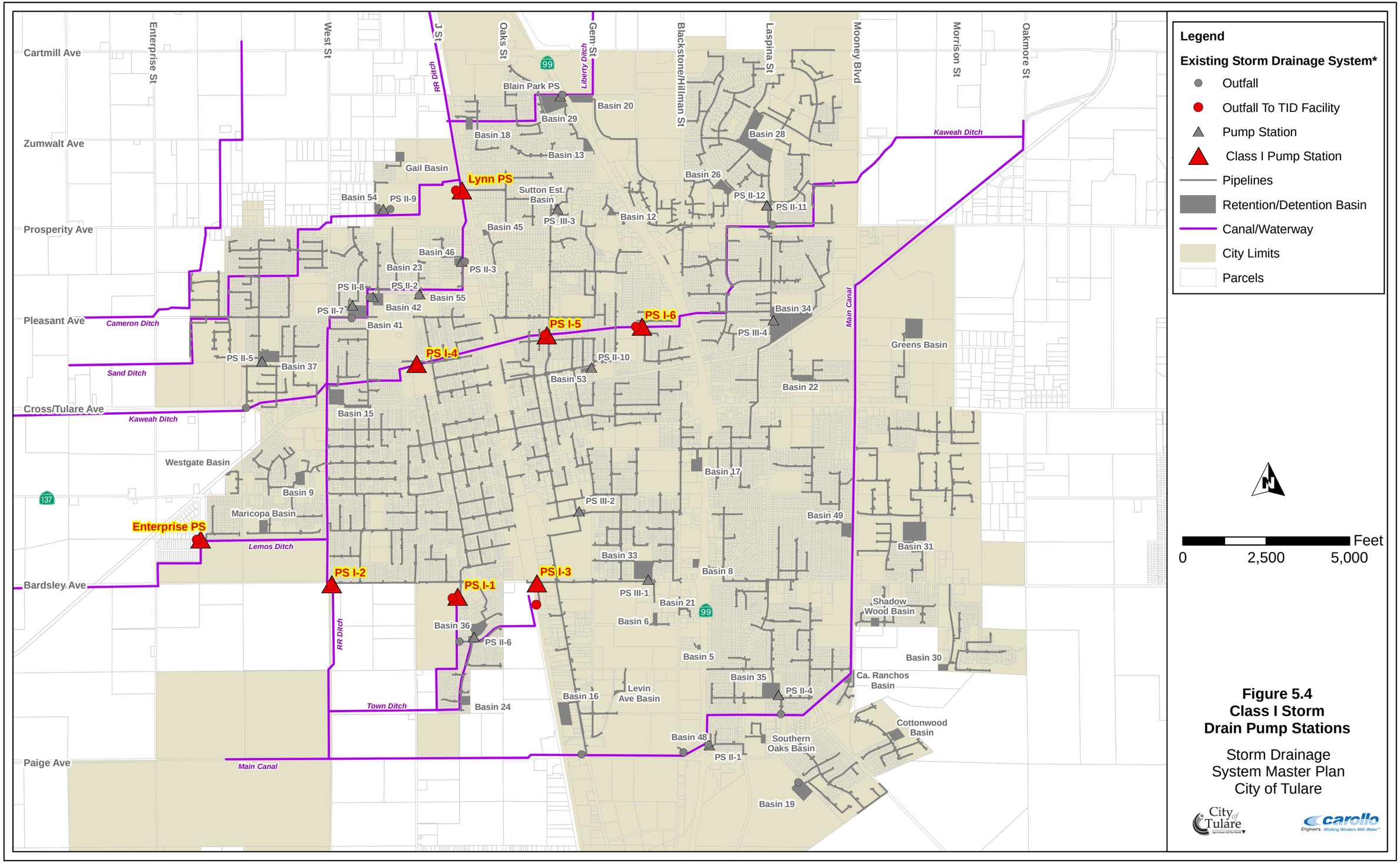
As mentioned earlier in this report, the City has three classes of storm drain pump stations. Class I pumps automatically discharge to TID facilities, Class II require TID approval before discharge, and Class III have no direct discharge to TID facilities. The City currently has eight Class I pump stations (Figure 5.4), which are the focus of this section.

TID typically performs maintenance on their facilities between September and mid December each year. The Class I pump stations discharge nuisance water into the canals during the maintenance period and hinder TID staff from conducting work. In order for TID to perform maintenance projects more efficiently, the Class I pump stations should be controlled to limit the discharge of nuisance water during September to mid December.

Based on discussion with TID staff, the City and TID should coordinate so that during TID maintenance, the Class I pump stations are controlled to limit nuisance water discharge. One possible way to facilitate this would be to allow the wet wells to fill to a higher level before discharging and coordinate with TID on the appropriate time to discharge the collected nuisance water. This would essentially make these Class I pump stations Class II pump stations for a portion of the year. Once the TID maintenance period is over the pump stations would revert back to Class I status.

5.5.2 March April Pre-Irrigation Water Delivery

TID typically performs a pre-irrigation run in March or April. During the pre-irrigation run, capacity in TID facilities for storm water would be occupied. Based on discussions with TID staff, it was suggested that the City and TID work together to develop a binding document that specifies how the pre-irrigation water delivery should be coordinated with the City's storm drainage needs as specified in the agreement between TID and the City.



Legend

Existing Storm Drainage System*

- Outfall
- Outfall To TID Facility
- Pump Station
- Class I Pump Station
- Pipelines
- Retention/Detention Basin
- Canal/Waterway
- City Limits
- Parcels

N

0 2,500 5,000 Feet

Figure 5.4
Class I Storm Drain Pump Stations

Storm Drainage System Master Plan
City of Tulare

City of Tulare
carollo Engineers...Working Wonders With Water™

*As of January 2009

CAPITAL IMPROVEMENT PROGRAM

This chapter presents the proposed Capital Improvement Program (CIP) for the City of Tulare (City) storm drainage system. The program is based on the evaluation of the City's storm drainage system, and on the recommended projects described in the previous chapters. The CIP has been prepared to assist the City in planning and constructing the sewer system improvements through the planning horizon year of 2030.

6.1 COST ESTIMATING ACCURACY

The cost estimates presented in the CIP have been prepared for general master planning purposes and for guidance in project evaluation and implementation. Final costs of a project will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule, and other variable factors such as: preliminary alignments, investigation of alternative routings, and detailed utility and topography surveys.

The Association for the Advancement of Cost Engineering (AACE) defines three types of cost estimates:

- **An Order of Magnitude Estimate for Master Plan Studies**. This is an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within +50 percent to -30 percent.
- **A Budget Estimate for Predesign Study**. A budget estimate is prepared with the use of flow sheets, layouts, and equipment details. It is normally expected that an estimate of this type would be accurate within +30 percent to -15 percent.
- **A Definite Estimate (Engineer's Estimate) for Time of Contract Bidding**. This estimate is prepared from very defined engineering data. The data includes fairly complete plot plans and elevations, soil data, and a complete set of specs. It is expected that a definite estimate would be accurate within +15 to -5 percent.

Costs developed for this study should be considered "order of magnitude" and have an expected accuracy range of +50 percent to -30 percent. The purpose of this chapter is to present the assumptions used in developing order of magnitude cost estimates for facilities recommended with this master plan. Recommended facility improvements, which will address current deficiencies and facilities required to meet future City needs, are presented within the body of the report.

6.2 COST ESTIMATING CRITERIA

The cost estimates presented in this study are developed from bid tabulations, cost curves, information obtained from previous studies, and Carollo Engineers, P.C. (Carollo) experience on other projects. The costs estimated for each recommended facility are

included in the CIP tables developed with this study. The tables are intended to be used to facilitate revisions to the City's CIP and ultimately to support determination of the user rates and connection impact fees.

6.2.1 Pipeline Unit Costs

Pipeline improvements to the City range in size from approximately 10-inches to 54-inches in diameter. Unit costs are given in Table 6.1. Construction of pipelines in undeveloped areas will likely cost less than those constructed in developed areas, such as downtown. To account for this, two separate unit cost schedules were developed. Schedule A is applied to pipeline projects in developed areas, whereas Schedule B is applied to currently undeveloped areas. Schedule B unit costs have been assumed to be equal to half of the Schedule A costs, based on data provided by City Staff.

Table 6.1 Pipeline Costs
Storm Drainage System Master Plan
City of Tulare

Pipe Size (inches)	Unit Cost[(1)]/($/linear foot)	
	Schedule A (developed)	Schedule B (undeveloped)
8	82	41
10	103	51
12	123	62
15	154	77
18	167	84
21	195	98
24	223	112
27	251	126
30	279	140
33	307	153
36	335	167
42	391	195
48	447	223
54	502	251

Notes:
1. ENR CCI = 8,362 (20-City Average, August 2008)

6.2.2 Detention/Retention Basin Unit Costs

Costs associated with new detention/retention basins include earthwork and piping. Costs not included are fencing, landscape, and land acquisition. The detention/retention basin

cost versus capacity curve shown in Figure 6.1 was developed based on projects of similar size in California.

6.2.3 Pump Station Unit Cost

Pump station improvements include the construction of facilities or increasing the capacity of exiting pump stations to convey storm runoff. Cost estimates for pump stations were developed based on projects of similar size in California.

6.2.4 Land Acquisition

Acquisition of property, easements, and right-of-way (ROW) will be required for some of the new pump stations, but not pipelines because it was assumed that public ROW will be utilized wherever possible. Land costs in Tulare County are not easily determined, particularly in the master-planning phase, and variables affecting properties can result in widely varying land prices. Since land acquisition costs are not included in this master plan, the final capital costs may vary from the estimates presented herein.

6.2.5 Construction Cost Adjustments

Costs estimated for this study were adjusted utilizing the Engineering News Record (ENR) Cost Construction Index (CCI). The ENR CCI is the primary index utilized by the planning and engineering community to adjust cost estimates developed in different years. The costs estimated in this chapter are in year 2008 dollars, based on an ENR CCI of 8,362 (August 2008, 20-City Average).

6.3 CAPITAL IMPROVEMENT PROGRAM

The CIP for the improvements identified by this master plan is presented in Table 6.2. Cost related explanations are provided below.

6.3.1 Baseline Construction Cost

This is the total estimated construction cost, in dollars, of the proposed improvements. Baseline Construction Costs were calculated according to the following.

- **Pipe Unit Cost:** Estimated unit cost of pipeline is based on the pipe's present day cost. The cost is expressed in dollars per linear foot ($/LF) of pipe length.
- **Pipe Cost:** Estimated cost of the pipeline, calculated by multiplying the estimated length by the unit cost, in dollars.
- **Other Infrastructure Facilities Costs:** Estimated lump sum costs. Used for pump stations, detention/retention basins, and other similar facilities.

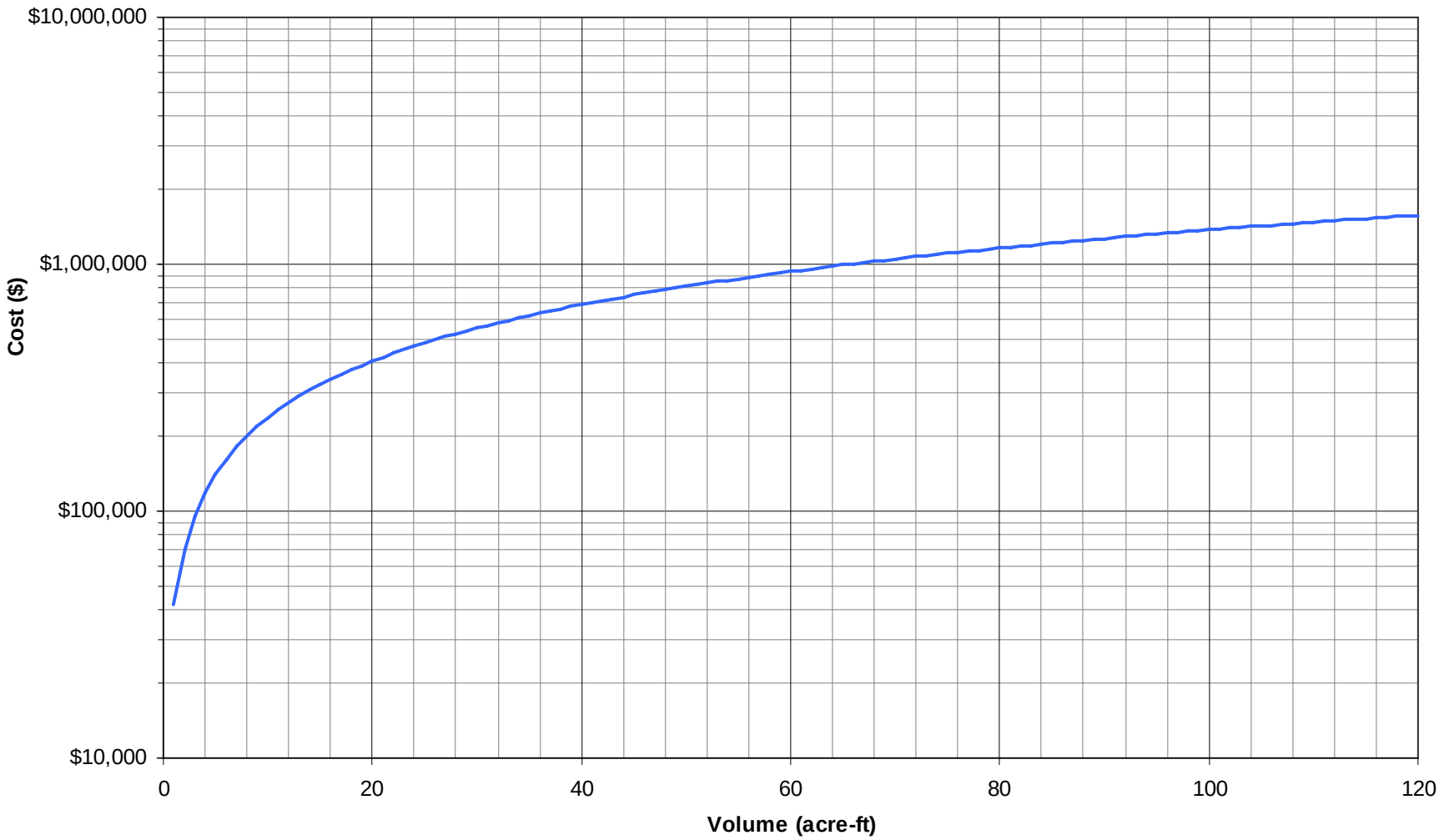


Figure 6.1
Detention/Retention Basin
Cost Versus Volume Curve
Storm Drainage System Master Plan
City of Tulare

Table 6.2 Capital Improvement Program
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Pipeline Unit Cost Schedule [4] (A or B)	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)	Capital Improv. Cost [3] ($)	Capital Improvement Schedule					Financing			
												Phase I 2009-11 ($)	Phase II 2012-15 ($)	Phase III 2015-20 ($)	Phase IV 2020-25 ($)	Phase V 2025-2030 ($)	Future Users Benefit (%)	Total Capital Cost ($)	Future Users Cost ($)	Existing Users Cost ($)
Academy Subbasin																				
A-1	Pipe	Academy Avenue	Mountain View St. to Laspina St.	X	X	A	--	24	New	800	279,000		279,000				0%	279,000	0	279,000
A-2	Pipe	Mountain View Street	Academy Ave. to 200' n/o Highway 137	X	X	A	--	12	New	500	96,000		96,000				0%	96,000	0	96,000
A-3	Pipe	Laspina Street	Academy Ave. to Eastgate Ave.	X	X	A	--	12	New	600	115,000		115,000				0%	115,000	0	115,000
A-4	Pipe	Laspina Street	Academy Ave. to 200' n/o Highway 137	X	X	A	--	15	New	500	120,000		120,000				0%	120,000	0	120,000
A-5	Pipe	Aronian Street	Eastgate Ave. to 800' n/o Eastgate Ave.			B	--	24	New	800	139,000			139,000			100%	139,000	139,000	0
A-6	Pipe	800' n/o Eastgate Ave.	Aronian St. to 800' e/o Aronian St.			B	--	24	New	800	139,000			139,000			100%	139,000	139,000	0
A-7	Pipe	Latimier Street	800' n/o Eastgate Ave. to 1,400' n/o Eastgate Ave.			B	--	24	New	600	104,000			104,000			100%	104,000	104,000	0
A-8	Force Main	Academy Avenue	Basin 22 to Main Canal			A	--	8	New	1,500	192,000			192,000			100%	192,000	192,000	0
A-B	Detention Basin	Aronian Street	Proposed Academy Basin			--	--	3 acre-ft	New	--	150,000			150,000			100%	150,000	150,000	0
A-PS	Pump Station	Mountain View Street	Academy Pump Station (Class II discharge from Basin 22)			--	--	2.6 cfs	New	--	235,000			235,000			100%	235,000	235,000	0
California Subbasin																				
C-1	Pipe	Alcott St/Dickens Ave	100' n/o Dickens Ave to Oaks St	X		A	21/--	36	Replace/New	1,000	522,000		522,000				0%	522,000	0	522,000
C-2	Pipe	Oaks Street	Dickens Ave to 150' s/o Sandra Ave	X		A	--	36	New	1,500	784,000		784,000				0%	784,000	0	784,000
C-3	Pipe	Oaks Street	150' s/o Sandra Ave to Lynn Ave	X		A	12/18	36	Replace	600	313,000		313,000				0%	313,000	0	313,000
C-4	Pipe	Oaks Street	Lynn Ave to Lois Ave	X		A	18	30	Replace	300	131,000		131,000				0%	131,000	0	131,000
C-5	Pipe	Oaks Street	Lois Ave to Prosperity Ave	X		A	18	24	Replace	800	279,000		279,000				0%	279,000	0	279,000
C-6	Pipe	Gail Avenue	Oaks St to 500' w/o M St	X		A	12	15	Replace	800	192,000			192,000			0%	192,000	0	192,000
C-7	Pipe	Lois Avenue	Oaks St to Williams St	X		A	12	21	Replace	800	244,000			244,000			0%	244,000	0	244,000
C-8	Pipe	Williams Street	Lois Ave to Berkeley Ave	X		A	12	15	Replace	500	120,000			120,000			0%	120,000	0	120,000
Del Lago Subbasin																				
DL-1	Pipe	Cartmill Avenue	800' e/o Hillman St to 300' e/o Hillman St			B	--	18	New	500	65,000			65,000				65,000	0	65,000
Downtown Subbasin																				
D-1	Pipe	Sacramento Street	Bardsley Ave to Proposed Downtown Basin 1	X		A	--	48	New	500	348,000	348,000					0%	348,000	0	348,000
D-2	Pipe	Cleveland St/Howard St	Bardlsey Ave to Sonora Ave	X		A	10/--	30	Replace/New	1,600	697,000	697,000					0%	697,000	0	697,000
D-3	Pipe	Sonora Ave/Pratt St	Howard St to Inyo Ave	X		A	21	30	Replace	1,800	784,000	784,000					0%	784,000	0	784,000
D-4	Pipe	Inyo Ave/D St	Pratt St to Kern Ave	X		A	8	12	Replace	1,300	249,000			249,000			0%	249,000	0	249,000
D-5	Pipe	Kern Avenue	Pratt St to D St	X		A	8	15	Replace	500	120,000			120,000			0%	120,000	0	120,000
D-6	Pipe	Sacramento Street	Sonora Ave to Inyo Ave	X		A	21	30	Replace	1,400	610,000	610,000					0%	610,000	0	610,000
D-7	Pipe	Santa Clara Street	Inyo Ave to Tulare Ave	X		A	21	30	Replace	900	392,000	392,000					0%	392,000	0	392,000
D-8	Pipe	Inyo Avenue	Santa Clara St to Los Angeles St	X		A	8	15	Replace	400	96,000		96,000				0%	96,000	0	96,000
D-9	Pipe	Inyo Avenue	Los Angeles St to e/o West St	X		A	8	12	Replace	400	77,000		77,000				0%	77,000	0	77,000
D-10	Pipe	Kern Avenue	Santa Clara St to e/o West St	X		A	8/10	12	Replace	800	154,000		154,000				0%	154,000	0	154,000
D-11	Pipe	Kern Avenue	Santa Clara St to California St	X		A	10	15	Replace	800	192,000		192,000				0%	192,000	0	192,000
D-12	Pipe	Kern Avenue	California St to A St	X		A	8	12	Replace	400	77,000		77,000				0%	77,000	0	77,000
D-13	Pipe	Tulare Avenue	Santa Clara St to e/o West St	X		A	8/10	12	Replace	700	134,000		134,000				0%	134,000	0	134,000
D-14	Pipe	Tulare Avenue	Santa Clara St to California St	X		A	10	15	Replace	800	192,000		192,000				0%	192,000	0	192,000
D-15	Pipe	Tulare Avenue	California St to A St	X		A	8	12	Replace	400	77,000		77,000				0%	77,000	0	77,000
D-16	Pipe	C Street	King Ave to San Jaoquin Ave	X		A	8	12	Replace	500	96,000			96,000			0%	96,000	0	96,000
D-17	Pipe	San Joaquin Avenue	E St to I St	X		A	6/8	18	Replace	1,600	418,000			418,000			0%	418,000	0	418,000
D-18	Pipe	Apline Avenue	Proposed Downtown Basin 2 to G St	X		A	8/--	48	Replace/New	1,300	906,000	906,000					0%	906,000	0	906,000
D-19	Pipe	G St/F St	Apline Ave to King Ave	X		A	8/10	36	Replace	3,400	1,776,000	1,776,000					0%	1,776,000	0	1,776,000
D-20	Pipe	I St/Sonora Ave	Proposed Downtown Basin 2 to Owens Ave	X		A	--	15	New	900	216,000		216,000				0%	216,000	0	216,000
D-21	Pipe	Kern Avenue	F St to H St	X		A	6/10	15	Replace	800	192,000		192,000				0%	192,000	0	192,000
D-22	Pipe	H Street	Kern Ave to Tulare Ave	X		A	8/10	12	Replace	500	96,000			96,000			0%	96,000	0	96,000
D-23	Pipe	G Street	King Ave to Tulare Ave	X		A	8	12	Replace	500	96,000			96,000			0%	96,000	0	96,000
D-24	Pipe	K St/L St	Proposed Downtown Basin 2 to King Avenue	X		A	10/15/24/--	48	Replace/New	3,300	2,299,000	2,299,000					0%	2,299,000	0	2,299,000
D-25	Pipe	Owens Ave/M St	L St to Inyo Ave	X		A	8/10	15	Replace	1,000	240,000			240,000			0%	240,000	0	240,000
D-26	Pipe	J St	Owens Ave to Inyo Ave	X	X	A	--	15	New	700	168,000		168,000				0%	168,000	0	168,000
D-27	Pipe	MLK Jr. Avenue	K St to O St (to Abandon PS III-2)	X		A	--	42	New	1,800	1,097,000	1,097,000					0%	1,097,000	0	1,097,000
D-28	Pipe	Land O Lakes Facility	Sonora Ave to PS III-2 (PS III-2 to be Abandoned, Pipeline Direction Reversed)	X		A	30	30	Replace	700	305,000	305,000					0%	305,000	0	305,000
D-29	Pipe	MLK Jr. Avenue	N St to Blackstone St	X		A	24	42	Replace	2,900	1,768,000		1,768,000				0%	1,768,000	0	1,768,000
D-30	Pipe	Bardsley Avenue	K St to PS III-1	X		A	14	24	Replace	2,700	940,000			940,000			0%	940,000	0	940,000
D-31	Pipe	Cedar Avenue	Q St to O St	X		A	8	15	Replace	800	192,000			192,000			0%	192,000	0	192,000
D-32	Pipe	R Street	Elm Ave to Cedar Ave	X		A	8	15	Replace	500	120,000			120,000			0%	120,000	0	120,000
D-33	Pipe	Cedar Avenue	R St to S St	X		A	8	15	Replace	400	96,000			96,000			0%	96,000	0	96,000
D-34	Pipe	Elm Avenue	Q St to P St	X		A	8	15	Replace	400	96,000			96,000			0%	96,000	0	96,000
D-35	Pipe	Mariposa Avenue	Center St to 300' e/o Center St	X		A	8	12	Replace	300	58,000			58,000			0%	58,000	0	58,000
D-36	Pipe	King Avenue	L St to Cherry St	X		A	18/21	36	Replace	2,200	1,149,000		1,149,000				0%	1,149,000	0	1,149,000
D-37	Pipe	N Street	King Avenue to San Joaquin Ave	X		A	8	15	Replace	500	120,000			120,000			0%	120,000	0	120,000
D-38	Pipe	O St/San Joaquin Ave	King Ave to Gem St	X		A	8/12	15	Replace	1,000	240,000			240,000			0%	240,000	0	240,000
D-39	Pipe	Gem Street	San Joaquin Ave to Academy Ave	X		A	8	12	Replace	300	58,000			58,000			0%	58,000	0	58,000

