

CITY OF LATHROP

Department of Public Works

Design & Construction Standards



2021

TABLE OF CONTENTS

SECTION 1 GENERAL STANDARDS	1-1
1-1 PURPOSE	1-1
1-2 DEFINITIONS.....	1-1
1-3 ACRONYMS AND ABBREVIATIONS	1-11
1-4 VARIANCES.....	1-13
1-5 APPEALS	1-14
1-6 EFFECTIVE DATE OF STANDARDS.....	1-14
1-7 REVISIONS.....	1-14
1-8 GENERAL REQUIREMENTS	1-14
1-9 CONSTRUCTION OF IMPROVEMENTS	1-22
1-10 SCADA TOWER AND COMMUNICATION SPECIFICATIONS	1-23
1-11 TRASH ENCLOSURES.....	1-24
SECTION 2 SUBMITTAL STANDARDS.....	2-1
2-1 PURPOSE	2-1
2-2 DRAFTING STANDARDS	2-1
2-3 PREPARATION OF IMPROVEMENT PLANS.....	2-1
2-4 STORM DRAIN NOTES:.....	2-14
2-5 STREET NOTES:.....	2-15
2-6 SANITARY SEWER NOTES:.....	2-17
2-7 WATER NOTES:	2-17
2-8 RECYCLED WATER NOTES:	2-19
2-9 SIGNAL INTERCONNECT CONDUIT NOTES:	2-19
2-10 SPECIAL NOTES:	2-20
2-11 IMPROVEMENT PLAN REVIEW CHECKLIST	2-20
2-12 IMPROVEMENT BOND ESTIMATE	2-20
2-13 RECORD MAPS	2-21
2-14 FINAL MAPS.....	2-22
2-15 PARCEL MAPS	2-27
SECTION 3 STORM DRAINAGE STANDARDS.....	3-1
3-1 PURPOSE.....	3-1
3-3 STORM WATER TREATMENT AND BEST MANAGEMENT PRACTICES.....	3-1
3-5 DESIGN STORM RUNOFF	3-5

3-7	DRAINAGE STRUCTURES	3-15
SECTION 4 WATER SYSTEM STANDARDS.....		4-1
4-1	PURPOSE	4-1
4-2	WATER SYSTEM EXPANSION/REPAIR.....	4-1
4-3	DEFINITIONS.....	4-1
4-4	WATER SUPPLY REQUIREMENTS.....	4-1
4-5	WATER DISTRIBUTION SYSTEM.....	4-4
4-7	SECURED FACILITIES	4-21
SECTION 5 SEWER SYSTEM STANDARDS		5-1
5-1	PURPOSE	5-1
5-2	DEFINITIONS.....	5-1
5-3	GENERAL REQUIREMENTS	5-1
5-4	SEWER SYSTEM DESIGN REQUIREMENTS.....	5-2
5-5	MATERIALS.....	5-11
5-6	TRENCHING, BACKFILL AND BEDDING	5-13
5-7	TESTING AND ACCEPTANCE	5-15
SECTION 6 ROADWAY STANDARDS.....		6-1
6-1	PURPOSE	6-1
6-2	DEFINITIONS.....	6-1
6-3	OTHER STANDARDS	6-1
6-4	TRAFFIC STUDIES.....	6-1
6-5	DESIGN STANDARDS.....	6-3
6-6	STREET LIGHTS.....	6-32
6-7	CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED) LIGHTING PRINCIPLES	6-35
6-8	STREET OPENING AND PAVEMENT RESTORATION IN MORATORIUM STREETS.....	6-36
SECTION 7 RECYCLED WATER SYSTEM STANDARDS.....		7-1
7-1	INTRODUCTION	7-1
7-2	PURPOSE	7-1
7-3	DEFINITIONS.....	7-1
7-4	CITY SUPPLIED RECYCLED WATER INFORMATION	7-1
7-5	REQUIREMENTS FOR DETERMINING ADEQUATE STORAGE CAPACITY AND LAND APPLICATION AREAS FOR RECYCLED WATER SYSTEMS.....	7-1