Table 6.2 Capital Improvement Program
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Pipeline Unit Cost Schedule [4] (A or B)	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)	Capital Improv. Cost [3] ($)	Capital Improvement Schedule					Financing			
												Phase I 2009-11 ($)	Phase II 2012-15 ($)	Phase III 2015-20 ($)	Phase IV 2020-25 ($)	Phase V 2025-2030 ($)	Future Users Benefit (%)	Total Capital Cost ($)	Future Users Cost ($)	Existing Users Cost ($)
D-40	Pipe	Cherry Street	King Avenue to San Joaquin Ave	X		A	15	30	Replace	300	131,000		131,000				0%	131,000	0	131,000
D-41	Pipe	Sycamore Avenue	Cherry St to Highland St	X		A	8	15	Replace	1,200	288,000			288,000			0%	288,000	0	288,000
D-42	Pipe	Cherry Street	King Ave to Inyo Ave	X		A	8	15	Replace	300	72,000			72,000			0%	72,000	0	72,000
D-43	Pipe	San Joaquin Ave/Highland St	Cherry St to Apricot Ave	X		A	10	24	Replace	1,700	592,000		592,000				0%	592,000	0	592,000
D-44	Pipe	Apricot Avenue	Highland St to Blackstone St	X		A	10	21	Replace	700	213,000		213,000				0%	213,000	0	213,000
D-45	Pipe	Blackstone Street	Apricot St to Academy St	X		A	10	18	Replace	200	52,000			52,000			0%	52,000	0	52,000
D-46	Pipe	Cherry Street	San Joaquin Ave to Academy Ave	X		A	10	15	Replace	700	168,000			168,000			0%	168,000	0	168,000
D-47	Pipe	Academy Avenue	Cherry St to 400' e/o Cherry St	X		A	10	12	Replace	400	77,000			77,000			0%	77,000	0	77,000
D-48	Pipe	Pine Street	Basin 53 to J St (Pine Storm Drain and Abandon Basin 53 and PS II-10)	X		A	--	30	New	3,500	1,524,000		1,524,000				0%	1,524,000	0	1,524,000
D-49	Pipe	Cross Avenue	Auburn St to Basin 53 (Abandon Basin 53 and PS II-10)	X		A	21	27	Replace	400	157,000		157,000				0%	157,000	0	157,000
D-50	Pipe	Cherry Street	n/o Cross Ave to s/o Pleasant Ave	X		A	8	18	Replace	1,000	261,000			261,000			0%	261,000	0	261,000
D-51	Pipe	Cherry Street	s/o Pleasant Ave to Terrace Ave	X		A	8	15	Replace	600	144,000			144,000			0%	144,000	0	144,000
D-52	Pipe	Pleasant Avenue	Proposed Downtown Basin 3 to M St	X		A	15/--	48	Replace/New	2,300	1,602,000		1,602,000				0%	1,602,000	0	1,602,000
D-53	Pipe	Pleasant Avenue	M St to Gem St	X		A	12	42	Replace	1,300	792,000		792,000				0%	792,000	0	792,000
D-54	Pipe	Lyndale Ave/Bash Ave	Delwood St to Pleasant Ave	X		A	--	36	New	2,300	1,202,000		1,202,000				0%	1,202,000	0	1,202,000
D-55	Pipe	Delwood St/Cross St	Highland St to Bash Ave	X		A	12	27	Replace	1,500	588,000		588,000				0%	588,000	0	588,000
D-56	Pipe	Cross Avenue	Highland St to Blackstone St	X		A	10	15	Replace	600	144,000			144,000			0%	144,000	0	144,000
D-57	Pipe	Highland St/Beverly Ave	Cross Ave to Bonita St	X		A	12/10	21	Replace	600	183,000			183,000			0%	183,000	0	183,000
D-58	Pipe	Beverly Avenue	Bonita St to Blackstone St	X		A	10	15	Replace	400	96,000			96,000			0%	96,000	0	96,000
D-59	Pipe	Windsor Avenue	Delwood St to Highland St	X		A	8	12	Replace	400	77,000			77,000			0%	77,000	0	77,000
D-60	Pipe	Gem Street	Pleasant Ave to Merritt Ave	X		A	10/--	36	Replace/New	1,400	731,000		731,000				0%	731,000	0	731,000
D-61	Pipe	Gem Street	Merritt Ave to 800'n.o Merritt Ave	X		A	15	27	Replace	800	313,000		313,000				0%	313,000	0	313,000
D-62	Pipe	Gem Street	800' n/o Merritt Ave to Prosperity Ave	X		A	15	21	Replace	500	152,000		152,000				0%	152,000	0	152,000
D-63	Pipe	Merritt Avenue	Cherry St to 300' e/o Cherry St	X		A	12	18	Replace	300	78,000			78,000			0%	78,000	0	78,000
D-64	Pipe	Estate Avenue	M St to 300' e/o M St	X		A	12	18	Replace	300	78,000			78,000			0%	78,000	0	78,000
D-65	Pipe	I Street	Pleasant Ave to 700' n/o Pleasant Avenue	X	X	A	--	12	New	700	134,000		134,000				0%	134,000	0	134,000
D-66	Pipe	Salida St/Kern Ave	Inyo Ave to Blackstone St	X	X	A	--	12	New	1,200	230,000		230,000				0%	230,000	0	230,000
D-67	Force Main	Bardsley Avenue	Force Main from Downtown Pump Station 1 (D-PS1)	X		A	--	18	New	700	183,000	183,000					0%	183,000	0	183,000
D-68	Force Main	w/o J Street	Force Main from Downtown Pump Station 2 (D-PS2)	X		A	--	24	New	1,200	418,000	418,000					0%	418,000	0	418,000
D-69	Force Main	I Street	Force Main from Downtown Pump Station 3 (D-PS3)	X		A	--	21	New	1,000	305,000		305,000				0%	305,000	0	305,000
D-70	Force Main	I Street	Force Main from Downtown Pump Station 4 (D-PS4)	X		A	--	18	New	1,800	470,000			470,000			0%	470,000	0	470,000
D-B1	Detention Basin	Bardsley Avenue	Proposed Downtown Basin 1	X		--	--	35 acre-ft	New	--	968,000	968,000					0%	968,000	0	968,000
D-B2	Detention Basin	w/o J Street	Proposed Downtown Basin 2	X		--	--	55 acre-ft	New	--	1,364,000	1,364,000					0%	1,364,000	0	1,364,000
D-B3	Detention Basin	I Street	Proposed Downtown Basin 3	X		--	--	45 acre-ft	New	--	1,171,000		1,171,000				0%	1,171,000	0	1,171,000
D-PS1	Pump Station	Bardsley Avenue	Downtown Pump Station 1 (Class II discharge from Downtown Basin 1)	X		--	--	10.0 cfs	New	--	905,000	905,000					0%	905,000	0	905,000
D-PS2	Pump Station	w/o J Street	Downtown Pump Station 2 (Class III discharge from Downtown Basin 2)	X		--	--	14.0 cfs	New	--	1,267,000	1,267,000					0%	1,267,000	0	1,267,000
D-PS3	Pump Station	I Street	Downtown Pump Station 3 (Class II discharge from Downtown Basin 3)	X		--	--	12.0 cfs	New	--	1,086,000		1,086,000				0%	1,086,000	0	1,086,000
D-PS4	Pump Station	I Street	Downtown Pump Station 4 (Class II discharge from Basin 16)	X		--	--	8.0 cfs	New	--	724,000			724,000			0%	724,000	0	724,000
Enterprise Subbasin																				
E-1	Pipe	700' n/o Bardsley Ave	200' e/o Enterprise St to 1,400' e/o Enterprise St			B	--	30	New	1,200	261,000			261,000			100%	261,000	261,000	0
E-2	Pipe	Haven Street	700' n/o Bardsley Ave to Sonora St			B	--	18	New	1,200	157,000			157,000			100%	157,000	157,000	0
E-3	Pipe	700' n/o Bardsley Ave	1,400' e/o Enterprise St to 2,000' e/o Enterprise St			B	--	21	New	600	91,000			91,000			100%	91,000	91,000	0
E-4	Pipe	700' n/o Bardsley Ave	Future City Basin 40 to Bardsley Ave			B	--	21	New	700	107,000			107,000			100%	107,000	107,000	0
E-5	Pipe	n/o Bardsley Avenue	400' w/o Enterprise St to 800' w/o Enterprise St			B	--	18	New	600	78,000			78,000			100%	78,000	78,000	0
E-6	Pipe	Enterprise Street	700' n/o Bardsley Ave to Sonora St			B	--	18	New	900	118,000			118,000			100%	118,000	118,000	0
E-7	Pipe	700' n/o Bardsley Ave	Basin 39 (E-B2) 2,000' e/o Enterprise St.			B	--	18	New	1,300	170,000			170,000			100%	170,000	170,000	0
E-8	Pipe	Maricopa St	Future City Basin 39 to Santa Barbara St			B	27	30	New/Replace	1,300	283,000			283,000			100%	283,000	283,000	0
E-9	Pipe	2,400' w/o West St	300' s/o Sonora St to 900' s/o Sonora St			B	--	30	New	600	131,000			131,000			100%	131,000	131,000	0
E-10	Pipe	900' s/o Sonora St	2,400' w/o West St to 900' w/o West St			B	--	24	New	1,500	261,000			261,000			100%	261,000	261,000	0
E-11	Force Main	700' n/o Bardsley Ave	Force Main from Enterprise Pump Station (E-PS)			B	--	15	New	100	12,000			12,000			100%	12,000	12,000	0
E-B1	Detention Basin	700' n/o Bardsley Ave	Future City Basin 40			--	--	20 acre-ft	New	--	632,000			632,000			100%	632,000	632,000	0
E-B2	Detention Basin	300' s/o Sonora St	Future City Basin 39			--	--	15 acre-ft	New	--	508,000			508,000			100%	508,000	508,000	0
E-PS	Pump Station	700' n/o Bardsley Ave	Enterprise Pump Station (Class II discharge from Basin 40)			--	--	5.0 cfs	New	--	452,000			452,000			100%	452,000	452,000	0
Evergreen Subbasin																				
EG-1	Pipe	Saratoga Avenue	A St. to E St.			A	--	24	New	700	244,000			244,000			100%	244,000	244,000	0
Gail Subbasin																				
G-1	Pipe	Zumwalt Ave	600' e/o Sacramento St to Sacramento St			B	--	54	New	600	235,000			235,000			100%	235,000	235,000	0
G-2	Pipe	Zumwalt Ave	Sacramento St to West St			B	--	42	New	1,300	396,000			396,000			100%	396,000	396,000	0
G-3	Pipe	West St	Zumwalt Ave to Cartmill Ave			B	--	36	New	2,500	653,000			653,000			100%	653,000	653,000	0
G-4	Pipe	West St	Cartmill Ave to 1,200' n/o Cartmill Ave			B	--	30	New	1,300	283,000				283,000		100%	283,000	283,000	0
G-5	Pipe	Sacramento Street	Zumwalt Ave to Elster Ave			B	--	48	New	1,200	418,000			418,000			100%	418,000	418,000	0
G-6	Pipe	Sacramento Street	Elster Ave to Cartmill Ave			B	--	42	New	1,600	488,000			488,000			100%	488,000	488,000	0

Table 6.2 Capital Improvement Program
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Pipeline Unit Cost Schedule [4] (A or B)	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)	Capital Improv. Cost [3] ($)	Capital Improvement Schedule					Financing			
												Phase I 2009-11 ($)	Phase II 2012-15 ($)	Phase III 2015-20 ($)	Phase IV 2020-25 ($)	Phase V 2025-2030 ($)	Future Users Benefit (%)	Total Capital Cost ($)	Future Users Cost ($)	Existing Users Cost ($)
G-7	Pipe	Cartmill Avenue	Sacramento St to 1,000' e/o Sacramento St			B	--	36	New	1,000	261,000					261,000	100%	261,000	261,000	0
G-8	Pipe	1,000' e/o Sacramento St	Cartmill Ave to 1,500' n/o Cartmill Ave			B	--	30	New	1,500	327,000					327,000	100%	327,000	327,000	0
G-9	Pipe	Sacramento Street	Cartmill Ave to 1,400' n/o Cartmill Ave			B	--	30	New	1,400	305,000					305,000	100%	305,000	305,000	0
G-10	Pipe	E Street	Zumwalt Ave to Elster Ave			B	--	30	New	1,400	305,000			305,000			100%	305,000	305,000	0
G-11	Pipe	Zumwalt Ave	400' w/o E St to Future City Basin 43 (G-B)			B	--	42	New	300	91,000			91,000			100%	91,000	91,000	0
G-12	Pipe	400' w/o E St	Gail Basin to Zumwalt Ave			B	--	30	New	600	131,000			131,000			100%	131,000	131,000	0
G-13	Pipe	Zumwalt Ave	400' w/o E St to E St			B	--	36	New	400	104,000			104,000			100%	104,000	104,000	0
G-14	Pipe	E Street	Zumwalt Ave to 500' s/o Zumwalt Ave			B	--	30	New	600	131,000			131,000			100%	131,000	131,000	0
G-15	Force Main	Zumwalt Ave	Force Main from Gail Pump Station (G-PS)			B	--	21	New	1,600	244,000			244,000			100%	244,000	244,000	0
G-B	Detention Basin	Zumwalt Ave	Future City Basin 43			--	--	50 acre-ft	New	--	1,269,000			1,269,000			100%	1,269,000	1,269,000	0
G-PS	Pump Station	Zumwalt Ave	Gail Pump Station (Class II discharge from Basin 43)			--	--	13.0 cfs	New	--	1,176,000			1,176,000			100%	1,176,000	1,176,000	0
The Greens Subbasin																				
GR-1	Pipe	1,500' w/o Morrision St	The Greens Basin to 2,700' s/o Prosperity Avenue			B	--	48	New	500	174,000			174,000			100%	174,000	174,000	0
GR-2	Pipe	2,700' s/o Prosperity Ave	1,500' w/o Morrison St to Morrison St			B	--	42	New	1,500	457,000			457,000			100%	457,000	457,000	0
GR-3	Pipe	Morrison Street	2,700' s/o Prosperity Ave to 1,600' s/o Prosperity Ave			B	--	36	New	1,100	287,000				287,000		100%	287,000	287,000	0
GR-4	Pipe	1,600' s/o Prosperity Ave	Morrison St to 1,400' e/o Morrison St			B	--	30	New	1,400	305,000					305,000	100%	305,000	305,000	0
GR-5	Pipe	600' e/o Morrison St	1,600' s/o Prosperity Ave to 700' s/o Prosperity Ave			B	--	21	New	900	137,000					137,000	100%	137,000	137,000	0
GR-6	Pipe	1,400' e/o Morrison St	1,600' s/o Prosperity Ave to 700' s/o Prosperity Ave			B	--	21	New	900	137,000					137,000	100%	137,000	137,000	0
GR-7	Pipe	1,500' w/o Morrison St	2,700' s/o Prosperity Ave to 2,300' s/o Prosperity Ave			B	--	36	New	900	235,000			235,000			100%	235,000	235,000	0
GR-8	Pipe	1,500' w/o Morrison St	2,300' s/o Prosperity Ave to 1,400' s/o Prosperity Ave			B	--	30	New	900	196,000			196,000			100%	196,000	196,000	0
GR-9	Pipe	s/o Prosperity-w/o Morrison	w/o Morrison St to s/o Prosperity Ave			B	--	24	New	1,500	261,000			261,000			100%	261,000	261,000	0
GR-10	Pipe	2,300' s/o Prosperity Ave	600' e/o Mooney Blvd to 1,400' e/o Mooney Blvd			B	--	24	New	800	139,000			139,000			100%	139,000	139,000	0
GR-11	Pipe	2,300' s/o Prosperity Ave	1,500' w/o Morrison St to 700' w/o Morrison St			B	--	18	New	800	104,000			104,000			100%	104,000	104,000	0
GR-12	Pipe	2,700' s/o Prosperity Ave	Morrison St to 700' e/o Morrison St			B	--	30	New	700	152,000					152,000	100%	152,000	152,000	0
GR-13	Pipe	2,700' s/o Prosperity Ave	700 ' e/o Morrison St to 1,400' e/o Morrison St			B	--	24	New	700	122,000					122,000	100%	122,000	122,000	0
GR-14	Pipe	2,200' n/o Tulare Ave	Greens Basin to 1,000' w/o Morrison St			B	--	30	New	500	109,000		109,000				100%	109,000	109,000	0
GR-15	Pipe	1,000' w/o Morrison St	2,200' n/o Tulare Ave to 1,500' n/o Tulare Ave			B	--	24	New	700	122,000		122,000				100%	122,000	122,000	0
GR-16	Pipe	1,000' w/o Morrison St	1,500' n/o Tulare Ave to 400' n/o Tulare Ave			B	--	21	New	1,100	168,000		168,000				100%	168,000	168,000	0
GR-17	Pipe	400' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St			B	--	18	New	600	78,000			78,000			100%	78,000	78,000	0
GR-18	Pipe	2,200' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St			B	--	18	New	600	78,000			78,000			100%	78,000	78,000	0
GR-19	Pipe	1,500' n/o Tulare Ave	1,000' w/o Morrison St to 400' w/o Morrison St			B	--	18	New	600	78,000			78,000			100%	78,000	78,000	0
GR-20	Pipe	1,700' n/o Tulare Ave	1,400' e/o Mooney Blvd to 600' e/o Mooney Blvd			B	--	30	New	800	174,000		174,000				100%	174,000	174,000	0
GR-21	Pipe	600' e/o Mooney Blvd	1,700' n/o Tulare Ave to 2,200' n/o Tulare Ave			B	--	24	New	500	87,000			87,000			100%	87,000	87,000	0
GR-22	Pipe	600' e/o Mooney Blvd	1,700' n/o Tulare Ave to 800' n/o Tulare Ave			B	--	24	New	900	157,000			157,000			100%	157,000	157,000	0
GR-23	Force Main	2,200' n/o Hwy 137	Force Main from The Greens Pump Station (GR-PS)			B	--	21	New	1,200	183,000		183,000				100%	183,000	183,000	0
GR-B	Detention Basin	2,200' n/o Hwy 137	Proposed Expansion to the Greens Basin			--	6 acre-ft	45 acre-ft	Expand	--	1,171,000		1,171,000				100%	1,171,000	1,171,000	0
GR-PS	Pump Station	2,200' n/o Hwy 137	The Greens Pump Station (Class II discharge fro the Greens Basin)			--	--	11.5 cfs	New	--	1,041,000		1,041,000				100%	1,041,000	1,041,000	0
Horizon Subbasin																				
H-1	Pipe	Gem Street	1,500' s/o Cartmill Ave to 600' s/o Cartmill Ave			B	--	36	New	900	235,000		235,000				100%	235,000	235,000	0
H-2	Pipe	1,900' s/o Cartmill Ave	Gem St to 600' e/o Gem St			B	--	36	New	600	157,000		157,000				100%	157,000	157,000	0
H-3	Pipe	1,900' s/o Cartmill Ave	600' e/o Gem St to 700' w/o Hillman St			B	--	30	New	1,300	283,000		283,000				100%	283,000	283,000	0
H-4	Pipe	600' s/o Cartmill Ave	Gem St to 600' e/o Gem St			B	--	36	New	600	157,000			157,000			100%	157,000	157,000	0
H-5	Pipe	600' s/o Cartmill Ave	600' e/o Gem St to 700' w/o Hillman St			B	--	30	New	1,300	283,000			283,000			100%	283,000	283,000	0
H-6	Pipe	600' s/o Cartmill Ave	1,400' w/o Gem St to Gem St			B	--	30	New	1,400	305,000			305,000			100%	305,000	305,000	0
H-7	Force Main	1,400' s/o Cartmill Ave	Force Main from Outlet Center Pump Station (H-PS)			B	--	27	New	250	49,000		49,000				100%	49,000	49,000	0
H-8	Pipe	Gem Street	Overflow Pipe between Horizon and North 2 Subbasin			B	--	30	New	1,400	305,000		305,000				100%	305,000	305,000	0
H-PS	Pump Station	1,400' s/o Cartmill Ave	Outlet Center Pump Station (Class II discharge from Outlet Center Basin)			B	--	22.0 cfs	New	--	1,991,000		1,991,000				100%	1,991,000	1,991,000	0
Industrial Subbasin																				
I-1	Pipe	O Street	O Street Basin to O Street	X		A	--	36	New	100	52,000		52,000				0%	52,000	0	52,000
I-2	Pipe	O Street	s/o Chestnut Ave to Almond Ave	X		A	--	30	New	500	218,000		218,000				0%	218,000	0	218,000
I-3	Pipe	O Street	Almond Ave to Walnut Ave	X		A	--	24	New	400	139,000		139,000				0%	139,000	0	139,000
I-4	Pipe	O Street	s/o Chestnut Ave to n/o Levin Ave	X		A	--	24	New	200	70,000		70,000				0%	70,000	0	70,000
I-5	Pipe	O Street	n/o Levin Ave to Levin Ave	X		A	--	15	New	300	72,000		72,000				0%	72,000	0	72,000
I-B	Detention Basin	O Street	Future O Street Basin	X		A	--	6.3 acre-ft	New	--	253,000		253,000				0%	253,000	0	253,000
Maple Subbasin																				
MA-1	Pipe	Maple Avenue	E St to G St	X		A	12/15	21	Replace	800	244,000		244,000				0%	244,000	0	244,000
MA-2	Pipe	G Street	Maple Ave to Beaumont Ave	X		A	10	18	Replace	500	131,000		131,000				0%	131,000	0	131,000
MA-3	Pipe	Beaumont Avenue	G St to H St	X		A	10	18	Replace	400	104,000		104,000				0%	104,000	0	104,000
MA-4	Pipe	Beaumont Avenue	H St to I St	X		A	8	15	Replace	400	96,000		96,000				0%	96,000	0	96,000
MA-5	Pipe	G Street	Pleasant Ave to Oakland Ave	X		A	10	15	Replace	300	72,000		72,000				0%	72,000	0	72,000
MA-6	Pipe	Oakland Avenue	G St to H St	X		A	10	15	Replace	300	72,000		72,000				0%	72,000	0	72,000

Table 6.2 Capital Improvement Program
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Pipeline Unit Cost Schedule [4] (A or B)	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)	Capital Improv. Cost [3] ($)	Capital Improvement Schedule					Financing			
												Phase I 2009-11 ($)	Phase II 2012-15 ($)	Phase III 2015-20 ($)	Phase IV 2020-25 ($)	Phase V 2025-2030 ($)	Future Users Benefit (%)	Total Capital Cost ($)	Future Users Cost ($)	Existing Users Cost ($)
Mountain View Subbasin																				
MV-1	Pipe	Kern Avenue	Basin 17 to Forrest St	X		A	24	30	Replace	900	392,000		392,000				0%	392,000	0	392,000
MV-2	Pipe	Kern Avenue	Sruce St to Canby St	X		A	21	24	Replace	600	209,000		209,000				0%	209,000	0	209,000
MV-3	Pipe	Canby Street	Kern Ave to Sequoia St	X		A	--	24	New	300	104,000		104,000				0%	104,000	0	104,000
MV-4	Force Main	Live Oak Park	Force Main from Live Oak Pump Station (MV-PS)	X		A	--	30	New	1,500	653,000	653,000					0%	653,000	0	653,000
MV-B	Retention Basin	Kern Avenue	Basin 17 Expansion	X		--	8 acre-ft	15 acre-ft	Expand	--	508,000		508,000				0%	508,000	0	508,000
MV-PS	Pump Station	Live Oak Park	Live Oak Pump Station (Class II discharge from Basin 34 & Abandon PS III-4)	X		--	--	25.0 cfs	New	--	2,262,000	2,262,000					0%	2,262,000	0	2,262,000
Northeast Subbasin																				
NE-1	Pipe	1,100' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 1,900' s/o Cartmill Ave			B	--	54	New	1,000	392,000				392,000		100%	392,000	392,000	0
NE-2	Pipe	1,900' s/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			B	--	48	New	1,200	418,000				418,000		100%	418,000	418,000	0
NE-3	Pipe	2,300' e/o Mooney Blvd	1,900' s/o Cartmill Ave to 700' s/o Cartmill Ave			B	--	42	New	1,100	335,000				335,000		100%	335,000	335,000	0
NE-4	Pipe	2,300' e/o Mooney Blvd	700' s/o Cartmill Ave to 600' n/o Cartmill Ave			B	--	42	New	1,300	396,000					396,000	100%	396,000	396,000	0
NE-5	Pipe	2,300' e/o Mooney Blvd	600' n/o Cartmill Ave to 2,000' n/o Cartmill Ave			B	--	42	New	1,400	427,000					427,000	100%	427,000	427,000	0
NE-6	Pipe	2,600' s/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			B	--	48	New	1,200	418,000				418,000		100%	418,000	418,000	0
NE-7	Pipe	2,300' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 3,300' s/o Cartmill Ave			B	--	42	New	700	213,000				213,000		100%	213,000	213,000	0
NE-8	Pipe	2,300' e/o Mooney Blvd	3,300' s/o Cartmill Ave to 700' n/o Prosperity Ave			B	--	36	New	1,200	313,000				313,000		100%	313,000	313,000	0
NE-9	Pipe	3,300' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			B	--	30	New	1,300	283,000				283,000		100%	283,000	283,000	0
NE-10	Pipe	1,100' e/o Mooney Blvd	2,600' s/o Cartmill Ave to 3,300' s/o Cartmill Ave			B	--	42	New	800	244,000				244,000		100%	244,000	244,000	0
NE-11	Pipe	1,100' e/o Mooney Blvd	3,300' s/o Cartmill Ave to 700' n/o Prosperity Ave			B	--	36	New	1,200	313,000				313,000		100%	313,000	313,000	0
NE-12	Pipe	1,100' e/o Mooney Blvd	1,900' s/o Cartmill Ave to 700' s/o Cartmill Ave			B	--	36	New	1,100	287,000				287,000		100%	287,000	287,000	0
NE-13	Pipe	1,900' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			B	--	36	New	1,300	340,000				340,000		100%	340,000	340,000	0
NE-14	Pipe	700' s/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			B	--	36	New	1,300	340,000				340,000		100%	340,000	340,000	0
NE-15	Pipe	600' n/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			B	--	36	New	1,300	340,000					340,000	100%	340,000	340,000	0
NE-16	Pipe	2,000' n/o Cartmill Ave	2,300' e/o Mooney Blvd to 1,300' w/o Oakmore St			B	--	36	New	1,400	366,000					366,000	100%	366,000	366,000	0
NE-17	Pipe	600' n/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			B	--	36	New	1,200	313,000					313,000	100%	313,000	313,000	0
NE-18	Pipe	2,000' n/o Cartmill Ave	1,100' e/o Mooney Blvd to 2,300' e/o Mooney Blvd			B	--	36	New	1,200	313,000					313,000	100%	313,000	313,000	0
NE-19	Force Main	2,600' n/o Prosperity Ave	Force Main from Northeast Pump Station (NE-PS)			B	--	30	New	300	65,000				65,000		100%	65,000	65,000	0
NE-B1	Detention Basin	2,600' n/o Prosperity Ave	Proposed Northeast 1 Basin			--	--	85 acre-ft	New	--	1,899,000				1,899,000		100%	1,899,000	1,899,000	0
NE-B2	Detention Basin	600' n/o Cartmill Ave	Proposed Northeast 2 Basin			--	--	17 acre-ft	New	--	559,000					559,000	100%	559,000	559,000	0
NE-PS	Pump Station	2,600' n/o Prosperity Ave	Northeast Pump Station (Class II discharge from Northeast 1 Basin)			--	--	25.0 cfs	New	--	2,262,000				2,262,000		100%	2,262,000	2,262,000	0
North 1 Subbasin																				
N1-1	Pipe	2,000' e/o Hillman St	North 1 Basin 1 to 600' s/o Ave 252			B	--	48	New	1,500	522,000			522,000			100%	522,000	522,000	0
N1-2	Pipe	600' s/o Ave 252	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd			B	--	42	New	1,300	396,000			396,000			100%	396,000	396,000	0
N1-3	Pipe	2,000' w/o Mooney Blvd	600' s/o Ave 252 to 700' n/o Cartmill Ave			B	--	36	New	1,400	366,000			366,000			100%	366,000	366,000	0
N1-4	Pipe	700' n/o Cartmill Ave	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			B	--	36	New	1,300	340,000			340,000			100%	340,000	340,000	0
N1-5	Pipe	600' s/o Ave 252	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			B	--	30	New	1,300	283,000			283,000			100%	283,000	283,000	0
N1-6	Pipe	600' s/o Ave 252	700' e/o Hillman St to			B	--	30	New	1,300	283,000			283,000			100%	283,000	283,000	0
N1-7	Pipe	1,300' n/o Cartmill Ave	700' e/o Hillman St to 2,000' e/o Hillman St			B	--	30	New	1,300	283,000			283,000			100%	283,000	283,000	0
N1-8	Pipe	2,000' w/o Mooney Blvd	600' s/o Ave 252 to 650' n/o Ave 252			B	--	42	New	1,300	396,000				396,000		100%	396,000	396,000	0
N1-9	Pipe	2,000' w/o Mooney Blvd	650' n/o Ave 252 to 650' s/o Oakdale Ave			B	--	36	New	1,300	340,000				340,000		100%	340,000	340,000	0
N1-10	Pipe	650' s/o Oakdale Ave	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			B	--	36	New	1,300	340,000				340,000		100%	340,000	340,000	0
N1-11	Pipe	650' s/o Oakdale Ave	700' w/o Mooney Blvd to 600' e/o Mooney Blvd			B	--	30	New	1,500	327,000				327,000		100%	327,000	327,000	0
N1-12	Pipe	650' n/o Ave 252	2,000' w/o Mooney Blvd to 700' w/o Mooney Blvd			B	--	36	New	1,300	340,000				340,000		100%	340,000	340,000	0
N1-13	Pipe	650' n/o Ave 252	700' w/o Mooney Blvd to 600' e/o Mooney Blvd			B	--	30	New	1,400	305,000				305,000		100%	305,000	305,000	0
N1-14	Pipe	650' n/o Ave 252	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd			B	--	42	New	1,200	366,000					366,000	100%	366,000	366,000	0
N1-15	Pipe	650' n/o Ave 252	700' e/o Hillman St to 2,000' e/o Hillman St			B	--	36	New	1,300	340,000					340,000	100%	340,000	340,000	0
N1-16	Pipe	700' e/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			B	--	30	New	1,300	283,000					283,000	100%	283,000	283,000	0
N1-17	Pipe	650' s/o Oakdale Ave	2,000' e/o Hillman St to 2,000' w/o Mooney Blvd			B	--	36	New	1,300	340,000					340,000	100%	340,000	340,000	0
N1-18	Force Main	1,300' n/o Cartmill Ave	Force Main from North 1 Pump Station (N1-PS)			B	--	27	New	200	39,000			39,000			100%	39,000	39,000	0
N1-B1	Detention Basin	1,300' n/o Cartmill Ave	Proposed North 1 Basin 1			--	--	55 acre-ft	New	--	1,364,000			1,364,000			100%	1,364,000	1,364,000	0
N1-B2	Detention Basin	650' n/o Ave 252	Proposed North 1 Basin 2			--	--	25 acre-ft	New	--	749,000				749,000		100%	749,000	749,000	0
N1-PS	Pump Station	1,300' n/o Cartmill Ave	North 1 Pump Station (Class II discharge from North 1 Basin 1)			--	--	20.0 cfs	New	--	1,810,000			1,810,000			100%	1,810,000	1,810,000	0
North 2 Subbasin																				
N2-1	Pipe	2,000' w/o Hillman St	650' n/o Cartmill Ave to 650' s/o Ave 252			B	--	54	New	1,300	509,000				509,000		100%	509,000	509,000	0
N2-2	Pipe	650' s/o Ave 252	2,000' w/o Hillman St to 3,300' w/o Hillman St			B	--	48	New	1,300	453,000				453,000		100%	453,000	453,000	0
N2-3	Pipe	650' s/o Ave 252	3,300' w/o Hillman St to 4,600' w/o Hillman St			B	--	42	New	1,300	396,000					396,000	100%	396,000	396,000	0
N2-4	Pipe	2,000' w/o Hillman St	650' s/o Ave 252 to 650' n/o Ave 252			B	--	48	New	1,300	453,000					453,000	100%	453,000	453,000	0
N2-5	Pipe	650' n/o Ave 252	2,000' w/o Hillman St to 3,300' w/o Hillman St			B	--	36	New	1,300	340,000					340,000	100%	340,000	340,000	0
N2-6	Pipe	3,300' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			B	--	30	New	1,300	283,000					283,000	100%	283,000	283,000	0
N2-7	Pipe	2,000' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			B	--	30	New	1,300	283,000					283,000	100%	283,000	283,000	0
N2-8	Pipe	650' s/o Ave 252	2,000' w/o Hillman St to 650' w/o Hillman St			B	--	42	New	1,400	427,000				427,000		100%	427,000	427,000	0
N2-9	Pipe	650' w/o Hillman St	650' s/o Ave 252 to 650' n/o Ave 252			B	--	36	New	1,300	340,000					340,000	100%	340,000	340,000	0

Table 6.2 Capital Improvement Program
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Pipeline Unit Cost Schedule [4] (A or B)	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)	Capital Improv. Cost [3] ($)	Capital Improvement Schedule					Financing			
												Phase I 2009-11 ($)	Phase II 2012-15 ($)	Phase III 2015-20 ($)	Phase IV 2020-25 ($)	Phase V 2025-2030 ($)	Future Users Benefit (%)	Total Capital Cost ($)	Future Users Cost ($)	Existing Users Cost ($)
N2-10	Pipe	650' w/o Hillman St	650' n/o Ave 252 to 650' s/o Oakdale Ave			B	--	30	New	1,300	283,000					283,000	100%	283,000	283,000	0
N2-11	Pipe	650' n/o Cartmill Ave	2,000' w/o Hillman St to 3,300' w/o Hillman St			B	--	48	New	1,300	453,000				453,000		100%	453,000	453,000	0
N2-12	Pipe	650' n/o Cartmill Ave	3,300' w/o Hillman St to 4,100' w/o Hillman St			B	--	42	New	800	244,000				244,000		100%	244,000	244,000	0
N2-13	Pipe	650' n/o Cartmill Ave	2,000' w/o Hillman St to 650' w/o Hillman St			B	--	36	New	1,400	366,000				366,000		100%	366,000	366,000	0
N2-14	Force Main	2,000' w/o Hillman St	Force Main from North 2 Pump Station (N2-PS)			B	--	27	New	200	39,000				39,000		100%	39,000	39,000	0
N2-B	Detention Basin	2,000' w/o Hillman St	Proposed North 2 Basin			--	--	100 acre-ft	New	--	2,149,000				2,149,000		100%	2,149,000	2,149,000	0
N2-PS	Pump Station	2,000' w/o Hillman St	North 2 Pump Station (Class II discharge from North 2 Basin)			--	--	25.0 cfs	New	--	2,262,000				2,262,000		100%	2,262,000	2,262,000	0
North Commercial Subbasin																				
NC-1	Pipe	1,100' n/o Cartmill Ave	300' e/o J St to 900' e/o J St			B	--	54	New	600	235,000					235,000	100%	235,000	235,000	0
NC-2	Pipe	e/o J St	Cartmill Ave to n/o Cartmill Ave			B	--	48	New	1,720	599,000					599,000	100%	599,000	599,000	0
NC-3	Pipe	800' e/o J St	Cartmill Ave to s/o Cartmill Ave			B	--	42	New	1,450	442,000					442,000	100%	442,000	442,000	0
NC-4	Pipe	1,100' n/o Cartmill Ave	800' e/o J St to Oaks St			B	--	30	New	1,700	370,000					370,000	100%	370,000	370,000	0
NC-5	Pipe	900' e/o J St	1,100' n/o Cartmill Ave to 2,500' n/o Cartmill Ave			B		48	New	1,400	488,000					488,000	100%	488,000	488,000	0
NC-6	Pipe	2,500' n/o Cartmill Ave	1,100' e/o J St to 600' e/o J St			B		42	New	500	152,000					152,000	100%	152,000	152,000	0
NC-7	Pipe	600' e/o J St	2,600' s/o Oakdale Ave to 900' s/o Oakdale Ave			B		36	New	1,700	444,000					444,000	100%	444,000	444,000	0
NC-8	Force Main	1,100' n/o Cartmill Ave	Force Main from North Pump Commercial Station (NC-PS)			B	--	24	New	200	35,000					35,000	100%	35,000	35,000	0
NC-B	Detention Basin	1,100' n/o Cartmill Ave	Proposed North Commercial Basin			--	--	40 acre-ft	New	--	1,071,000					1,071,000	100%	1,071,000	1,071,000	0
NC-B2	Detention Basin	Highway 99	Grade separation pond			--	--	26 acre-ft	New	--	772,000					772,000	100%	772,000	772,000	0
NC-PS	Pump Station	1,100' n/o Cartmill Ave	North Commercial PS (Class II discharge from North Commerc. Basin)			--	--	16.5 cfs	New	--	1,493,000					1,493,000	100%	1,493,000	1,493,000	0
Northwest Subbasin																				
NW-1	Pipe	Gail Street	Northwest Basin to 1,300' w/o West St			B	--	54	New	2,600	1,019,000					1,019,000	100%	1,019,000	1,019,000	0
NW-2	Pipe	Gail Street	Northwest Basin to 1,300' e/o Enterprise St			B	--	54	New	1,300	509,000					509,000	100%	509,000	509,000	0
NW-3	Pipe	1,300' e/o Enterprise St	Gail St to Zumwalt Ave			B	--	42	New	1,300	396,000					396,000	100%	396,000	396,000	0
NW-4	Pipe	1,300' e/o Enterprise St	Zumwalt Ave to 1,300' n/o Zumwalt Ave			B	--	36	New	1,300	340,000					340,000	100%	340,000	340,000	0
NW-5	Pipe	Enterprise Street	Gail St to Zumwalt Ave			B	--	48	New	1,300	453,000					453,000	100%	453,000	453,000	0
NW-6	Pipe	Enterprise Street	Zumwalt Ave to 1,300' n/o Zumwalt Ave			B	--	42	New	1,200	366,000					366,000	100%	366,000	366,000	0
NW-7	Pipe	1,300' w/o West St	Gail St to Zumwalt Ave			B	--	48	New	1,400	488,000					488,000	100%	488,000	488,000	0
NW-8	Pipe	1,300' w/o West St	Zumwalt Ave to 1,300' n/o Zumwalt Ave			B	--	42	New	1,300	396,000					396,000	100%	396,000	396,000	0
NW-9	Pipe	Zumwalt Avenue	1,300' e/o Enterprise St to 2,600' e/o Enterprise St			B	--	30	New	1,300	283,000					283,000	100%	283,000	283,000	0
NW-10	Force Main	Gail Street	Force Main from Northwest Pump Station (NW-PS)			B	--	30	New	200	44,000					44,000	100%	44,000	44,000	0
NW-B	Detention Basin	Gail Street	Proposed Northwest Basin			--	--	90 acre-ft	New	--	1,984,000					1,984,000	100%	1,984,000	1,984,000	0
NW-PS	Pump Station	Gail Street	Northwest Pump Station (Class II discharge from Northwest Basin)			--	--	28.0 cfs	New	--	2,533,000					2,533,000	100%	2,533,000	2,533,000	0
Palm Ranch Subbasin																				
PR-1	Pipe	s/o State Highway 137	1,500' w/o Oakmore St to Oakmore St			A	--	30	New	1,500	653,000	653,000					100%	653,000	653,000	0
PR-2	Force Main	s/o Alpine Avenue	Palm Ranch Pump Station Force Main (PR-PS)			A	--	21	New	1,800	549,000	549,000					100%	549,000	549,000	0
PR-PS	Pump Station	s/o Alpine Avenue	Palm Ranch Pump Station (Class II discharge from existing Basin 31)			--	--	11.5 cfs	New	--	1,041,000	1,041,000					100%	1,041,000	1,041,000	0
Parkwood Meadows No. 1 Subbasin																				
PM1-1	Pipe	Oakwood St Extension	Vetter St to 300' e/o Vetter St			B	--	15	New	300	36,000	36,000					100%	36,000	36,000	0
PM1-2	Pipe	Old Town St Extension	Vetter St to 300' e/o Vetter St			B	--	15	New	300	36,000	36,000					100%	36,000	36,000	0
Parkwood Meadows No. 2 Subbasin																				
PM2-1	Pipe	E Street	Basin 24 to Lemonwood Ave			A	12	24	Replace	300	104,000	104,000					100%	104,000	104,000	0
PM2-2	Pipe	Lemonwood Avenue	E St to 200' w/o Applewood St			A	--	21	New	700	213,000	213,000					100%	213,000	213,000	0
PM2-3	Pipe	200' w/o Applewood St	Lemonwood St to 800' s/o Lemonwood St			B	--	21	New	800	122,000	122,000					100%	122,000	122,000	0
PM2-4	Pipe	Peachwood Avenue	Basin 24 to 600' e/o E St			B	--	24	New	500	87,000		87,000				100%	87,000	87,000	0
PM2-5	Pipe	600' e/o E St	Peachwood Ave to 650' n/o Paige Ave			B	--	21	New	1,000	152,000		152,000				100%	152,000	152,000	0
PM2-6	Pipe	600' e/o E St	Peachwood Ave to 400' n/o Peachwood Ave			B	--	21	New	400	61,000		61,000				100%	61,000	61,000	0
PM2-7	Force Main	E Street	Force Main from Parkwood Meadows 2 Pump Station (PM2-PS)			A	--	12	New	100	19,000	19,000					100%	19,000	19,000	0
PM2-B	Detention Basin	E Street	Proposed Basin 24 Expansion			--	5 acre-ft	14 acre-ft	Expand	--	482,000	482,000					100%	482,000	482,000	0
PM2-PS	Pump Station	E Street	Parkwood Meadows 2 Pump Station (Class II discharge from Basin 24)			--	--	3.5 cfs	New	--	317,000	317,000					100%	317,000	317,000	0
Pleasant Oak Subbasin																				
PO-1	Pipe	Pleasant Avenue	Denair St to 700' e/o Denair St			A	--	12	New	700	134,000	134,000					100%	134,000	134,000	0
PO-2	Pipe	w/o West Street	Pleasant Ave to 500' n/o Pleasant Ave			A	--	21	New	500	152,000	152,000					100%	152,000	152,000	0
PO-B	Detention Basin	Pleasant Avenue	Pleasant Oak Basin			--	--	3 acre-ft	New	--	150,000	150,000					100%	150,000	150,000	0
Pratt/Bardsley Subbasin																				
PB-1	Pipe	200' n/o Dogwood Ave	600' e/o Pratt St to 1,100' e/o Pratt St			B	--	42	New	500	152,000	152,000					100%	152,000	152,000	0
PB-2	Pipe	600' e/o Pratt St	200' n/o Dogwood Ave to 1,500' n/o Dogwood Avenue			B	--	36	New	1,300	340,000	340,000					100%	340,000	340,000	0
PB-3	Pipe	600' e/o Pratt St	1,500' n/o Dogwood Avenue to 600' s/o Bardsley Ave			B	--	30	New	1,300	283,000		283,000				100%	283,000	283,000	0
PB-4	Pipe	600' s/o Bardsley Ave	600' e/o Pratt St to 700' w/o Pratt St			B	--	24	New	1,300	226,000		226,000				100%	226,000	226,000	0
PB-5	Pipe	300' e/o Pratt St	600' s/o Dogwood Ave to 1,500' n/o Dogwood Ave			B	--	24	New	1,100	192,000	192,000					100%	192,000	192,000	0
PB-6	Force Main	200' n/o Dogwood Ave	Force Main from West/Paige Pump Station (WP-PS)			B	--	12	New	200	19,000	19,000					100%	19,000	19,000	0
PB-B	Detention Basin	200' n/o Dogwood Ave	Proposed West/Paige Basin			--	--	15 acre-ft	New	--	508,000	508,000					100%	508,000	508,000	0
PB-PS	Pump Station	200' n/o Dogwood Ave	West/Paige Pump Station (Class II discharge from West/Paige Basin)			--	--	4.0 cfs	New	--	362,000	362,000					100%	362,000	362,000	0