7-6	USES OF RECYCLED WATER	7-6
7-7	RECYCLED WATER SYSTEM EXPANSION AND REPAIRS.....	7-6
7-8	RECYCLED WATER SYSTEM INFORMATION AND REQUIREMENTS	7-6
7-9	CITY ACCEPTANCE.....	7-6
7-10	SUBMITTAL REQUIREMENTS.....	7-7
7-11	RECYCLED WATER DISTRIBUTION SYSTEM DESIGN REQUIREMENTS	7-10
7-12	RECYCLED WATER IRRIGATION SYSTEM DESIGN REQUIREMENTS	7-14
7-13	RECYCLED WATER STORAGE POND DESIGN REQUIREMENTS	7-23
7-14	RECYCLED WATER PERCOLATION BASIN DESIGN REQUIREMENT .	7-25
7-16	TESTING AND INSPECTION.....	7-26
7-17	SIGNAGE AND IDENTIFICATION PAINTING AND MARKING.....	7-29
SECTION 8 LANDSCAPE AND PLANTING STANDARDS		8-1
8-1	GENERAL.....	8-1
8-2	CERTIFICATE OF COMPLIANCE.....	8-1
8-3	MEASUREMENT OF QUANTITIES	8-1
8-4	MATERIALS.....	8-1
8-5	CONDITIONS	8-1
8-6	SUBMITTALS	8-4
8-7	INSPECTIONS.....	8-5
8-8	SCHEDULING.....	8-6
8-9	SUBSTITUTIONS.....	8-6
8-10	PREPARING PLANTING AREAS	8-6
8-11	PLANTING - GENERAL.....	8-8
8-12	PLANT ESTABLISHMENT.....	8-12
8-13	WEED CONTROL	8-12
8-14	WATERING	8-13
8-15	START OF MAINTENANCE PERIOD INSPECTION.....	8-13
SECTION 9 IRRIGATION SYSTEM STANDARDS		9-1
9-1	GENERAL.....	9-1
9-2	MANUFACTURER’S WARRANTIES.....	9-1
9-3	GUARANTEE	9-1
9-4	RECORD DRAWINGS.....	9-1

9-5	WATER TAPS ON CITY MAINS	9-1
9-6	CONNECTIONS TO EXISTING LANDSCAPE MAINS	9-2
9-7	SALVAGE.....	9-2
9-8	CONDUIT.....	9-2
9-9	BACKFLOW PROTECTION ASSEMBLIES.....	9-5
9-10	IRRIGATION CONTROL VALVES AND VALVE BOXES	9-6
9-11	VALVE MANIFOLDS.....	9-6
9-12	SWING JOINT ASSEMBLIES.....	9-6
9-13	SPRINKLERS.....	9-6
9-14	TRENCHES.....	9-7
9-15	INSTALLATION OF IRRIGATION PIPE.....	9-8
9-16	TESTING OF IRRIGATION SYSTEM.....	9-9
9-17	BACKFILL OF IRRIGATION PIPELINES	9-10
9-18	RE-PAVING	9-10
9-19	PLASTIC IRRIGATION PIPE.....	9-11
9-20	PLASTIC IRRIGATION PIPE FITTINGS	9-11
9-21	ELECTRIC AUTOMATIC CONTROLLER	9-11
9-22	ELECTRIC CONTROL WIRES	9-12
9-23	IRRIGATION CONTROL WIRES.....	9-12
9-24	ELECTRIC REMOTE CONTROL VALVES - SIZES 3/4" TO 2".....	9-12
9-25	MANUAL CONTROL VALVES	9-13
9-26	IRRIGATION VALVE BOXES.....	9-13
9-27	QUICK COUPLING VALVES.....	9-13
9-28	BOOSTER PUMPS	9-13
9-29	RECORD DRAWINGS AND IRRIGATION STATION CHART	9-14
SECTION 10 PARK IMPROVEMENTS STANDARDS		10-1
10-1	GENERAL.....	10-1
10-2	MANUFACTURER’S WARRANTIES.....	10-1
10-3	GUARANTEES.....	10-1
10-4	MEASUREMENT OF QUANTITIES	10-1
10-5	CONDITIONS	10-1
10-6	SUBMITTALS	10-2
10-7	SUBSTITUTIONS.....	10-3
10-8	WARRANTY	10-3
10-9	MATERIALS.....	10-3