Table 6.2 Capital Improvement Program
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Pipeline Unit Cost Schedule [4] (A or B)	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)	Capital Improv. Cost [3] ($)	Capital Improvement Schedule					Financing			
												Phase I 2009-11 ($)	Phase II 2012-15 ($)	Phase III 2015-20 ($)	Phase IV 2020-25 ($)	Phase V 2025-2030 ($)	Future Users Benefit (%)	Total Capital Cost ($)	Future Users Cost ($)	Existing Users Cost ($)
Southeast Subbasin																				
SE-1	Pipe	Levin Avenue	Basin 30 to 700' w/o Basin 30			B	--	36	New	1,800	470,000		470,000				100%	470,000	470,000	0
SE-2	Pipe	Nelder Grove Street	Levin Ave to Azalea Ave			B	--	36	New	1,300	340,000		340,000				100%	340,000	340,000	0
SE-3	Pipe	Levin Avenue	900' e/o Mooney Blvd to Mooney Blvd			B	--	24	New	900	157,000		157,000				100%	157,000	157,000	0
SE-4	Pipe	Morrison Street	Basin 30 to 1,000' s/o Levin Ave			B	--	54	New	1,000	392,000		392,000				100%	392,000	392,000	0
SE-5	Pipe	Foster Dr Extension	Dover Canyon St to Morrison St			B	--	48	New	2,200	766,000		766,000				100%	766,000	766,000	0
SE-6	Pipe	Morrison Street	1,000' s/o Levin Ave to 3,200' s/o Levin Ave			B	--	54	New	2,200	862,000				862,000		100%	862,000	862,000	0
SE-7	Pipe	Morrison Street	3,200' s/o Levin Ave to 4,300' s/o Levin Ave			B	--	48	New	1,100	383,000				383,000		100%	383,000	383,000	0
SE-8	Pipe	Morrison Street	4,300' s/o Levin Ave to 4,900' s/o Levin Ave			B	--	42	New	600	183,000				183,000		100%	183,000	183,000	0
SE-9	Pipe	1,200 s/o Levin Ave	Morrison St to 2,200' e/o Morrison St			B	--	36	New	2,200	575,000				575,000		100%	575,000	575,000	0
SE-10	Pipe	1,200 s/o Levin Ave	2,200' e/o Morrison St to the College of the Sequoias PS (SE-PS2)			B	--	30	New	1,100	239,000				239,000		100%	239,000	239,000	0
SE-11	Pipe	3,900' e/o Morrison St	College of the Sequoias Basin to 1,200' s/o Levin Ave			B	--	54	New	800	313,000			313,000			100%	313,000	313,000	0
SE-12	Pipe	3,900' e/o Morrison St	1,200' s/o Levin Ave to Levin Ave Extension			B	--	54	New	1,400	549,000			549,000			100%	549,000	549,000	0
SE-13	Pipe	3,900' e/o Morrison St	Levin Ave Extension to 1,200' n/o Levin Ave Extension			B	--	48	New	1,200	418,000			418,000			100%	418,000	418,000	0
SE-14	Pipe	1,200 s/o Levin Ave	3,900' e/o Morrison St to 2,700' w/o Road 132			B	--	42	New	1,300	396,000			396,000			100%	396,000	396,000	0
SE-15	Pipe	1,200 s/o Levin Ave	2,700' w/o Road 132 to 1,400' w/o Road 132			B	--	36	New	1,300	340,000			340,000			100%	340,000	340,000	0
SE-16	Pipe	Levin Avenue Extension	3,900' e/o Morrison St to 2,700' w/o Road 132			B	--	42	New	1,200	366,000			366,000			100%	366,000	366,000	0
SE-17	Pipe	Levin Avenue Extension	2,700' w/o Road 132 to 1,400' w/o Road 132			B	--	36	New	1,300	340,000			340,000			100%	340,000	340,000	0
SE-18	Pipe	1,200' n/o Levin Ave Ext	3,900' e/o Morrison St to 2,700' w/o Road 132			B	--	48	New	1,300	453,000			453,000			100%	453,000	453,000	0
SE-19	Pipe	1,200' n/o Levin Ave Ext	2,700' w/o Road 132 to 1,400' w/o Road 132			B	--	42	New	1,100	335,000			335,000			100%	335,000	335,000	0
SE-20	Pipe	3,200' s/o Levin Ave	Morrison St to 1,100' e/o Morrison St			B	--	42	New	1,100	335,000				335,000		100%	335,000	335,000	0
SE-21	Pipe	1,100' e/o Morrison St	3,200' s/o Levin Ave to 4,300' s/o Levin Ave			B	--	36	New	1,100	287,000				287,000		100%	287,000	287,000	0
SE-22	Pipe	4,300' s/o Levin Ave	Morrison St to 900' w/o Morrison St			B	--	42	New	900	274,000				274,000		100%	274,000	274,000	0
SE-23	Pipe	Bardsley Avenue	Morrison St to 1,000' e/o Morrison St			B	--	24	New	1,000	174,000			174,000			100%	174,000	174,000	0
SE-24	Pipe	Bardsley Avenue	1,000' e/o Morrison St to Oakmore St			B	--	42	New	1,200	366,000				366,000		100%	366,000	366,000	0
SE-25	Pipe	Bardsley Avenue	Oakmore St to 1,300' e/o Oakmore St			B	--	36	New	1,300	340,000				340,000		100%	340,000	340,000	0
SE-26	Pipe	Bardsley Avenue	1,300' e/o Oakmore St to 2,600' e/o Oakmore St			B	--	30	New	1,300	283,000				283,000		100%	283,000	283,000	0
SE-27	Pipe	Morrison Street	Bardsley Ave to 1,000' n/o Bardsley Ave			B	--	24	New	1,000	174,000			174,000			100%	174,000	174,000	0
SE-28	Pipe	1,000' e/o Morrison St	Bardsley Ave to 1,100' n/o Bardsley Ave			B	--	24	New	1,100	192,000				192,000		100%	192,000	192,000	0
SE-29	Pipe	Oakmore Street	Bardsley Ave to 1,100' n/o Bardsley Ave			B	--	36	New	1,300	340,000				340,000		100%	340,000	340,000	0
SE-30	Pipe	Oakmore Street	1,100' n/o Bardsley Ave to 3,100' n/o Bardsley Ave			B	--	30	New	2,000	435,000				435,000		100%	435,000	435,000	0
SE-31	Pipe	1,400' w/o Road 132	1,200' n/o Levin Ave Ext to Bardsley Ave			B	--	36	New	1,200	313,000				313,000		100%	313,000	313,000	0
SE-32A	Force Main	Levin Avenue	Dual Force Main for Southeast Pump Station (SE-PS1)			B	--	21	New	2,300	350,000		350,000				100%	350,000	350,000	0
SE-32B	Force Main	Levin Avenue	Dual Force Main for Southeast Pump Station (SE-PS1)			B	--	21	New	2,300	350,000		350,000				100%	350,000	350,000	0
SE-33	Force Main	1,200' s/o Levin Ave	Force Main for College of the Sequoias Pump Station (SE-PS2)			B	--	21	New	600	91,000		91,000				100%	91,000	91,000	0
SE-B1	Detention Basin	Levin Avenue	Proposed Expansion of Basin 30			--	--	100 acre-ft	Expand	--	2,149,000		2,149,000				100%	2,149,000	2,149,000	0
SE-B2	Detention Basin	1,200' s/o Levin Ave	Proposed College of the Sequoias Basin 1			--	--	55 acre-ft	New	--	1,364,000		1,364,000				100%	1,364,000	1,364,000	0
SE-B3	Detention Basin	Bardsley Avenue	Proposed Southeast Basin			--	--	20 acre-ft	New	--	632,000				632,000		100%	632,000	632,000	0
SE-B4	Detention Basin	1,200' n/o Levin Ave Ext	Proposed College of the Sequoias Basin 2			--	--	12 acre-ft	New	--	429,000				429,000		100%	429,000	429,000	0
SE-PS1	Pump Station	Levin Avenue	Southeast Pump Station (Class II discharge from Basin 30)			--	--	30.0 cfs	New	--	2,714,000		2,714,000				100%	2,714,000	2,714,000	0
SE-PS2	Pump Station	1,200' s/o Levin Ave	College of the Sequoias Pump Station (Class III, pumps following storm)			--	--	14.0 cfs	New	--	1,267,000			1,267,000			100%	1,267,000	1,267,000	0
Southeast Commercial Subbasin																				
SEC-1	Pipe	500' n/o Elk Bayou	SEC-B1 to 4,600' w/o Road 124			B	--	54	New	3,000	1,175,000		1,175,000				100%	1,175,000	1,175,000	0
SEC-2	Pipe	4,600' w/o Road 124	500' n/o Elk Bayou to 1,900' n/o Elk Bayou			B	--	48	New	1,400	488,000		488,000				100%	488,000	488,000	0
SEC-3	Pipe	4,600' w/o Road 124	1,900' n/o Elk Bayou to 4,100' n/o Elk Bayou			B	--	42	New	2,200	670,000		670,000				100%	670,000	670,000	0
SEC-4	Pipe	3,400' n/o Hosfield	4,600' w/o Road 124 to 5,900' w/o Road 124			B	--	42	New	1,300	396,000		396,000				100%	396,000	396,000	0
SEC-5	Pipe	3,400' ne/o Laspina St	2,600' nw/o Elk Bayou to 3,700' nw/o Elk Bayou			B	--	36	New	1,100	287,000		287,000				100%	287,000	287,000	0
SEC-6	Pipe	4,600' n/o Hosfield	4,600' w/o Road 124 to 5,900' w/o Road 124			B	--	30	New	1,300	283,000		283,000				100%	283,000	283,000	0
SEC-7	Pipe	5,900' se/o Foster Dr	3,100' sw/o Road 124 to 1,900' sw/o Road 124			B	--	54	New	1,200	470,000		470,000				100%	470,000	470,000	0
SEC-8	Pipe	5,900' se/o Foster Dr	1,900' sw/o Road 124 to 700' sw/o Road 124			B	--	48	New	1,200	418,000		418,000				100%	418,000	418,000	0
SEC-9	Pipe	700' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr			B	--	42	New	1,300	396,000		396,000				100%	396,000	396,000	0
SEC-10	Pipe	700' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr			B	--	36	New	1,100	287,000		287,000				100%	287,000	287,000	0
SEC-11	Pipe	3,100' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr			B	--	42	New	1,300	396,000		396,000				100%	396,000	396,000	0
SEC-12	Pipe	3,100' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr			B	--	36	New	1,100	287,000		287,000				100%	287,000	287,000	0
SEC-13	Pipe	1,900' sw/o Road 124	5,900' se/o Foster Dr to 4,600' se/o Foster Dr			B	--	42	New	1,300	396,000		396,000				100%	396,000	396,000	0
SEC-14	Pipe	1,900' sw/o Road 124	4,600' se/o Foster Dr to 3,500' se/o Foster Dr			B	--	36	New	1,100	287,000		287,000				100%	287,000	287,000	0
SEC-15	Pipe	6,100' w/o Road 124	700' n/o Hosfield to 2,000' n/o Hosfield			B	--	30	New	1,300	283,000		283,000				100%	283,000	283,000	0
SEC-16	Pipe	500' n/o Elk Bayou	4,600' w/o Road 124 to 3,400' w/o Road 124			B	--	36	New	1,900	496,000		496,000				100%	496,000	496,000	0
SEC-17	Pipe	500' n/o Elk Bayou	3,400' w/o Road 124 to 2,100' w/o Road 124			B	--	30	New	1,300	283,000				283,000		100%	283,000	283,000	0
SEC-18	Pipe	3,400' w/o Road 124	500' n/o Elk Bayou to 1,800' n/o Elk Bayou			B	--	30	New	1,300	283,000		283,000				100%	283,000	283,000	0
SEC-19	Pipe	n/o Elk Bayou-w/o Road 124	SEC-B3 to 5,300' n/o Hosfield			B	--	36	New	2,200	575,000				575,000		100%	575,000	575,000	0
SEC-20	Pipe	2,100' w/o Road 124	SEC-B3 to 6,200' n/o Hosfield			B	--	36	New	2,200	575,000				575,000		100%	575,000	575,000	0

Table 6.2 Capital Improvement Program
Storm Drainage System Master Plan
City of Tulare

Improvement No.	Type of Improv.	Description/ Street	Description / Limits	Existing System Improv.	Removal of Storm Drain from Sewer	Pipeline Unit Cost Schedule [4] (A or B)	Ex. Size/ Diam. (in)	New Size/ Diam. (in)	Parallel/ Replace/ New	Length (ft)	Capital Improv. Cost [3] ($)	Capital Improvement Schedule					Financing			
												Phase I 2009-11 ($)	Phase II 2012-15 ($)	Phase III 2015-20 ($)	Phase IV 2020-25 ($)	Phase V 2025-2030 ($)	Future Users Benefit (%)	Total Capital Cost ($)	Future Users Cost ($)	Existing Users Cost ($)
SEC-21A	Force Main	n/o Hosfield	Dual Force Main for Southeast Commercial Pump Station (SEC-PS)			B	--	21	New	300	46,000		46,000				100%	46,000	46,000	0
SEC-21B	Force Main	n/o Hosfield	Dual Force Main for Southeast Commercial Pump Station (SEC-PS)			B	--	21	New	300	46,000		46,000				100%	46,000	46,000	0
SEC-B1	Detention Basin	n/o Hosfield	Proposed Southeast Commercial Basin 1			--	--	115 acre-ft	New	--	2,390,000		2,390,000				100%	2,390,000	2,390,000	0
SEC-B2	Detention Basin	5,900' se/o Foster Dr	Proposed Southeast Commercial Basin 2			--	--	35 acre-ft	New	--	968,000		968,000				100%	968,000	968,000	0
SEC-B3	Detention Basin	2,200' w/o Road 124	Proposed Southeast Commercial Basin 3			--	--	25 acre-ft	New	--	749,000					749,000	100%	749,000	749,000	0
SEC-PS	Pump Station	n/o Hosfield	Southeast Commercial PS (Class II discharge from SE Commercial Basin 1)			--	--	30.0 cfs	New	--	2,714,000		2,714,000				100%	2,714,000	2,714,000	0
Sunrise Subbasin																				
SR-1	Pipe	1,200' se/o Foster Dr	1,600' sw/o Sunrise St to Basin 19			B	--	54	New	800	313,000			313,000			100%	313,000	313,000	0
SR-2	Pipe	1,600' sw/o Sunrise St	1,200' se/o Foster Dr to 2,000' se/o Foster Dr			B	--	54	New	800	313,000			313,000			100%	313,000	313,000	0
SR-3	Pipe	1,100' se/o Laspina St	1,600' sw/o Sunrise St to 2,600' sw/o Sunrise St			B	--	48	New	1,000	348,000				348,000		100%	348,000	348,000	0
SR-4	Pipe	700' se/o Laspina St	2,600' sw/o Sunrise St to 3,600' sw/o Laspina St			B	--	42	New	900	274,000				274,000		100%	274,000	274,000	0
SR-5	Pipe	1,600' sw/o Sunrise St	1,400' se/o Foster Dr to 500' se/o Foster Dr			B	--	30	New	900	196,000			196,000			100%	196,000	196,000	0
SR-6	Pipe	1,600' sw/o Sunrise St	2,700' se/o Foster Dr to 2,200' se/o Foster Dr			B	--	24	New	1,200	209,000				209,000		100%	209,000	209,000	0
SR-7	Force Main	w/o Elsinore Street	Force Main from Sunrise Pump Station (SR-PS)			A	--	21	New	2,200	670,000				670,000		100%	670,000	670,000	0
SR-B	Detention Basin	w/o Elsinore Street	Expand Existing Basin 19			--	20 acre-ft	55 acre-ft	Expand	--	1,364,000				1,364,000		100%	1,364,000	1,364,000	0
SR-PS	Pump Station	w/o Elsinore Street	Sunrise Pump Station (Class II discharge from Basin 19)			--	--	14.0 cfs	New	--	1,267,000			1,267,000			100%	1,267,000	1,267,000	0
Terrace Park Subbasin																				
TP-1	Pipe	Kohn Avenue	Aronian St to Laspina St	X	X	A	--	21	Replace/New	1,300	396,000		396,000				0%	396,000	0	396,000
TP-2	Pipe	Laspina Street	Kohn Ave to 400' n/o Kohn Ave	X	X	A	--	15	New	400	96,000		96,000				0%	96,000	0	96,000
TP-3	Pipe	Laspina Street	Kohn Ave to Sonora Ave	X	X	A	--	15	New	300	72,000		72,000				0%	72,000	0	72,000
TP-4	Force Main	Marvin Avenue	Force Main for Terrace Park Pump Station (TP-PS)	X		A	--	15	New	200	48,000		48,000				0%	48,000	0	48,000
TP-PS	Pump Station	Marvin Avenue	Terrace Park Pump Station (Class II discharge from Basin 49)	X		--	--	5.0 cfs	New	--	452,000		452,000				0%	452,000	0	452,000
West No. 1 Subbasin																				
W1-1	Pipe	Enterprise Street	Tulare Ave to 1,200' n/o Tulare Ave			B	--	48	New	1,200	418,000			418,000			100%	418,000	418,000	0
W1-2	Pipe	Enterprise Street	1,200' n/o Tulare Ave to Pleasant Ave			B	--	42	New	1,500	457,000				457,000		100%	457,000	457,000	0
W1-3	Pipe	Enterprise Street	Pleasant Ave to 1,400' n/o Pleasant Ave			B	--	36	New	1,400	366,000				366,000		100%	366,000	366,000	0
W1-4	Pipe	Enterprise Street	1,300' s/o Prosperity Ave to 500' s/o Prosperity Ave			B	--	30	New	800	174,000				174,000		100%	174,000	174,000	0
W1-5	Pipe	1,200' n/o Tulare Ave	Enterprise St to 1,100' e/o Enterprise St			B	--	30	New	1,100	239,000			239,000			100%	239,000	239,000	0
W1-6	Pipe	1,200' n/o Tulare Ave	1,100' e/o Enterprise St to 2,100' e/o Enterprise St			B	--	24	New	1,000	174,000			174,000			100%	174,000	174,000	0
W1-7	Force Main	Tulare Avenue	Force Main from West No. 1 Pump Station (W1-PS)			B	--	15	New	800	96,000				96,000		100%	96,000	96,000	0
W1-B	Detention Basin	Enterprise Street	Proposed West No. 1 Basin			--	--	30 acre-ft	New	--	861,000			861,000			100%	861,000	861,000	0
W1-PS	Pump Station	Enterprise Street	West No. 1 Pump Station (Class II discharge from West No. 1 Basin)			--	--	7.5 cfs	New	--	679,000			679,000			100%	679,000	679,000	0
West No. 2 Subbasin																				
W2-1	Pipe	1,300' s/o Tulare Ave	1,300' e/o Enterprise St to Enterprise St			B	--	42	New	1,300	396,000			396,000			100%	396,000	396,000	0
W2-2	Pipe	Enterprise Street	1,300' s/o Tulare Ave to Inyo Ave			B	--	36	New	1,400	366,000			366,000			100%	366,000	366,000	0
W2-3	Pipe	Enterprise Street	Inyo Ave to 800' s/o Inyo Ave			B	--	30	New	800	174,000			174,000			100%	174,000	174,000	0
W2-4	Pipe	Enterprise Street	1,300' s/o Tulare Ave to 600' s/o Tulare Ave			B	--	30	New	700	152,000			152,000			100%	152,000	152,000	0
W2-5	Pipe	1,300' s/o Tulare Ave	1,300' e/o Enterprise St to 2,600' e/o Enterprise St			B	--	21	New	1,300	198,000			198,000			100%	198,000	198,000	0
W2-6	Force Main	1,300' e/o Enterprise St	Force Main from West No. 2 Pump Station (W2-PS)			B	--	15	New	1,300	156,000			156,000			100%	156,000	156,000	0
W2-B	Detention Basin	1,300' e/o Enterprise St	Proposed West No. 2 Basin			--	--	30 acre-ft	New	--	861,000			861,000			100%	861,000	861,000	0
W2-PS	Pump Station	1,300' e/o Enterprise St	West No. 2 Pump Station (Class II discharge from West No. 2 Basin)			--	--	7.5 cfs	New	--	679,000			679,000			100%	679,000	679,000	0
Westgate Subbasin																				
WG-1	Pipe	n/o Inyo Ave	Connection between existing 21" storm drains			B	--	21	New	380	58,000		58,000				100%	58,000	58,000	0
Total City of Tulare CIP																				
										Total City of Tulare CIP	**166,122,000**	**17,234,000**	**46,035,000**	**41,945,000**	**35,364,000**	**25,544,000**		**166,122,000**	**120,266,000**	**45,856,000**

Notes:
1. Proposed casings size and carrier pipe size.
2. Estimated Construction Cost is Baseline Construction Cost plus 30% to account for unforeseen events and unknown conditions.
3. Capital Improvement Cost is Estimated Construction Cost plus 20% to cover other costs including Engineering, Administation, Construction Inspection, and Legal Costs.
4. Separate pipeline unit costs were developed for "Developed Areas" (Schedule A) and and "Undeveloped Areas" (Schedule B).

6.3.2 Estimated Construction Cost

Since knowledge about site-specific conditions of each proposed project is limited at the master planning stage, a 30 percent contingency was applied to the Baseline Construction Cost to account for unforeseen events and unknown conditions.

The Estimated Construction Cost for the proposed improvement consists of the Baseline Construction Cost plus the construction contingency.

6.3.3 Capital Improvement Cost

Other project-related costs have been identified and estimated at 20 percent of the Estimated Construction Costs. These costs include engineering, administration, construction inspection, and legal costs.

The Capital Improvement Cost for each proposed improvement is the total of the Estimated Construction Cost (including contingency) plus the other costs discussed in the previous paragraph.

An example calculation to determine the Capital Improvement Cost is provided as follows:

Example Calculation:

Given:

Baseline Construction Cost = $1,000,000

Required:

Capital Improvement Cost

Solution:

Estimated Construction Cost = (Baseline Construction Cost) x (1 + 0.30)

Estimated Construction Cost = ($1,000,000) x (1 + 0.30)

Estimated Construction Cost = $1,300,000

Capital Improvement Cost = (Estimated Construction Cost) x (1 + 0.20)

Capital Improvement Cost = ($1,300,000) x (1+ 0.20)

Capital Improvement Cost = $1,560,000

6.3.4 Capital Improvement Schedule

The CIP costs were prioritized based on their urgency to meet existing deficiencies and for servicing anticipated growth. It is recommended that improvements to mitigate existing deficiencies be constructed as soon as possible. Due to the number of existing improvements, however, projects to mitigate existing deficiencies should be spread out over several phases. The recommended improvements to serve future growth have a significant

total capital cost that is best distributed based on the order in which the City will develop. The master plan CIP utilizes the following phases:

- Phase I. This short-term phase includes improvements that are allocated between 2009 and 2011.
- Phase II. This intermediate phase includes improvements that are allocated between 2012 and 2015.
- Phase III. This intermediate phase includes improvements that are allocated between 2016 and 2020.
- Phase IV. This long-term phase includes improvements that are allocated between 2021 and 2025.
- Phase V. This long-term phase includes improvements that are allocated between 2026 and 2030.

Table 6.3 summarizes the master plan capital improvement costs by phase and improvement type.

Table 6.3 Capital Improvement Schedule Storm Drainage System Master Plan City of Tulare

Improv. Type	Cost (million dollars)					
	Phase I (2009-2011)	**Phase II (2012-2015)**	**Phase III (2016-2020)**	**Phase IV (2021-2025)**	**Phase V (2026-2030)**	**Total**
Pipelines[(1)]	10.5	30.4	22.4	22.0	16.4	**101.7**
Retention/ Detention Basins	2.3	7.6	8.0	8.4	5.1	**31.4**
Pump Stations	4.4	8.0	11.6	5.0	4.0	**33.0**
Total	**17.2**	**46.0**	**42.0**	**35.4**	**25.5**	**166.1**

Note:
1. Includes gravity storm drains, force mains, and pipeline casings.

6.4 USER BENEFIT AND COST ALLOCATION

The improvements in this master plan have been classified into two categories:

- Services benefiting existing users.
- Services necessitated by or benefiting new development.

An opinion of benefit to existing and future users, based on preliminary project information, was included in this master plan. Once estimates for specific projects are completed, a more precise allocation may be performed if required by the provisions of the California Government Code Section 66000 and AB1600.

Table 6.4 summarizes the master plan capital improvement costs by phase and user type.

Table 6.4 Capital Improvement Program – Existing and Future Users
Storm Drainage System Master Plan
City of Tulare

Customer Type	Cost (million dollars)					
	Phase I (2009-2011)	**Phase II (2012-2015)**	**Phase III (2016-2020)**	**Phase IV (2021-2025)**	**Phase V (2026-2030)**	**Total**
Existing[(1)]	17.2	21.1	7.5	0.0	0.0	**45.8**
Future	0.0	24.9	34.5	35.4	25.5	**120.3**
Total	**17.2**	**46.0**	**42.0**	**35.4**	**25.5**	**166.1**

Note:
1. Existing User costs have been distributed throughout several phases based on the project prioritizations presented in Chapter 5.

APPENDIX A - TULARE DESIGN STORM REPORT

May 21, 2007

From:
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To:
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Tulare Design Storm Report

METHODOLOGY

A literature search was made for precipitation records for the Tulare area. The best source of Depth-Duration-Frequency Data (DDF) was the California Department of Water Resources, ftp://ftp.water.ca.gov/users/dfmhydro/Rainfall%20Dept-Duration-Frequency/ Three stations were close enough to be considered representative of Tulare. These stations were Exeter, Visalia and Fresno (see Figure 1 and Table 1). Another station, Corcoran, ten miles to the southeast, exhibited lower values and indicated that the slightly lower values for Visalia were more representative of Tulare than the other two stations.

Log-normal probability graphs were constructed from the station data and shown in Figures 2-4. A composite curves of the Depth-Duration-Frequency (DDF) data were in turn fit to power equations of the form: ***Depth (inches)=a*time(hours)^b.***

RESULTS

Figure 5 shows the DDF curves for Tulare. Table 2 shows DDF for Tulare as power equations. Tables 3A-3G show recommended hourly distributions for 24-hour design storms. These distributions are balanced, symmetrical distributions as commonly used nationwide. Figures 6A-6F show plots of the distributions.

Table 1. Precipitation Station Data

	Dist from Tulare	Statio No	County	Lat	Long.	Elev.	Source		Yrs Rec	Slope	Intercept
Fresno AP	45.4 mi NW	C00 3257 00	Fresno	36.770	-119.717	331	HPD		102	0.326	0.488
Exeter	18.5 mi NE	C00 2922 00	Tulare	36.359	-119.079	439	HPD		49	0.422	0.434
Visalia 33	9.7 mi N	C00 9367 33	Tulare	36.301	-119.223	350	CIMIS	33	22	0.2806	0.542

FRESNO

	R 2	**RI 5**	**R 10**	**R 25**	**R 50**	**R 100**
1	0.45	0.64	0.77	0.93	1.05	1.16
2	0.56	0.80	0.96	1.16	1.30	1.45
3	0.62	0.89	1.07	1.30	1.46	1.62
6	0.80	1.15	1.38	1.67	1.88	2.09
12	1.01	1.44	1.73	2.09	2.36	2.62
24	1.19	1.71	2.05	2.48	2.80	3.11

EXETER

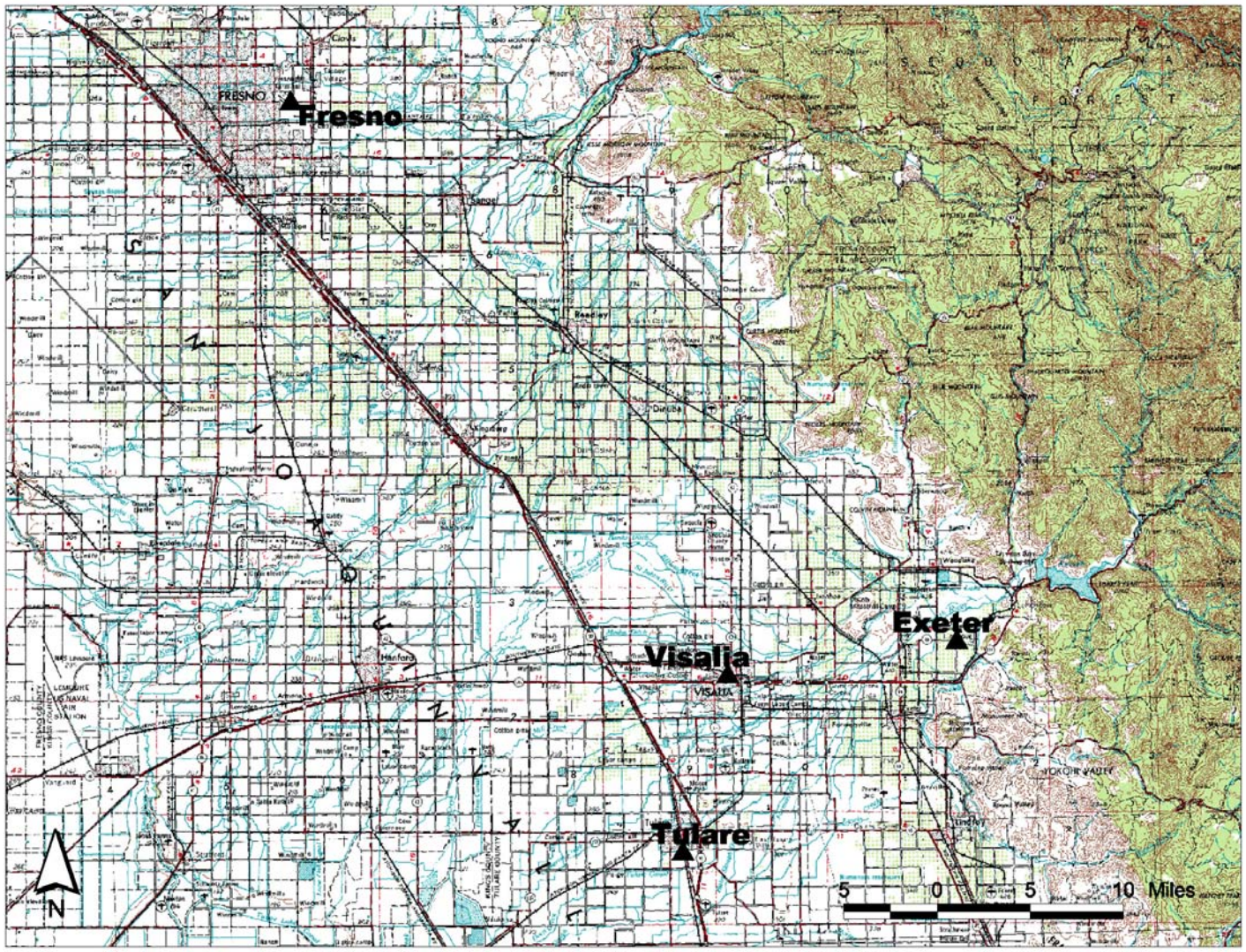
	R 2	**R 5**	**R 10**	**R 25**	**R50**	**R 100**
1	0.38	0.54	0.64	0.78	0.88	0.98
2	0.54	0.77	0.93	1.12	1.26	1.40
3	0.66	0.94	1.13	1.37	1.54	1.71
6	0.86	1.23	1.48	1.79	2.02	2.24
12	1.13	1.61	1.94	2.35	2.64	2.94
24	1.41	2.01	2.41	2.92	3.29	3.66

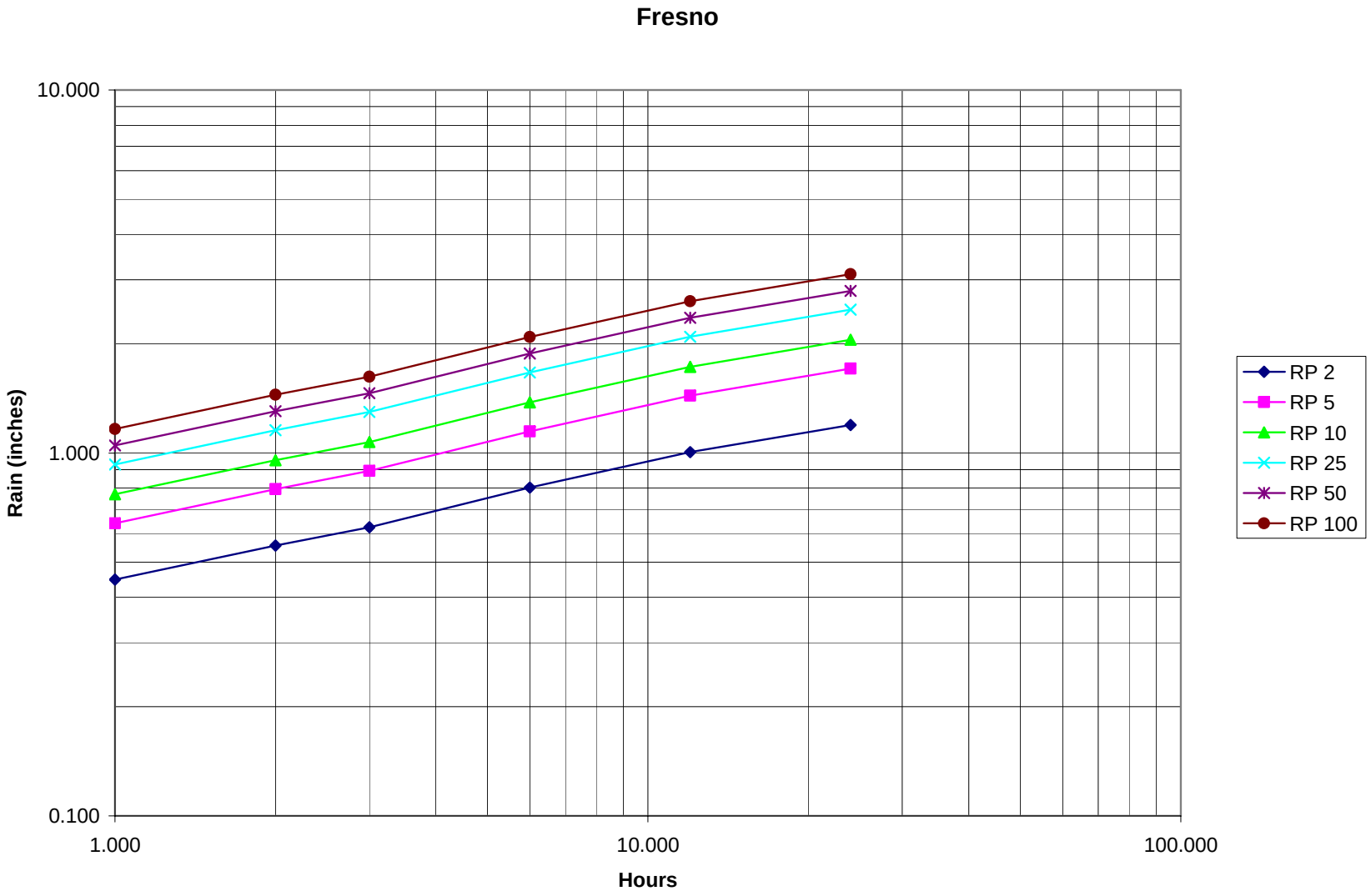
VISALIA 33

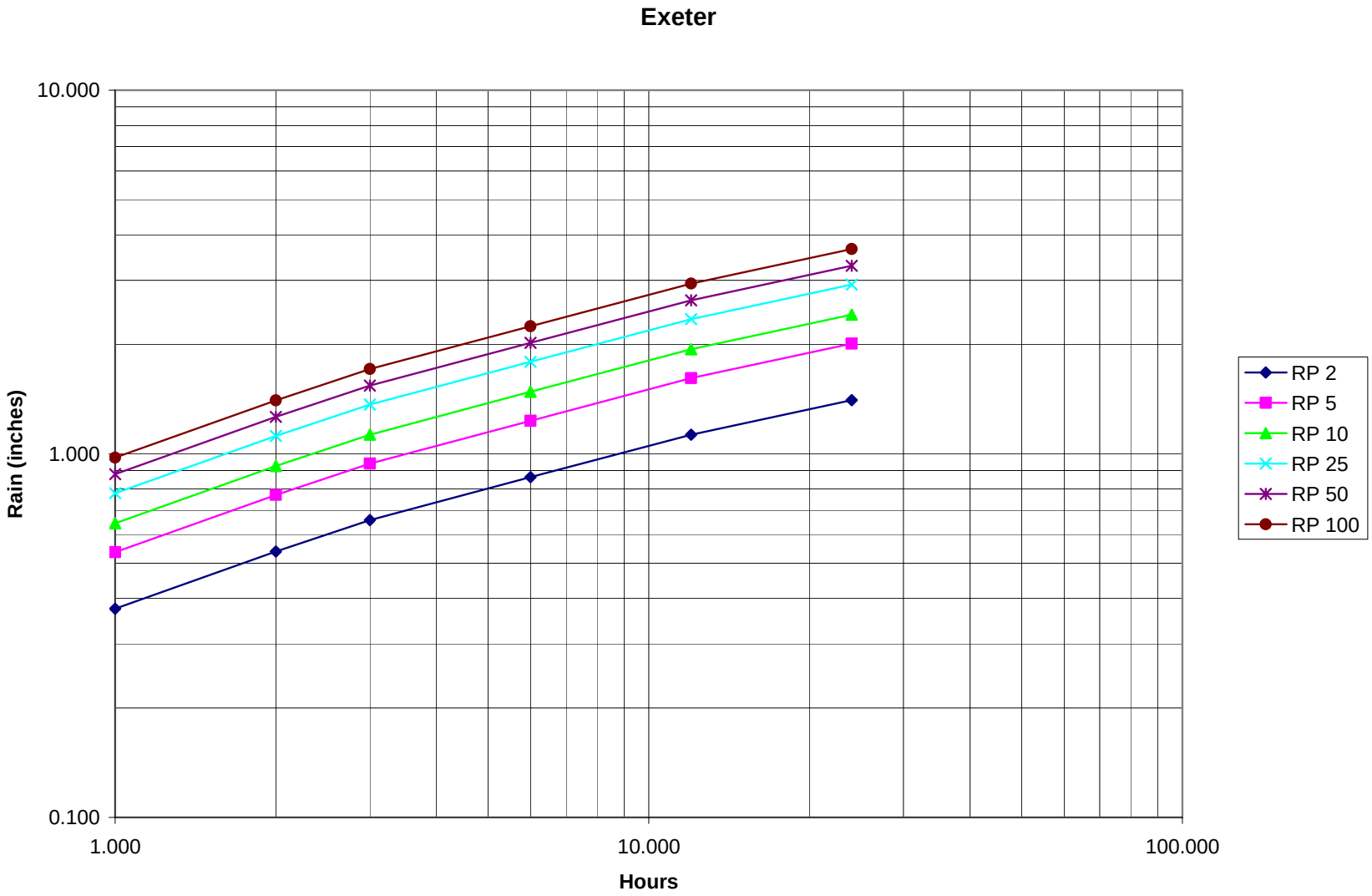
	R 2	**R 5**	**R 10**	**R 25**	**R 50**	**R 100**
1	0.48	0.69	0.83	1.00	1.13	1.25
2	0.58	0.84	1.00	1.21	1.37	1.52
3	0.66	0.95	1.14	1.38	1.55	1.73
6	0.81	1.16	1.39	1.68	1.90	2.11
12	0.96	1.37	1.65	2.00	2.25	2.50
24	1.17	1.67	2.01	2.43	2.74	3.04
48	1.38	2.03	2.48	3.05	3.47	3.88

TULARE

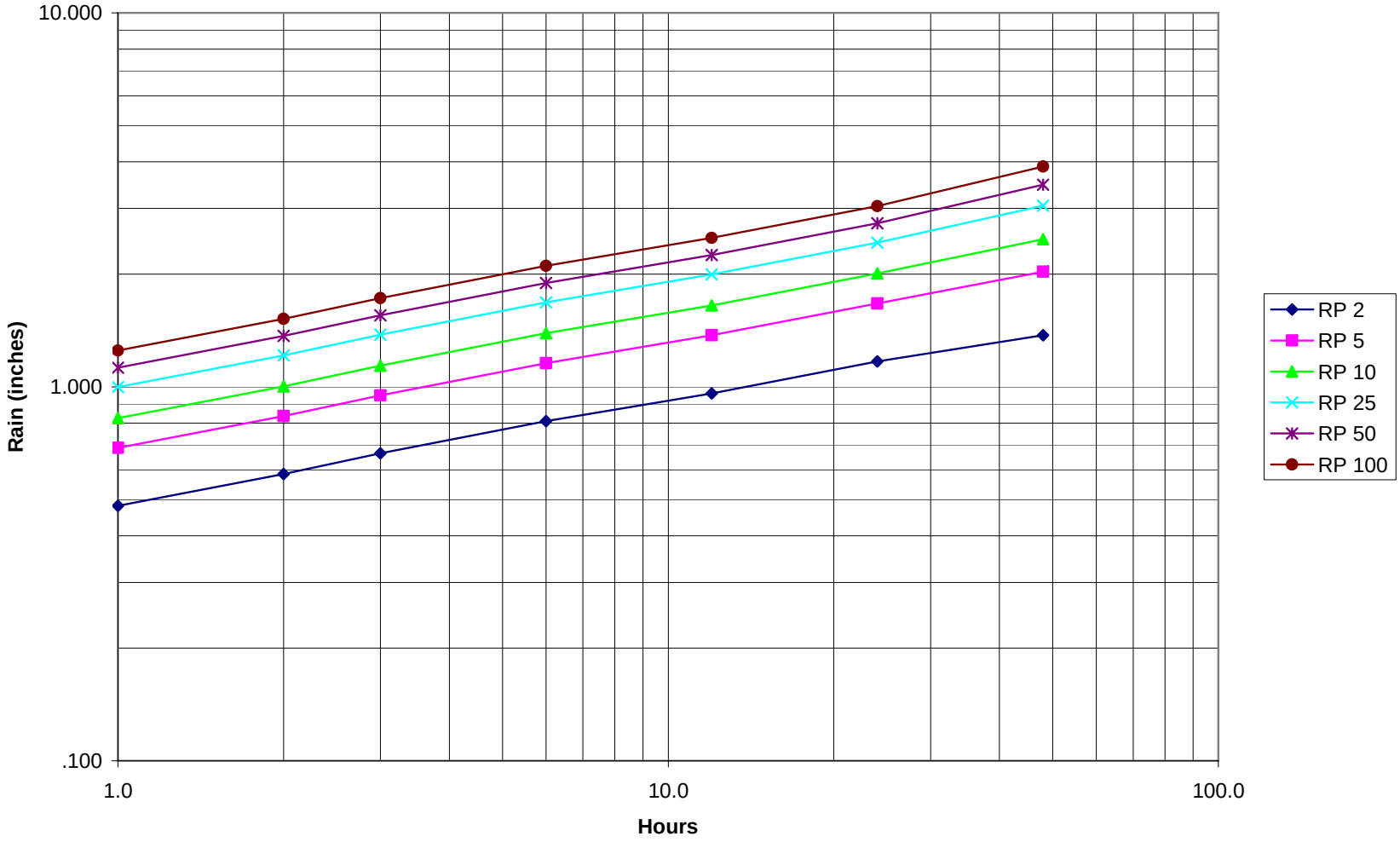
	R 2	R 5	R 10	R 25	R 50	R 100
1	0.45	0.64	0.77	0.93	1.05	1.16
2	0.55	0.79	0.95	1.15	1.3	1.44
3	0.62	0.89	1.07	1.3	1.47	1.63
6	0.76	1.09	1.32	1.61	1.83	2.03
12	0.92	1.34	1.63	1.99	2.26	2.52
24	1.13	1.65	2.01	2.47	2.8	3.13
48	1.38	2.03	2.48	3.05	3.47	3.88

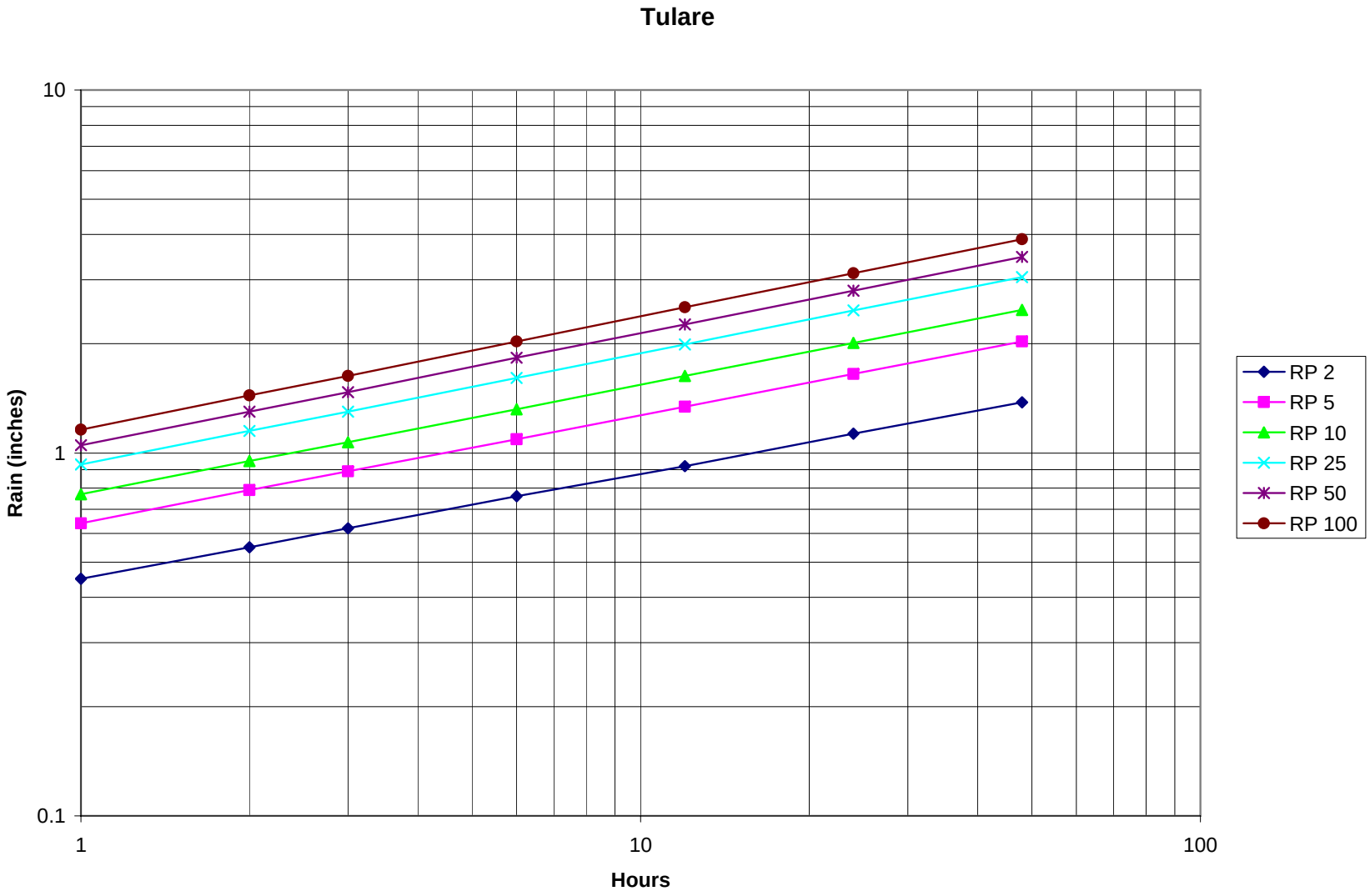

Fresno
Visalia
Exeter
Tulare
N
5 0 5 10 Miles

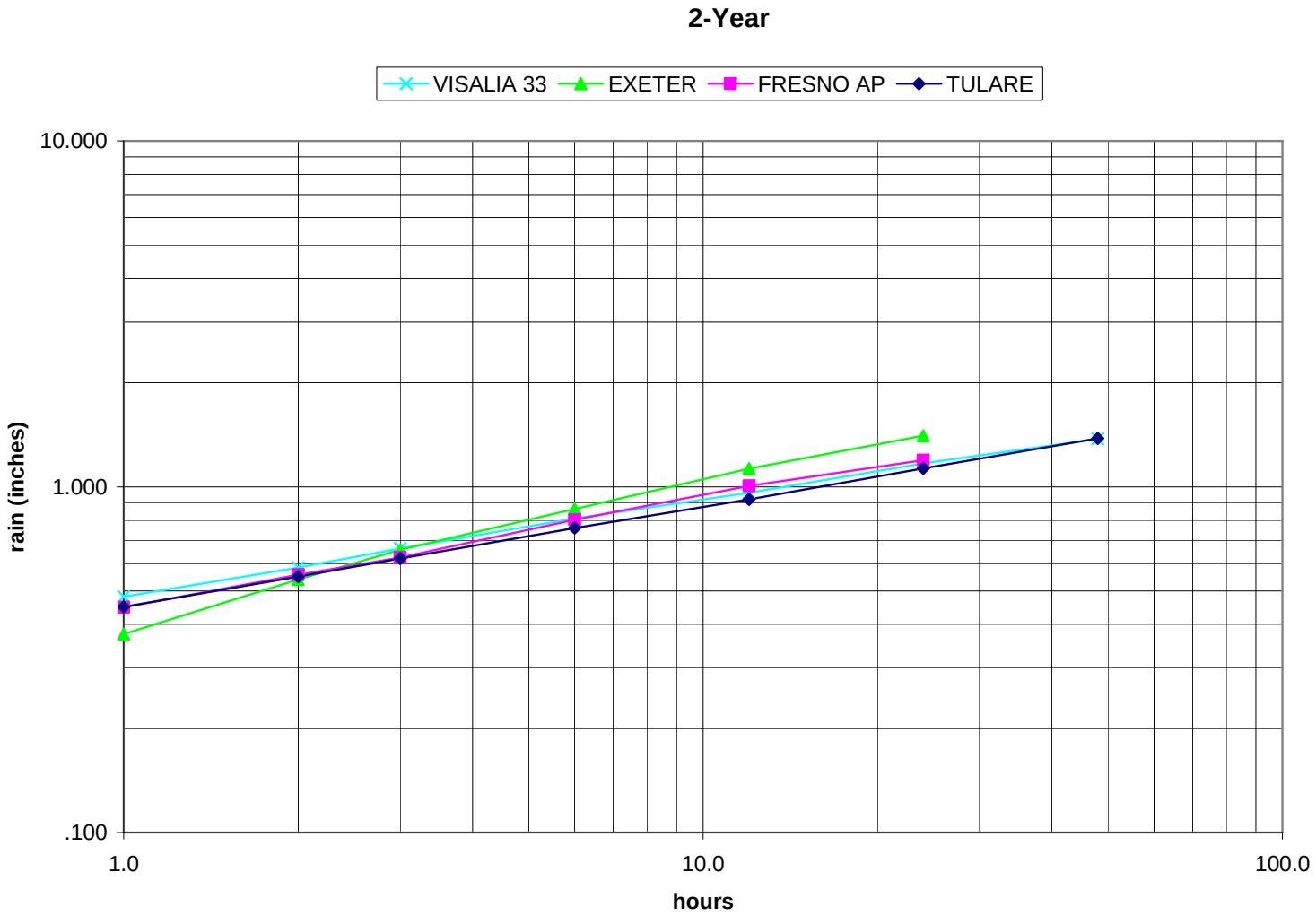

Fresno
10.000
1.000
0.100
Rain (inches)
1.000
10.000
100.000
Hours
RP 2
RP 5
RP 10
RP 25
RP 50
RP 100