10-10 LAYOUT	10-4
10-11 SITE FURNISHINGS.....	10-4
10-12 PLAY EQUIPMENT	10-6
10-13 CONCRETE FOOTINGS.....	10-7
10-14 PARK WATER SYSTEMS.....	10-7
10-15 PARK IRRIGATION SYSTEMS	10-8
10-16 PARK SANITARY SEWERS.....	10-8
10-17 PARK STORM DRAINAGE	10-9
10-18 PARK ELECTRICAL AND LIGHTING.....	10-9
10-19 ENCLOSURES.....	10-9
10-20 CLEANING	10-9
SECTION 11 TREE PRUNING STANDARDS.....	11-1
11-1 GENERAL.....	11-1
11-2 STANDARDS.....	11-1
11-3 QUALITY CONTROL.....	11-1
11-4 PRUNING PLANS	11-2
11-5 PRUNING PRACTICES	11-2

APPENDICES

Appendix A – Improvement Plan Review Checklist

Appendix B – General Record Maps Review Checklist

Appendix C – Final Map Checklist

Appendix D – Parcel Map Checklist

Appendix E – City of Lathrop Benchmarks

Appendix F – RTU/PLC Programming Guidelines for SCADA Interface

Appendix G – Secured Facilities

Appendix H – Wastewater and Storm Water Pump Station Criteria

Appendix I – AutoCAD Digital Submission Standards

Appendix J – Cleaning and Closed-Circuit Television Inspection of Sanitary Sewer and Storm Drain Pipelines

Appendix K - Storm Drain Design

SECTION 1 GENERAL STANDARDS

1-1 PURPOSE

The Design and Construction Standards are intended to provide the minimum standards facilities and all appurtenances thereto in the City of Lathrop. The Design and Construction Standards include the Standard Details.

The primary scope of the Standards is for those improvements to be turned over to the City for operation and maintenance. However, the City recognizes that it has a responsibility to assure that certain privately owned improvements meet a minimum standard. In general, the Standards will be applied to privately owned and maintained improvements of an uninvolved third party property owner.

The design of each development is a special case, and the Standards shall not be construed as a maximum standard for any construction. Under certain conditions, any or all phases of a development may be required to exceed the Standards. It is also recognized that there may be developments where it is impossible to meet the Standards. It is suggested that these cases be reviewed with the City Engineer early in the design process to minimize reworking plans where deviations are not permitted.

Any items not included in the Standards shall be designed in accordance with the State Planning Manual, 2016 California Building Code (CBC), State Highway Design Manual, Subdivision Ordinance or Zoning Ordinance as defined below, or as directed by the City Engineer.

The Public Works Director shall be the final authority on all questions that may arise as to the interpretation of the Standards. The Director's decision shall be final and he/she shall have authority to enforce and make effective such decisions for design, construction, and repair of streets, utilities, drainage, sewerage, and water supply.

1-2 DEFINITIONS

In using these Standards, attention is directed to Section 1 of the State Standard Specifications and to the following additional and qualifying definitions:

Average Dry Weather Flow	The average sewer flow during dry weather months, (July, August and September) typically measured in millions of gallons per day (MGD).
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Agricultural Irrigation	Irrigation for crop or pasture.
Applicant	Any person, association, corporation, entity, or government agency requesting approval for design and construction of public infrastructure, often a sub divider or developer.
AWWA Guidelines	The American Water Works Association latest guidelines for recycled water facilities: (1) Guidelines for Distribution of Non-Potable Water and (2) Guidelines for the On-Site Retrofit of Facilities using Disinfected Tertiary Recycled Water.
Bicycle Way	An area either within or outside the right-of-way of a dedicated street where bicycle travel is the designated use.
Bidder	Any person or persons, firms, partnerships, joint ventures, corporations or combination thereof submitting proposal for work contemplated, acting directly or through a duly authorized representative.
Calendar Day	Every day shown on a calendar. Sundays and holidays are included.
California Department of Public Health	State of California, Department of Public Health
California Manual On Uniform Traffic Control Devices	The U.S. Department of Transportation, Federal Highway Administration, Manual on Uniform Traffic Control Devices, as amended for use in California (latest edition).
California Storm water Quality Association	Is an organization that provides information, tools, and education for storm water compliance. They have developed a series of fact sheets on how to implement and maintain best management practices. Their website is: www.casqa.org .