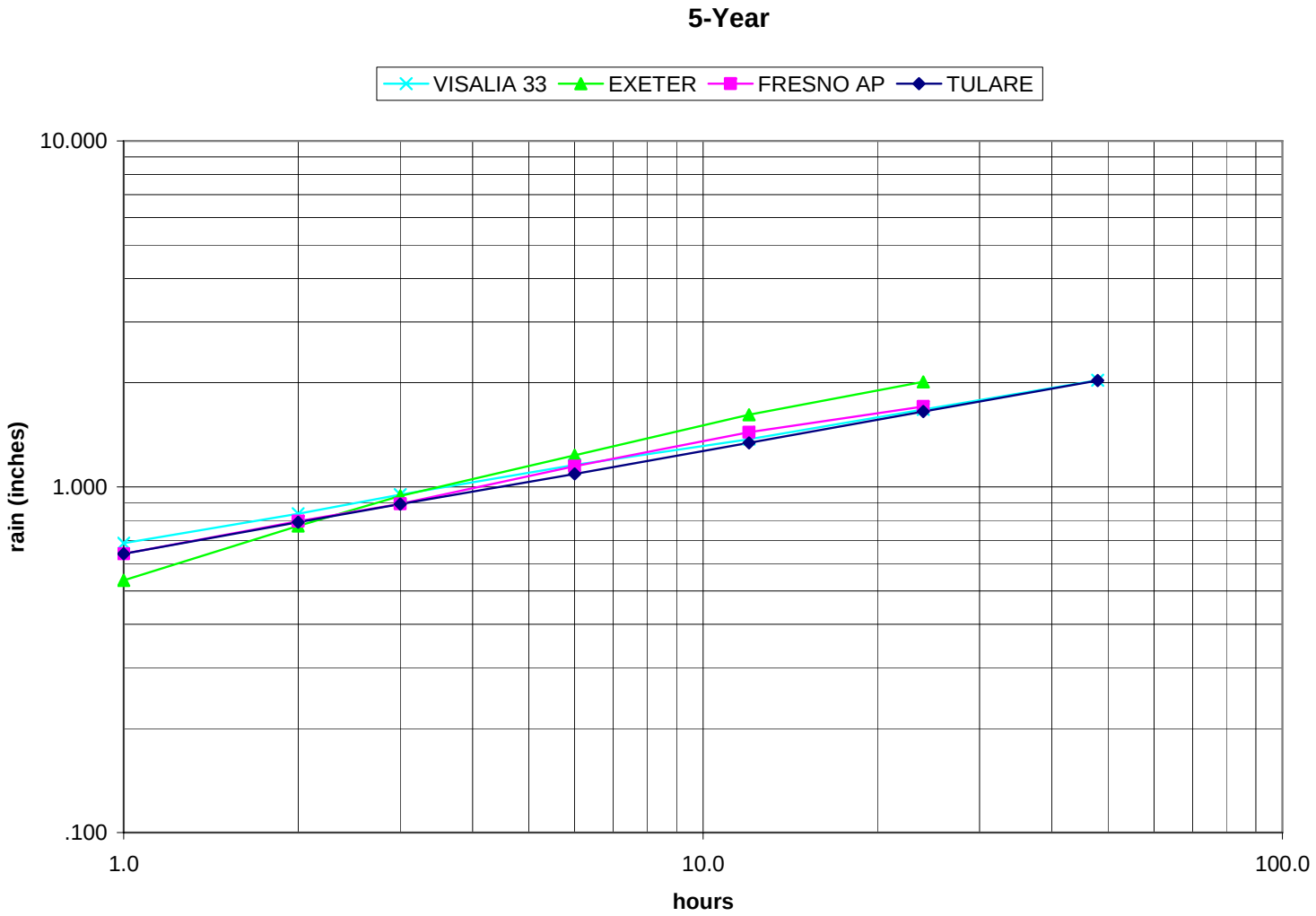

Exeter
10.000
1.000
0.100
Rain (inches)
1.000
10.000
100.000
Hours
RP 2
RP 5
RP 10
RP 25
RP 50
RP 100

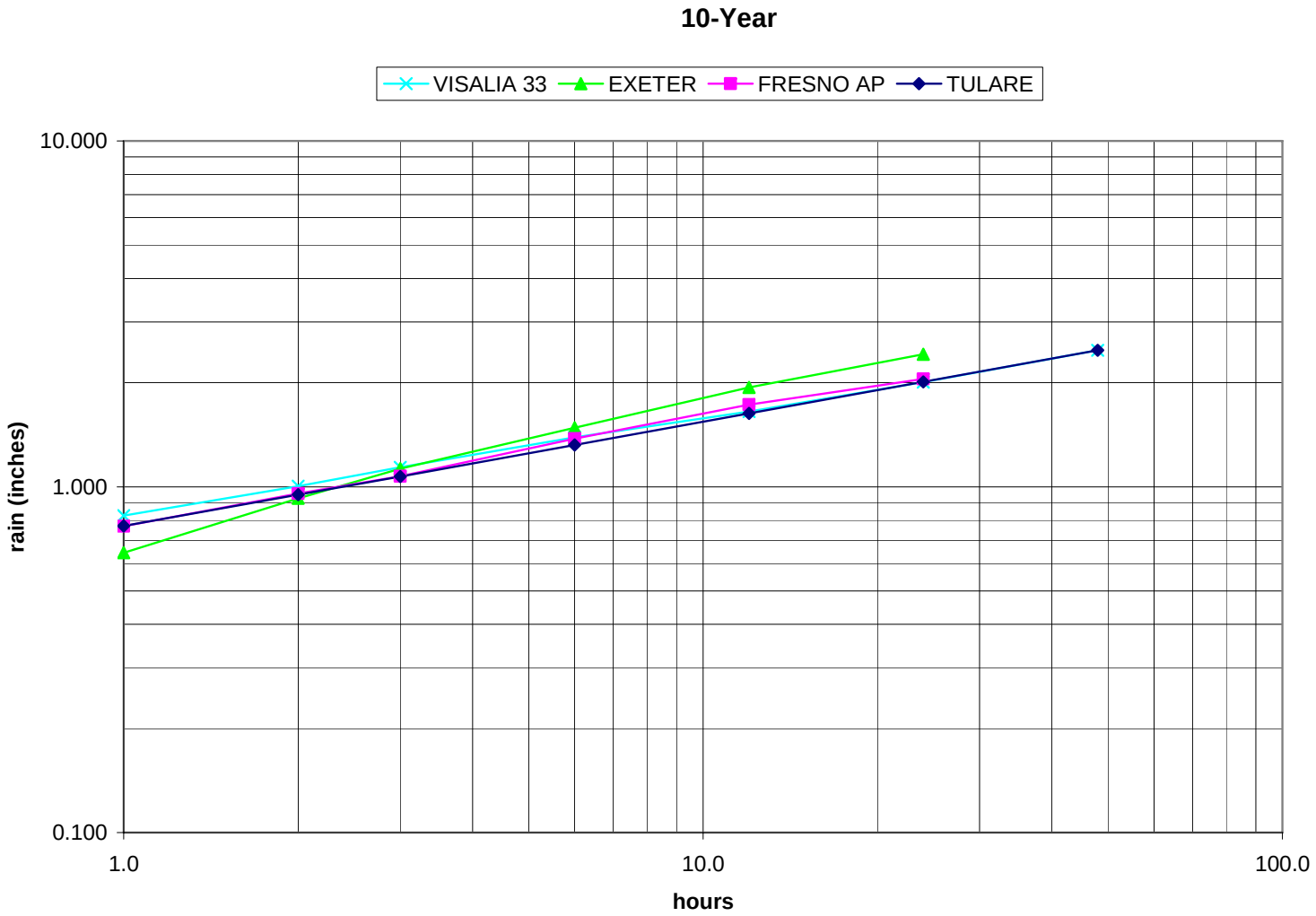
Visalia 33

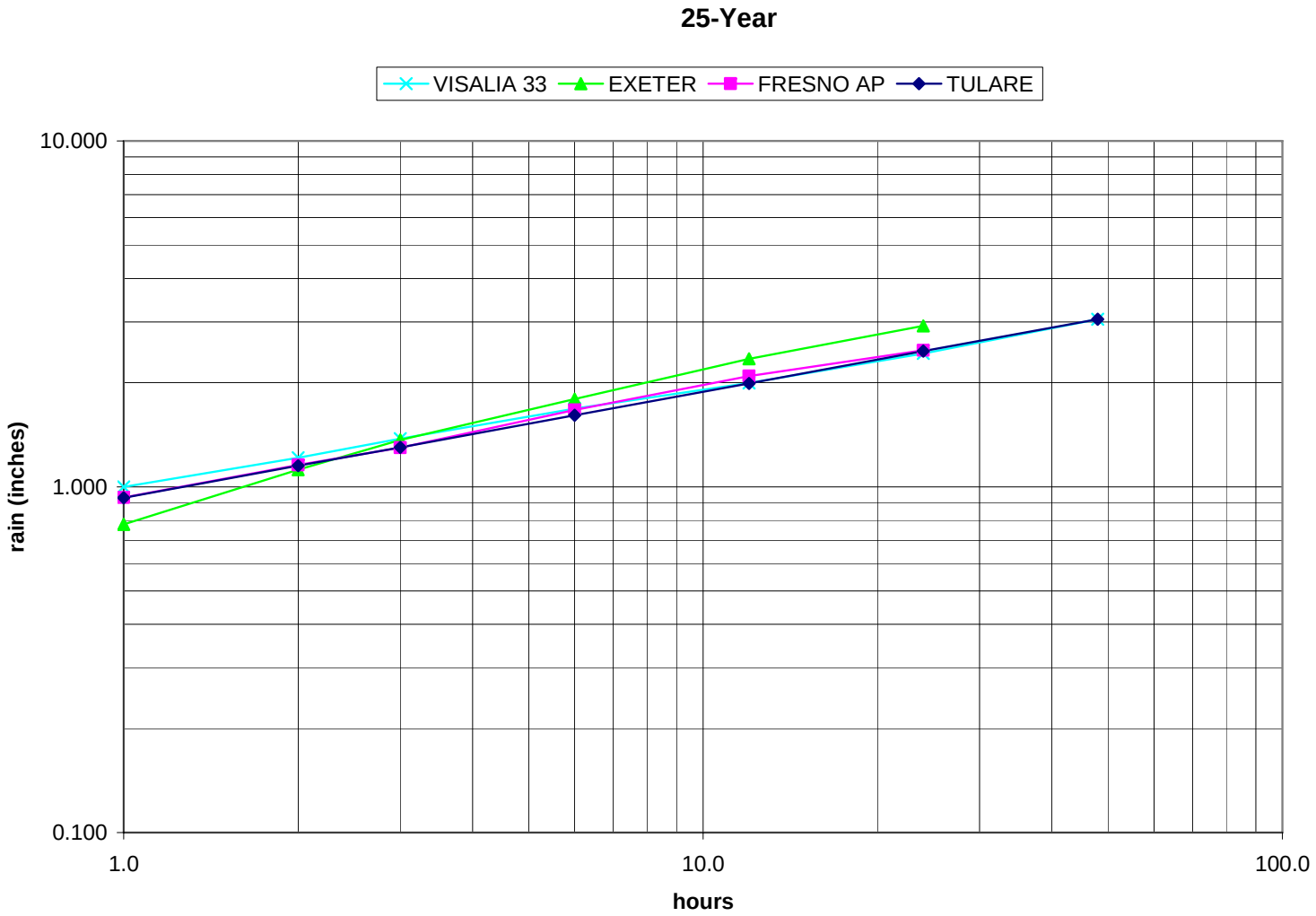

10.000
1.000
.100
Rain (inches)
1.0
10.0
100.0
Hours
RP 2
RP 5
RP 10
RP 25
RP 50
RP 100

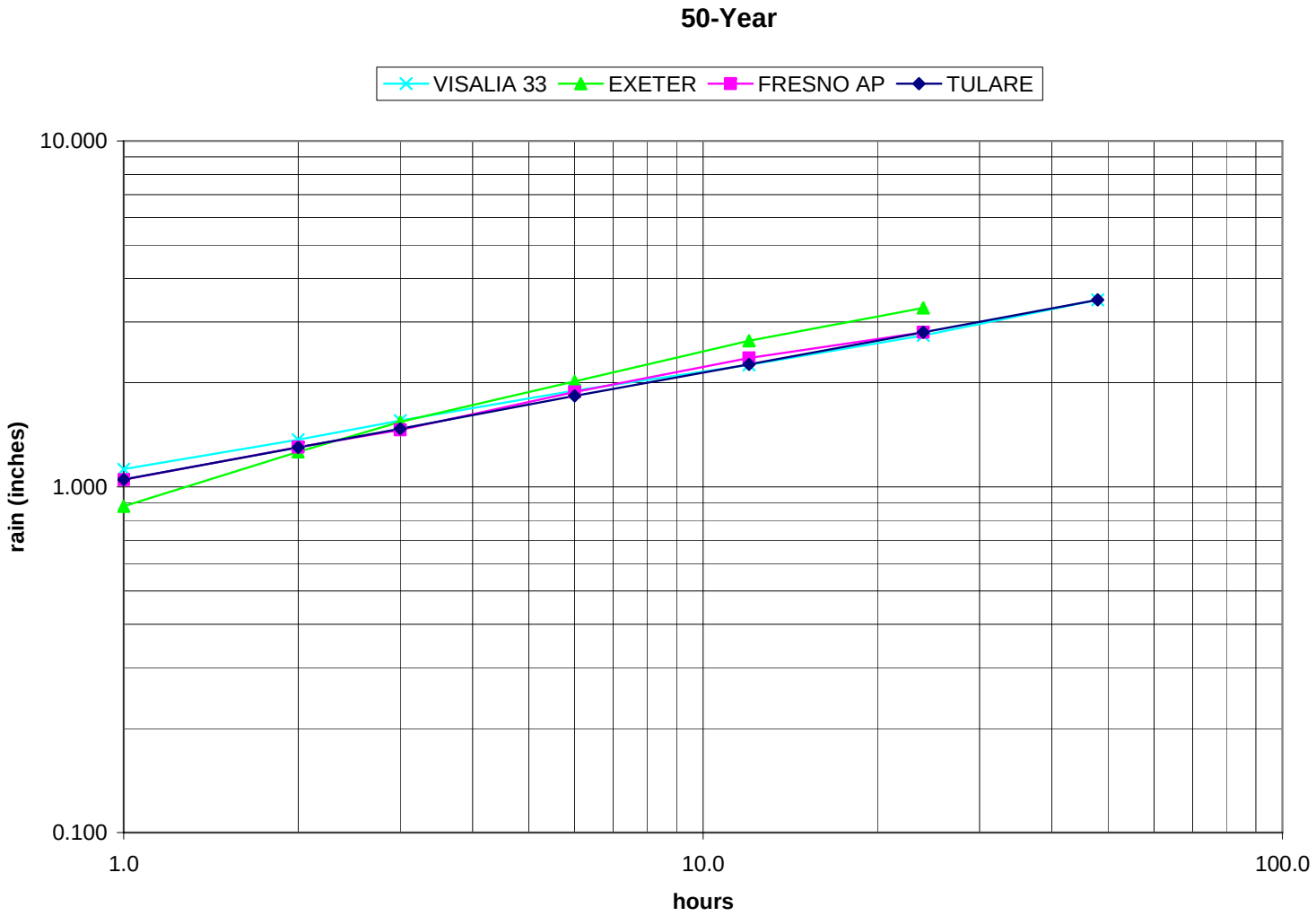

Tulare
10
1
0.1
Rain (inches)
1
10
100
Hours
RP 2
RP 5
RP 10
RP 25
RP 50
RP 100

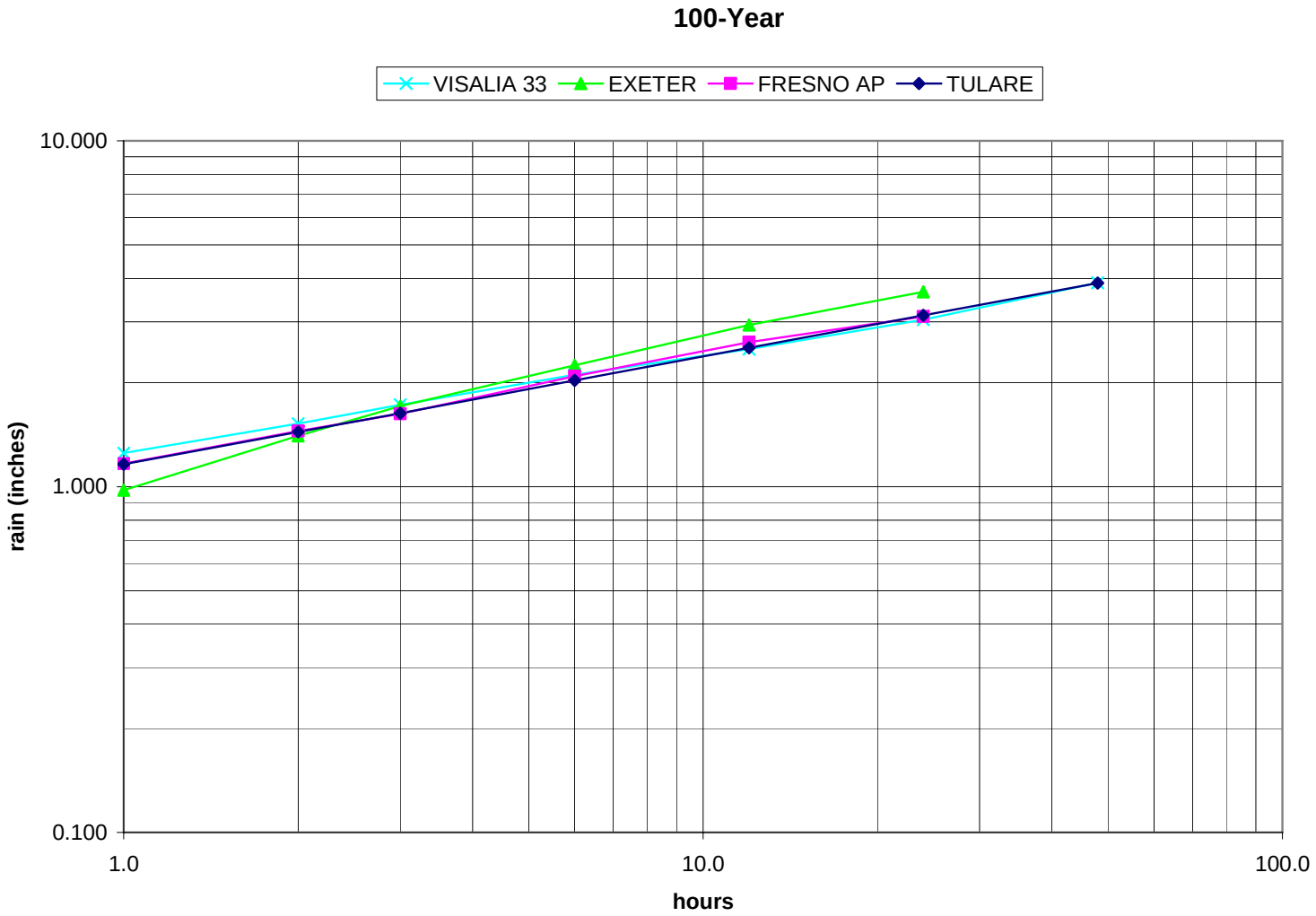

2-Year
VISALIA 33
EXETER
FRESNO AP
TULARE
10.000
1.000
.100
rain (inches)
1.0
10.0
100.0
hours


5-Year
VISALIA 33
EXETER
FRESNO AP
TULARE
10.000
1.000
.100
rain (inches)
1.0
10.0
100.0
hours


10-Year
VISALIA 33
EXETER
FRESNO AP
TULARE
10.000
1.000
0.100
rain (inches)
1.0
10.0
100.0
hours


25-Year
VISALIA 33
EXETER
FRESNO AP
TULARE
10.000
1.000
0.100
rain (inches)
1.0
10.0
100.0
hours


50-Year
VISALIA 33
EXETER
FRESNO AP
TULARE
10.000
1.000
0.100
rain (inches)
1.0
10.0
100.0
hours


100-Year
VISALIA 33
EXETER
FRESNO AP
TULARE
10.000
1.000
0.100
rain (inches)
1.0
10.0
100.0
hours

Ta

Table 2.
Tulare DDF Data
Depth (inches) = A * T (hours) ^ B

	A	B	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr	48-hr
2-yr	0.45	0.289	*0.45*	*0.55*	*0.62*	*0.76*	*0.92*	*1.13*	*1.38*
5-yr	0.64	0.298	*0.64*	*0.79*	*0.89*	*1.09*	*1.34*	*1.65*	*2.03*
10-yr	0.77	0.302	*0.77*	*0.95*	*1.07*	*1.32*	*1.63*	*2.01*	*2.48*
25-yr	0.93	0.307	*0.93*	*1.15*	*1.30*	*1.61*	*1.99*	*2.47*	*3.05*
50-yr	1.05	0.309	*1.05*	*1.30*	*1.47*	*1.83*	*2.26*	*2.80*	*3.47*
100-yr	1.16	0.312	*1.16*	*1.44*	*1.63*	*2.03*	*2.52*	*3.13*	*3.88*

Table 3A

2-Year Recurrence at Tulare

D=.5t^.3284

Hour	*Depth*	*Incremental*	*Design*
1	0.45	0.45	**0.01**
2	0.55	0.10	**0.02**
3	0.62	0.07	**0.02**
4	0.67	0.05	**0.02**
5	0.72	0.04	**0.02**
6	0.76	0.04	**0.02**
7	0.79	0.03	**0.02**
8	0.82	0.03	**0.03**
9	0.85	0.03	**0.03**
10	0.88	0.03	**0.04**
11	0.90	0.02	**0.07**
12	0.92	0.02	**0.45**
13	0.94	0.02	**0.10**
14	0.96	0.02	**0.05**
15	0.98	0.02	**0.04**
16	1.00	0.02	**0.03**
17	1.02	0.02	**0.03**
18	1.04	0.02	**0.02**
19	1.05	0.02	**0.02**
20	1.07	0.02	**0.02**
21	1.08	0.02	**0.02**
22	1.10	0.01	**0.02**
23	1.11	0.01	**0.01**
24	1.13	0.01	**0.01**

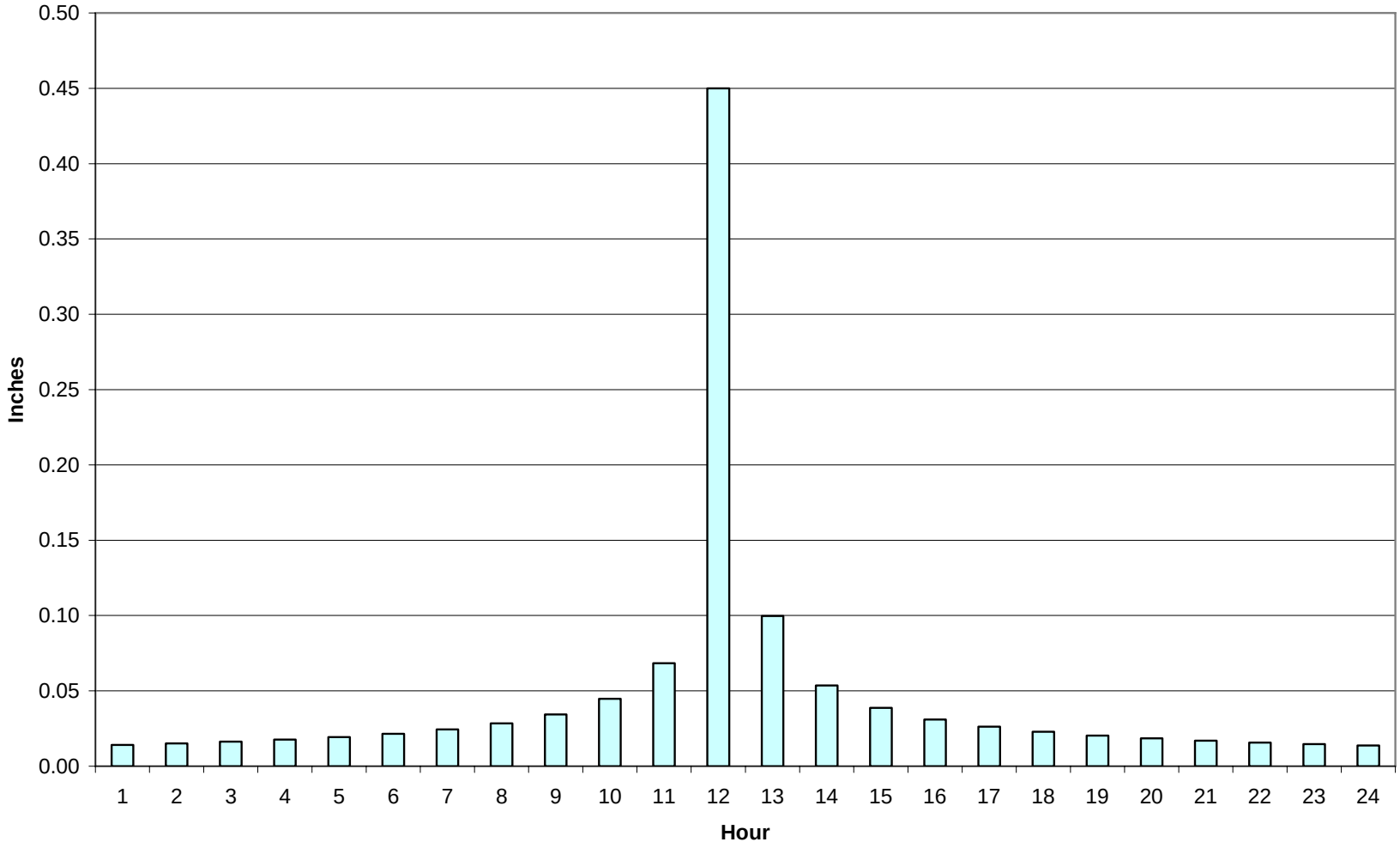

2-Year Tulare Design Storm
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Inches
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour

Table 3B

5-Year Recurrence at Tulare

D=.6*t^1.6

Hour	*Depth*	*Incremental*	*Design*
1	0.64	0.64	**0.02**
2	0.79	0.15	**0.02**
3	0.89	0.10	**0.02**
4	0.97	0.08	**0.03**
5	1.03	0.07	**0.03**
6	1.09	0.06	**0.03**
7	1.14	0.05	**0.04**
8	1.19	0.05	**0.04**
9	1.23	0.04	**0.05**
10	1.27	0.04	**0.07**
11	1.31	0.04	**0.10**
12	1.34	0.03	**0.64**
13	1.37	0.03	**0.15**
14	1.41	0.03	**0.08**
15	1.43	0.03	**0.06**
16	1.46	0.03	**0.05**
17	1.49	0.03	**0.04**
18	1.51	0.03	**0.03**
19	1.54	0.02	**0.03**
20	1.56	0.02	**0.03**
21	1.59	0.02	**0.03**
22	1.61	0.02	**0.02**
23	1.63	0.02	**0.02**
24	1.65	0.02	**0.02**

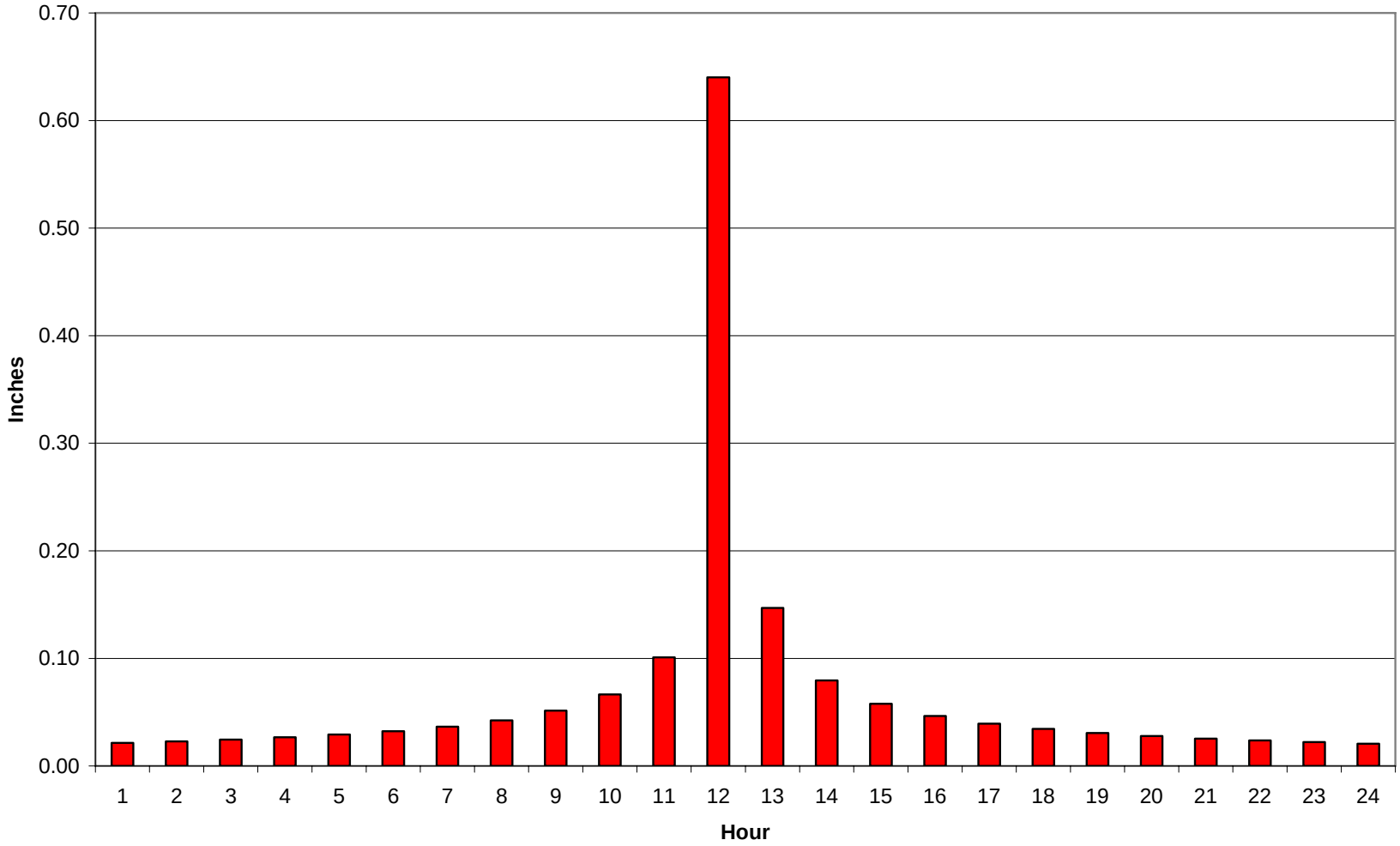

5-Year Tulare Design Storm
Inches
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour

Table 3C

10-Year Recurrence at Tulare

D=.86*t^2.02

Hour	*Depth*	*Incremental*	*Design*
1	0.77	0.77	**0.03**
2	0.95	0.18	**0.03**
3	1.07	0.12	**0.03**
4	1.17	0.10	**0.03**
5	1.25	0.08	**0.04**
6	1.32	0.07	**0.04**
7	1.39	0.06	**0.05**
8	1.44	0.06	**0.05**
9	1.50	0.05	**0.06**
10	1.54	0.05	**0.08**
11	1.59	0.05	**0.12**
12	1.63	0.04	**0.77**
13	1.67	0.04	**0.18**
14	1.71	0.04	**0.10**
15	1.74	0.04	**0.07**
16	1.78	0.03	**0.06**
17	1.81	0.03	**0.05**
18	1.84	0.03	**0.04**
19	1.87	0.03	**0.04**
20	1.90	0.03	**0.03**
21	1.93	0.03	**0.03**
22	1.96	0.03	**0.03**
23	1.98	0.03	**0.03**
24	2.01	0.03	**0.03**

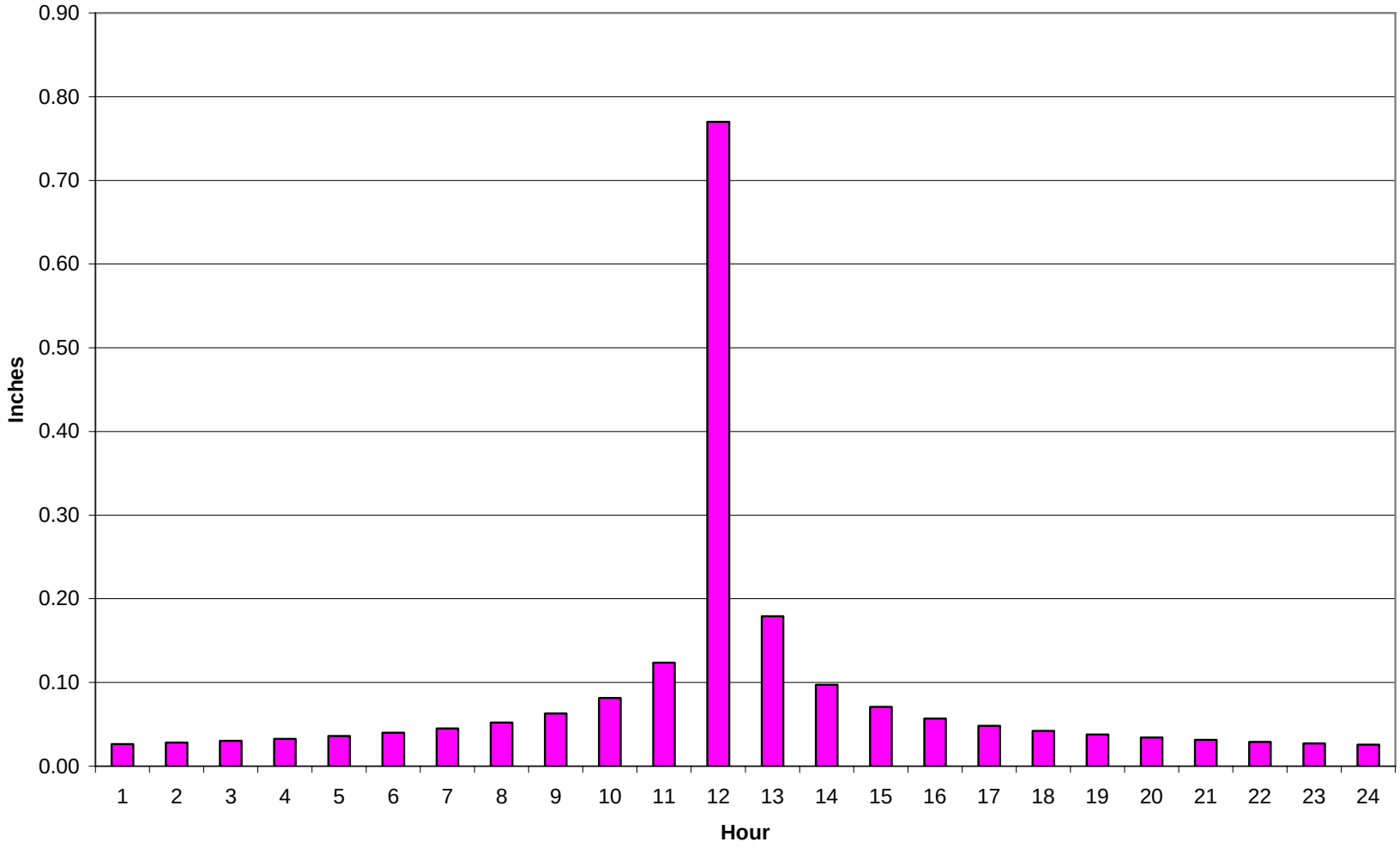

10-Year Tulare Design Storm
Inches
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour

Table 3D

25-Year Recurrence at Tulare

D=1.05*t^2.3

Hour	*Depth*	*Incremental*	*Design*
1	0.93	0.93	**0.03**
2	1.15	0.22	**0.04**
3	1.30	0.15	**0.04**
4	1.42	0.12	**0.04**
5	1.52	0.10	**0.04**
6	1.61	0.09	**0.05**
7	1.69	0.08	**0.06**
8	1.76	0.07	**0.06**
9	1.83	0.06	**0.08**
10	1.89	0.06	**0.10**
11	1.94	0.06	**0.15**
12	1.99	0.05	**0.93**
13	2.04	0.05	**0.22**
14	2.09	0.05	**0.12**
15	2.14	0.04	**0.09**
16	2.18	0.04	**0.07**
17	2.22	0.04	**0.06**
18	2.26	0.04	**0.05**
19	2.30	0.04	**0.05**
20	2.33	0.04	**0.04**
21	2.37	0.04	**0.04**
22	2.40	0.03	**0.04**
23	2.44	0.03	**0.03**
24	2.47	0.03	**0.03**

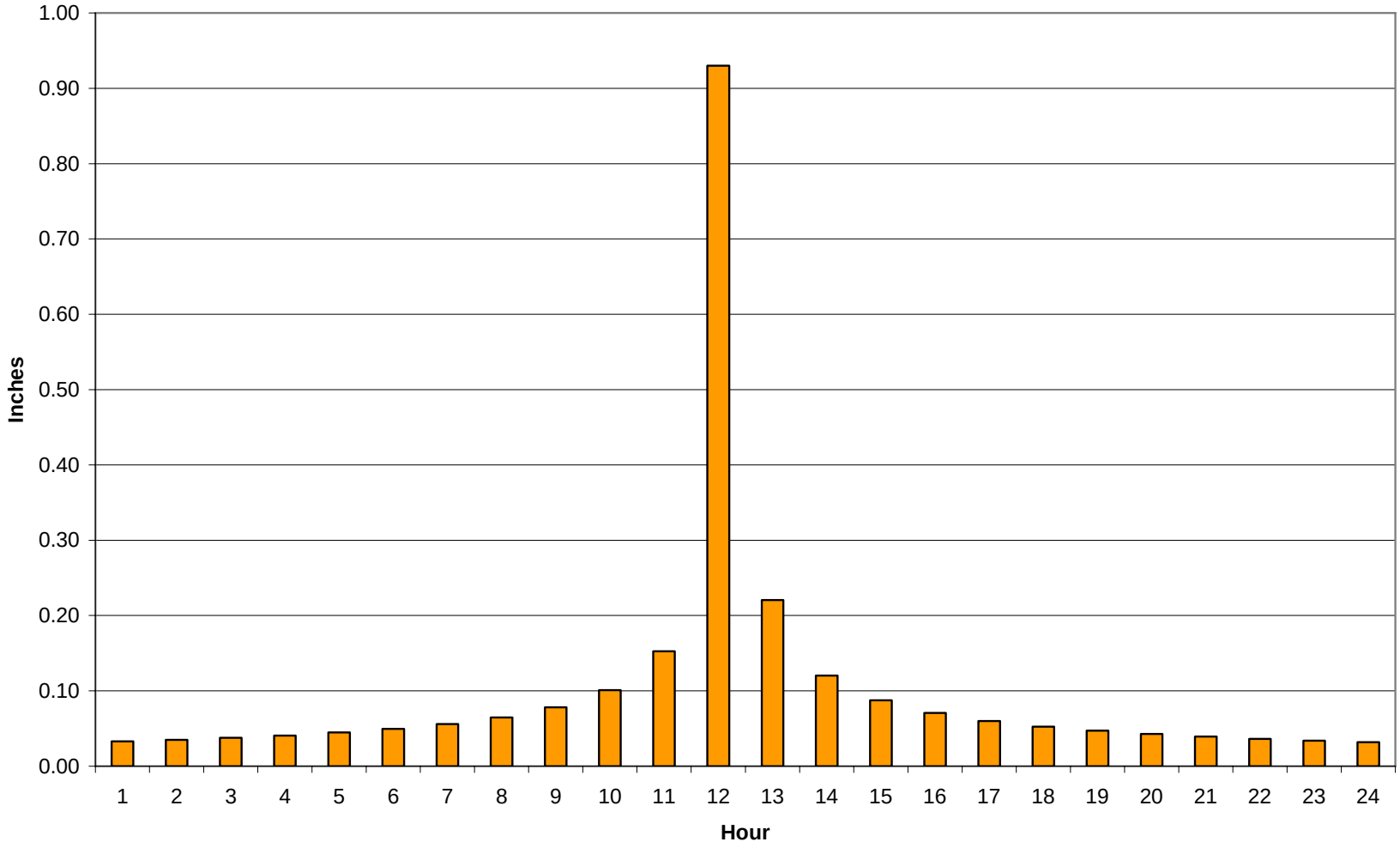

25-Year Tulare Design Storm
Inches
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour

Table 3E

50-Year Recurrence at Tulare

D=1.22*t^2.53

Hour	*Depth*	*Incremental*	*Design*
1	1.05	1.05	**0.04**
2	1.30	0.25	**0.04**
3	1.47	0.17	**0.04**
4	1.61	0.14	**0.05**
5	1.73	0.12	**0.05**
6	1.83	0.10	**0.06**
7	1.92	0.09	**0.06**
8	2.00	0.08	**0.07**
9	2.07	0.07	**0.09**
10	2.14	0.07	**0.12**
11	2.20	0.06	**0.17**
12	2.26	0.06	**1.05**
13	2.32	0.06	**0.25**
14	2.37	0.05	**0.14**
15	2.42	0.05	**0.10**
16	2.47	0.05	**0.08**
17	2.52	0.05	**0.07**
18	2.56	0.04	**0.06**
19	2.61	0.04	**0.05**
20	2.65	0.04	**0.05**
21	2.69	0.04	**0.04**
22	2.73	0.04	**0.04**
23	2.77	0.04	**0.04**
24	2.80	0.04	**0.04**

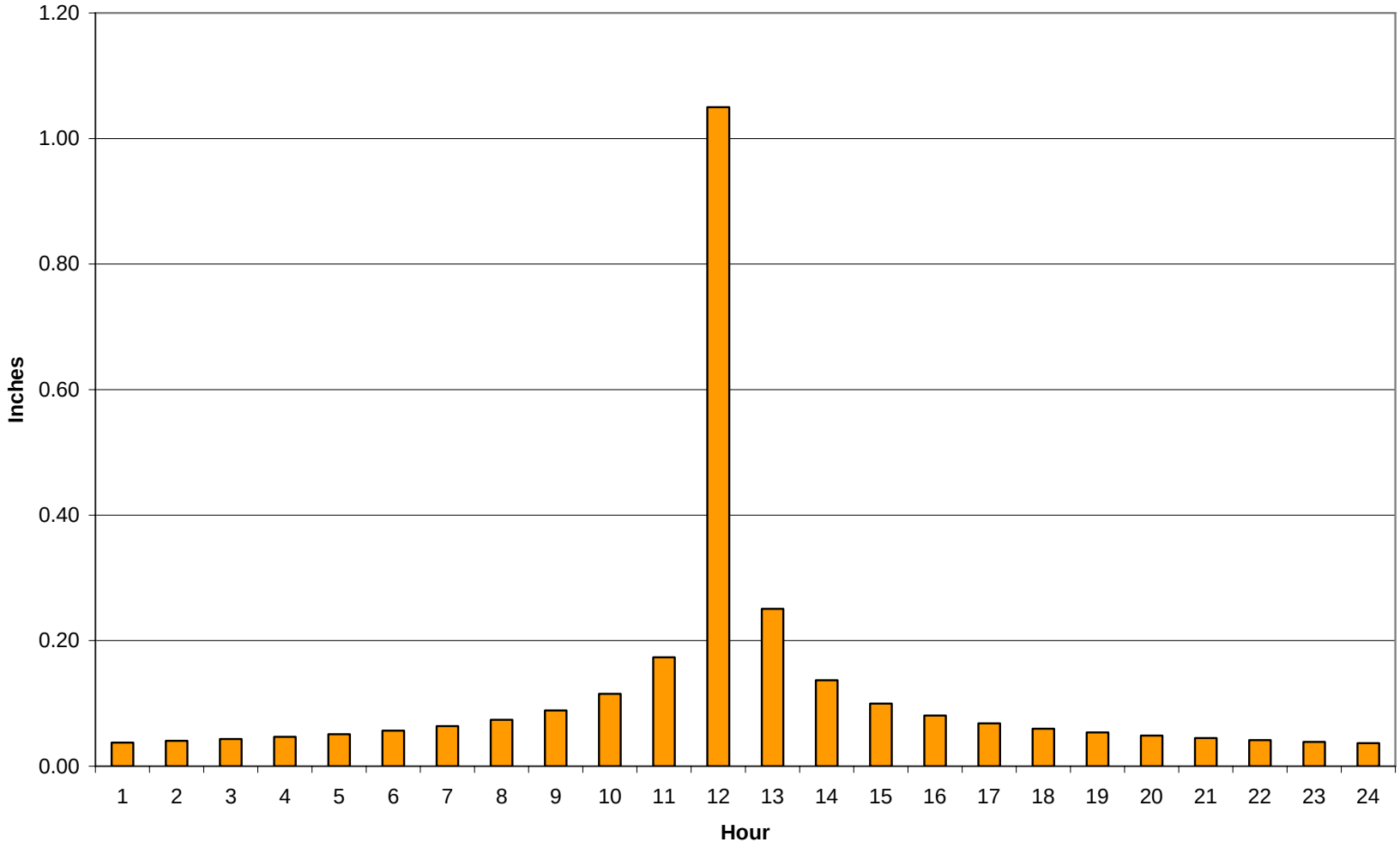
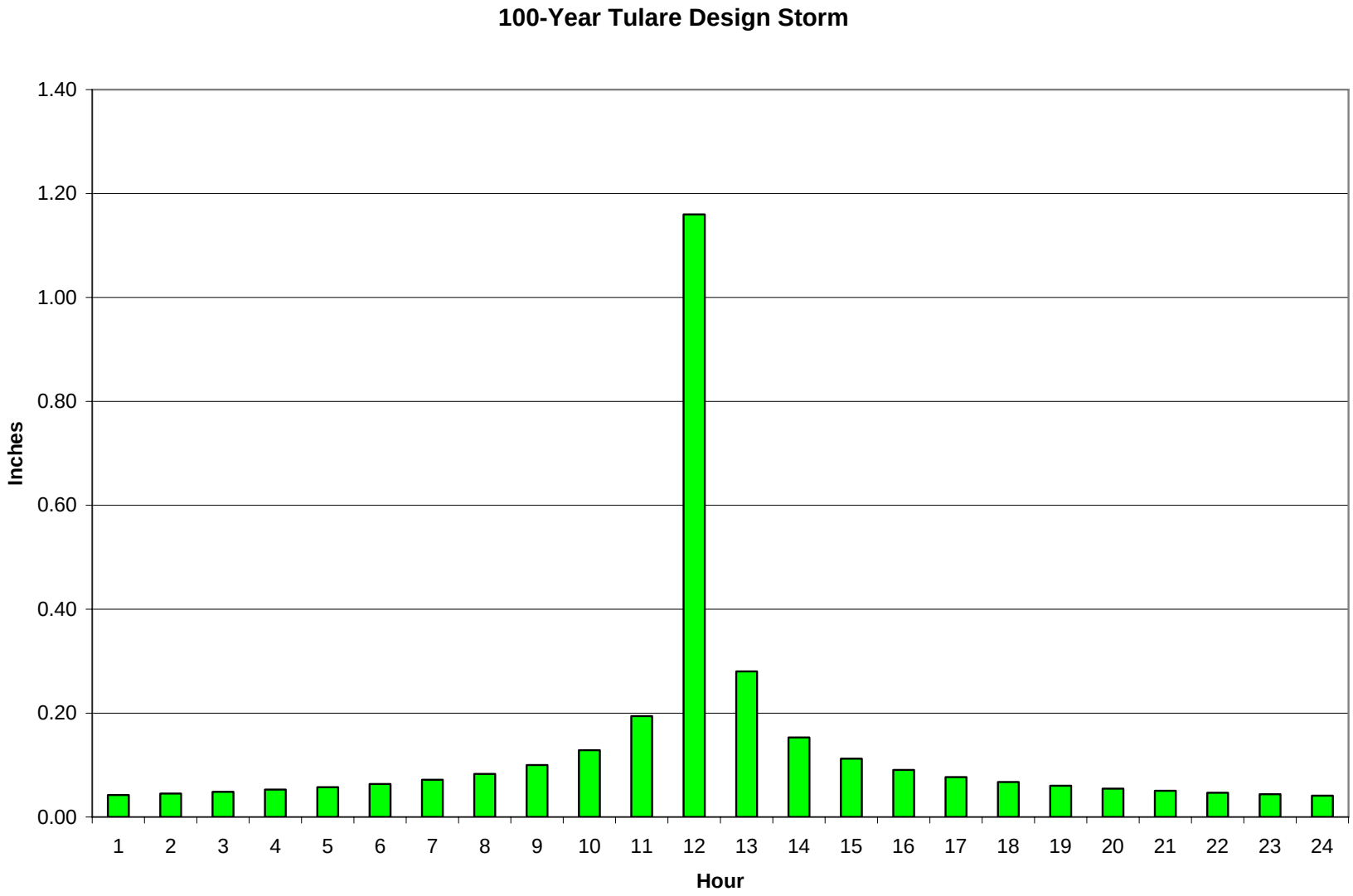

50-Year Tulare Design Storm
Inches
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour

Table 3F

100-Year Recurrence at Tulare

D=1.39*t^2.75

Hour	*Depth*	*Incremental*	*Design*
1	1.16	1.16	**0.04**
2	1.44	0.28	**0.05**
3	1.63	0.19	**0.05**
4	1.79	0.15	**0.05**
5	1.92	0.13	**0.06**
6	2.03	0.11	**0.06**
7	2.13	0.10	**0.07**
8	2.22	0.09	**0.08**
9	2.30	0.08	**0.10**
10	2.38	0.08	**0.13**
11	2.45	0.07	**0.19**
12	2.52	0.07	**1.16**
13	2.58	0.06	**0.28**
14	2.64	0.06	**0.15**
15	2.70	0.06	**0.11**
16	2.76	0.05	**0.09**
17	2.81	0.05	**0.08**
18	2.86	0.05	**0.07**
19	2.91	0.05	**0.06**
20	2.95	0.05	**0.05**
21	3.00	0.05	**0.05**
22	3.04	0.04	**0.05**
23	3.09	0.04	**0.04**
24	3.13	0.04	**0.04**


100-Year Tulare Design Storm
Inches
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
Hour

APPENDIX B - AGREEMENT BETWEEN THE CITY OF TULARE AND THE TULARE IRRIGATION DISTRICT

TID Agreement

AGREEMENT

THIS AGREEMENT is made and entered into this ___ day of _____, 2005, by and between TULARE IRRIGATION DISTRICT, "District," an Irrigation District organized and existing pursuant to the laws of the State of California (hereinafter referred to as "District"), and the City of Tulare, a Municipal Corporation of the State of California (hereinafter referred to as "City")

WITNESSETH

A. WHEREAS, District is a public entity engaged in the importation and delivery of water for irrigation purposes to landowners within the District; and

B. WHEREAS, District's water importation efforts create an important groundwater recharge benefit to City; and

C. WHEREAS, City and District entered into an Agreement dated August 18, 1954 (hereafter referred to as "1954 Agreement"), which provided for the use by City of certain canal and ditch facilities owned and controlled by District for the purpose of disposing of storm drainage; and

D. WHEREAS, the 1954 Agreement, in recognition of the groundwater recharge and storm water disposition benefits afforded by the District, provided for the payment by City of fees to replace assessments the District loses by virtue of the detachment from the District of lands that are annexed into the City; and

E. WHEREAS, the 1954 Agreement provided terms for the maintenance and control of certain District facilities necessary to handle City's storm drainage needs; and

F. WHEREAS, the 1954 Agreement terminated by its terms in 1988, but the parties have been operating pursuant to the terms of the 1954 Agreement notwithstanding its expiration; and

G. WHEREAS, consistent with the 1954 Agreement, the District granted its interest in a portion of the Kaweah Ditch to the City by way of a quitclaim deed dated August 18, 1954, subject to a reserved right for the District to use the portion of the granted ditch for the conveyance of irrigation water; and

H. WHEREAS, the parties desire to enter into a new agreement based generally on the provisions of the 1954 Agreement, and desire also to enter into additional agreements regarding, among other things, policies for the conversion of canal or ditch easements to pipeline

easements; construction of encroachments within such converted easements; conditions to be imposed for fencing of canal, ditch or pipeline easement areas; and agreements to enter into various joint projects;

NOW THEREFORE, the parties hereto covenant and agree as follows:

1. Acknowledgment of Reserved Right of District To Use City-owned Portions of Kaweah Ditch Pipeline. The parties acknowledge that although portions of the Kaweah Ditch were deeded to the City by Quitclaim Deed dated August 18, 1954, the District retained the right to use the Kaweah Ditch Pipeline to its full capacity for the conveyance of District's water. This reserved right is limited only by District's obligation under this Agreement to allow for the specified storm drain flows.

2. Use of District Facilities By City For Storm Drain Purposes. The District does hereby give and grant to the City the right and privilege of pumping water, or otherwise diverting water from its storm drain system, into the irrigation canals of the District running through the City, or along or near the boundary lines of the City, as follows:

a. That portion of the irrigation ditch or pipeline commonly known as the Kaweah Ditch Pipeline existing within the boundaries of the City of Tulare, as they may from time to time be modified;

b. That portion of the irrigation ditch commonly known as the Town Ditch existing within the boundaries of the City of Tulare, as they may from time to time be modified and

c. That portion of the irrigation ditch commonly known as the Railroad Ditch existing within the boundaries of the City of Tulare, as they may from time to time be modified.

3. Discharge Volumes. The City agrees that it will not, without the written consent of the District through its Board of Directors or General Manager, divert more than the following amounts:

a. Thirty cubic feet per second (30 cfs) of water at any time into Kaweah Ditch Pipeline; or

b. Seventy-five cubic feet per second (75 cfs) of water at any time into the Town Ditch; or

c. Twenty cubic feet per second (20 cfs) of water at any time into the Railroad Ditch (not including the flow from the Kaweah Ditch and the Town Ditch).

The above-noted discharge rates are maximum rates, and are subject to the limitations of the particular facilities that are actually in place. The parties acknowledge that particular portions of the above-noted facilities may have capacities that are lower than the above-noted maximum discharges.

4. Maintenance. District hereby agrees to keep up and maintain at its cost and expense the above-referenced ditches or pipelines which are owned by District, together with District's system of ditches connected therewith, so that they may have the capacity to dispose of the water from the storm drain system of the City. City hereby agrees to keep up and maintain at its cost and expense the portion of the Kaweah Ditch Pipeline which was transferred to City by quitclaim deed dated August 18, 1954, so that the Kaweah Ditch Pipeline maintains the capacity to carry irrigation water to other facilities of the District.

5. Additional Facilities. The parties acknowledge that there may be additional locations other than those enumerated above at which City has established a discharge of storm water into District's system. These additional locations may or may not be properly authorized through separate agreements between City and District, or they may have been intended to be included within the capacities noted above. The parties agree that as part of the ongoing efforts to meet and confer regarding the operation of this Agreement (as called for below), City and District will endeavor to inventory and quantify all discharges, including those that are in addition to the authority established by this Agreement. The parties further agree to amend this Agreement, if necessary, to establish the terms under which such additional discharges will be accepted by District.

6. Operation And Control Of Headgates, Pumping Stations And Diversion Points. City agrees that District shall exercise exclusive control of the headgates which regulate the flow of water into and through the ditches subject to this Agreement during the storm seasons for the duration of this agreement, and City further agrees that District's acceptance of the storm drain volumes provided in paragraph 2 above is subject to the existence of spare capacity in the subject ditches at the time of the desired discharge. District agrees that City shall have the right to control the pumping stations and diversion points it maintains for the purpose of diverting storm drain water pursuant to this Agreement into the subject canals and pipelines, providing such

operation does not cause the volume of such discharges to exceed the volumes provided in paragraph 2 above.

7. Installation of Additional Pumping Stations. District agrees that City may establish such additional pumping stations and diversion points as it may, from time to time, require, upon any rights of way owned by District, for the purpose of diverting storm water into the ditches that are the subject of this Agreement, provided that such pumping stations will not interfere with District's use and maintenance of such ditches or pipelines, or with the rights of others in said rights of way, or increase the total diversion volume beyond that provided in paragraph 2 above. City shall consult with District prior to construction of any such pumping stations and diversion points, and shall apply for and receive any encroachment agreement that District shall require.

8. Non-Pollution Agreement. City hereby agrees that it will not deposit in any ditches, canals or pipelines of District any water which is polluted with sewage or any other unhealthful or noxious matter. In addition, City specifically agrees as follows:

a. District reserves the right to cause all discharges of storm waters into its canals or pipelines to cease should it receive evidence that any pollutants or other unhealthful or noxious matter, has been discharged into the storm drain system and is likely to reach its canals or pipelines.

b. City agrees that it alone shall be responsible for compliance with any applicable state or federal laws relating to the discharge of storm drainage and any related discharges into District's facilities, including the obtaining of any necessary permit under state or federal law, and City shall defend, indemnify and hold District harmless from any claim of violation of such state or federal laws arising from any discharge of storm water into its canals or pipelines pursuant to this Agreement.

9. City Payments In Lieu Of District Assessments Upon Annexation and Detachment. In consideration of the foregoing, and in recognition of the District's groundwater recharge benefits to the City and surrounding lands, City agrees to pay to the District on each Assessment Date an amount equal to the product of the number of Detached Acres multiplied times the Assessment Rate, where:

a. "Assessment Date" means the first day of January of each year of the term of this agreement;

b. "Detached Acres" means the total number of acres of all land that was within the

original boundary of the District and has, as of the Assessment Date, been both annexed into the City and detached from the District's boundaries; and

c. "Assessment Rate" means the total average per-acre rate assessed by District on the Assessment Date upon lands within the District that are adjacent to City's boundaries, including the portion of the rate imposed as a pass through federal environmental restoration charge pursuant to the Central Valley Project Improvement Act of 1992 and subsequent rules, regulations and agreements. By way of example only, assuming the average valuation of lands within the District adjacent to the City's boundaries as of the Assessment Date is $2,000 per acre, and the lands are assessed at $.80 per $100 of valuation, this would result in an assessment of $16 per acre. In addition to this, lands within the District are assessed a $16 per acre federal environmental restoration charge. The City charge would therefore be $32 per acre of Detached Lands. The Assessment Rate shall be adjusted annually if necessary to reflect the average per-acre rate assessed upon lands adjacent to City's boundaries on the Assessment Date, as determined by District.

The parties agree that all lands annexed into the City but not detached from the District shall continue to be assessed directly by the District and shall not be included as Detached Acres for the purpose of calculating the City's annual payment. The parties further agree that "Detached Acres" shall include, for the purpose of calculating City's annual assessment payment only, that land owned by City for which deliveries of surface water are made by District, including land used by City for its wastewater treatment facility.

10. Power Charges for Town Ditch Pump. In addition to the annual payment established in paragraph 7 above, City shall pay all power charges associated with the operation of the booster pump on the Town Ditch near the northwest corner of Section 15, Township 20 South Range 24 East.

11. Effective Date and Term of Agreement. The effective date of this agreement shall be the date last signed below. This Agreement shall expire 30 years after the effective date. This agreement shall have no force or effect upon a determination that the performance of any provision of this Agreement will result or has resulted in the violation of state or federal law.

12. City Obligations As Consideration For Benefits To City. It is the intention of the parties that City's obligations contained in this Agreement shall constitute consideration in exchange for the various benefits City may receive by reason of any of the following:

a. the transportation by District of irrigation water or water for sinking purposes into the District,

b. any pumping of ground water by City, or any agency thereof, within the boundaries of City, or otherwise,

c. the disposal of storm drainage from City into the irrigation system of the District as Authorized by this Agreement, and

d. any other direct or indirect benefits which may accrue to the City through the operations of the District.

13. Joint Operations Committee. City's City Manager and District's General Manager shall appoint at least two appropriate representatives to a Joint Operations Committee, which shall meet not less than once every six months for the purpose of addressing ongoing operational issues. As an initial matter, the Joint Operations Committee shall conduct an inventory of existing discharge sites and their capacities, and determining the authority for such sites.

14. Creation of Joint Development Policies. In addition to ongoing operation issues, the Joint Operations Committee shall initially undertake an effort to develop policies, procedures and standards to be applied by the respective parties in addressing development proposals within the City's boundaries that have the potential to affect or are affected by the existence of District's canals, ditches or pipelines. Such polices, procedures and standards to be drafted and proposed for adoption shall address the following issues, at a minimum:

a. Uniform requirements and conditions to be imposed by District for the conversion of open ditches or canals to covered pipelines, including the responsibility of landowners or developers, the terms and conditions of pipeline easements that are required to be granted to District in conjunction with such conversion, the conditions under which encroachments will be allowed within such easements, standard specifications for pipelines, work to be performed by District and assignment of cost of such work related to conversion to pipelines, and the liability of the parties in relation to the converted pipelines and permitted encroachments.

b. Requirements and conditions imposed by City and District for the fencing of District ditch, canal, pipeline and service road easement areas, including the specifications and standards for construction of such fences or walls, and separate specifications for residential and industrial development.

c. Requirements for setbacks from District's ditches, canals or pipelines.

d. Requirements for the aesthetic features of developments in relation to the ditches, canals or pipelines, and attendant improvements such as roads, fences, walls, walkways, trails, greenbelts or setback areas.

e. Ongoing operational issues, as the parties may see fit.

The Joint Operations Committee shall meet at least quarterly and as long as may be necessary for the completion of the drafting of such proposed policies. Nothing in this paragraph shall be construed as a requirement by either party to adopt any specific policy, ordinance, standard or procedure, and each party shall retain full discretion in determining whether to adopt any specific policy, ordinance, standard or procedure.

15. Consideration of Joint Water Management and Other Projects. City and District agree to work jointly toward the development and consideration of projects to which City and District shall both contribute resources for joint benefit. Such joint projects shall potentially include, but not be limited to, the following:

a. Development of groundwater recharge facilities.

b. Acquisition of local water rights or imported supplies to provide mutual benefits.

c. Development of a wastewater treatment program, whereby City delivers treated wastewater into District's water delivery system.

d. Development of a program for surface water supplies to be delivered by District to City for municipal uses, including aesthetic or other non-consumptive uses.

e. Joint ownership, construction and use of bridges.

f. Telemetry (SCADA) and automation of City's storm water discharge operations into District conveyance system.

g. Accommodation for property acquisition and construction by City of a fire station on District property.

The items noted above shall be addressed by the Joint Operations Committee, or by a subcommittee or separate ad hoc committee, as the parties may see fit. Nothing in this paragraph

shall be construed as a requirement by either party to adopt or agree to participate in any specific project, and each party shall retain full discretion in determining whether to adopt or agree to participate in any such project. .

16. Adoption of Recommendations of Joint Operations Committee. All recommendations of the Joint Operations Committee shall be referred to the City Council and the District Board of Directors for appropriate review consistent with their applicable required procedures for action on such matters. The approval of each governing body shall be required to adopt and implement such recommendations

17. Representations and Warranties of Authority. Each party represents to all other parties that such party has the full power and authority to enter into this Agreement, that the execution and delivery thereof will not violate any agreement to which such party is a party or by which such party is bound, and that this Agreement, as executed and delivered, constitutes a valid and binding obligation of such party, enforceable in accordance with its terms. The corporate, partnership, and association signatories to this Agreement expressly warrant that they have been authorized by their respective company, partnership, or association entities to execute this Agreement and to bind them to the terms and provisions hereof. Any public agency signatory to this Agreement represents and warrants that the Agreement is executed in compliance with a resolution of the governing entity of the public agency, duly adopted by the governing entity and transcribed in full in the minutes of the governing entity. Any individual signing this Agreement on behalf of a public agency represents that she/he has full authority to do so.

18. Duty to Cooperate. Each party shall cooperate so as to facilitate the other party's efforts to carry out its obligations under this Agreement.

19. Successors and Transferees. The obligations and benefits of this Agreement do not run with the land, and are personal to the City and the District and are not assignable or transferable.

20. Entire Agreement. This Agreement constitutes the entire agreement between the parties, and it is expressly understood and agreed that the Agreement has been freely and voluntarily entered into by the parties with the advice of counsel, who have explained the legal effect of this Agreement. The terms of this Agreement are contractual and not mere recitals. The parties further acknowledge that no warranties, representations or inducements not contained in this Agreement have been made on any subject in connection with this Agreement, and that

they have not been induced to execute this Agreement by reason of non-disclosure or suppression of any fact. This Agreement may not be altered, modified or otherwise changed in any respect except by writing, duly executed by the parties or their authorized representatives. This Agreement is fully integrated.

21. Construction. The parties acknowledge that each party and its counsel have reviewed and revised this Agreement and that no rule of construction to the effect that any ambiguities are to be resolved against the drafting party shall be employed in the interpretation of this Agreement.

22. Severability. In the event any of the terms, conditions or covenants contained in this Agreement is held to be invalid, any such invalidity shall not affect any other terms, conditions or covenants contained herein which shall remain in full force and effect.

23. Governing Law. California law shall govern the interpretation and enforcement of this Agreement.

24. Remedies. Any motion or other action by the parties to enforce this Agreement shall be filed or otherwise brought and adjudicated in the Tulare County Superior Court. The Tulare County Superior Court shall maintain and reserve jurisdiction of this action for the purpose of enforcing the terms of this Agreement as a judgment or order of the Court. Nothing in this paragraph shall be interpreted in a manner to preclude whatever rights the parties may have to appeal rulings of the Tulare County Superior Court. The parties otherwise retain the full range of legal and equitable remedies to enforce the terms of this Agreement, including injunctive relief and specific performance, to ensure the parties comply with their commitments under this Agreement. In any action to enforce this Agreement, each party shall be responsible for its own attorneys' fees and costs. The parties shall meet and confer and attempt to resolve their differences informally before commencing any action to enforce this Agreement.

25. Further Assurances. In addition to the documents and instruments to be delivered as herein provided, each of the parties shall, from time to time at the request of the other parties, execute and deliver to the other parties such other instruments of transfer, conveyance and assignment and shall take such other action as may be required to more effectively carry out the terms of this Agreement.

26. Time of the Essence. Time is expressly declared to be of the essence of this Agreement and of every provision hereof in which time is an element.

27. Captions. Paragraph titles or captions contained herein are inserted as a matter of convenience and for reference, and in no way define, limit, extend or describe the scope of this Agreement or any provision thereof.

28. Notices. Where required by this Agreement, notice shall be provided by regular mail or overnight delivery, and shall be considered made when deposited in U.S. or express mail.

29. Counterparts. The parties may execute this agreement in counterparts. The counterparts, if any, constitute a single agreement.

IN WITNESS WHEREOF, the parties have executed this Agreement to be effective as of the date and year last below written.

CITY OF TULARE
"CITY"

By: _____
Kevin Northcraft Date
City Manager

Attested

By: _____
Deputy City Clerk Date

Approved as to form and content.

By: _____
S.L. Kabot Date
City Attorney

TULARE IRRIGATION DISTRICT
"DISTRICT"

By: _____
David G. Bixler Date
President, Board of Directors

By: _____
J. Paul Hendrix Date
General Manager

Approved as to form and content.

By: _____
Daniel M. Dooley Date
District Counsel