California Building Code (CBC)	The current edition of the California Building Code of the International Code Council as adopted by the Building Division of the City.
City	The City of Lathrop, a political subdivision of the State of California.
City Council	The City Council of the City of Lathrop, State of California.
City Engineer	The City Engineer is the head of the Engineering Division – not the same as the Public Works Director.
City Maintained Street	A street for which the City has accepted maintenance responsibilities.
Construction Standards	Are analogous to the meaning of and documents for the Design and Construction Standards as hereinafter defined.
Consulting Engineer	Any person(s), firm, partnership or corporation legally authorized to practice engineering in the State of California who prepares or submits improvement plans and specifications to the Public Works Department/City Engineer for approval. This term is used interchangeably with Design Engineer and Engineer of Record
Contract	Written agreement covering the performance of work.
Contractor	Any person(s), firm, partnership, corporation or combination thereof who have entered into a contract with any person(s), firm, special district, or the City or their legal representatives for the construction of any improvement within the City.
Date of Signing of Contract	The date upon which a properly executed contract is delivered to and executed by the City Manager or Mayor.
Day	A Calendar day or 24 hours measured from midnight to next midnight.

Design & Construction Standards	The Design and Construction Standards, including the Standard Details of the City. When not covered by the Design and Construction Standards, the Standard Plans and Specifications of the State of California, Department of Transportation (latest edition) shall prevail.
Design Engineer	The Professional Engineer (registered by the State of California in a discipline appropriate to the project) employed by the applicant to design, prepare plans, and conduct related engineering activities. See Consulting Engineer.
Design Standards	See the definition for Design and Construction Standards
Detention Basin	A drainage basin with an outlet facility providing terminal drainage capable of emptying the full basin within a specified time.
Developer/Sub divider	A person(s) firm, corporation, partnership, association, or agent thereof who causes land to be subdivided or cause existing property to be improved.
Director	The Public Works Director of the City acting either directly or through properly authorized agents acting within the scope of the particular duties delegated to them.
Distribution System - Recycled Water	Recycled water mains, together with all appurtenances and necessary valves, meters, service laterals, and associated material and equipment to carry recycled water and distribute it to the end user.
Distribution System - Water	Water mains, together with all appurtenances and necessary valves, fire hydrants, meters, service laterals, blow offs, and associated material and equipment which carry potable water and distribute it to individual consumers.
Easement	An easement dedicated to the City or public utility that is continuing and irrevocable unless formally abandoned.
Engineer	Is identical to the definition of City Engineer as herein defined.

Engineering Division	The Engineering Division of the Public Works Department of the City.
Erosion and Sediment Control Plan (ESCP)	A site map that shows areas of disturbed soil, construction activity, and best management practices (BMPs) to be utilized by the contractor to control erosion and capture sediment. The ESCP must include adequate annotation to describe the BMP implementation and maintenance for each phase of the project. An ESCP is required of all projects that have soil disturbance. For projects that will apply for coverage under the State of California's Construction General Permit, the Storm Water Pollution Prevention Plan (SWPPP) required by that permit may be submitted by the developer in lieu of the ESCP.
Flood Protection Level (FPL)	Development of flood protection facilities equivalent to 100-year or 200-year storm frequency. The level of protection shall be determined by the Director of Public Works or the governing body.
Frontline Sprinklers	The closest sprinklers to an irrigation boundary, including sensitive and recreational areas.
Geomembrane	Synthetic liner comprised of polymer resins, plasticizers, and various additives.
Highway Design Manual	The State of California, Department of Transportation, Highway Design Manual (latest edition).
Improvements	Refers to street work, asphalt paving, sidewalk, curb, gutter, driveways, water, sanitary sewer and storm drainage facilities, street lights, fire hydrants, landscaping, fences, and public utilities to be installed by the developer in the street right-of-way or in an easement dedicated to the City or public utility.
Infiltration	The quantity of groundwater or surface water that leaks into a pipe through joints, breaks, or holes.
Inspector	The authorized representative of the City Engineer and/or the Public Works Director assigned to a jobsite.

International Building Code (IBC)	The current edition of the International Building Code of the International Code Council as adopted by the Building Division of the City.
Laboratory	Any testing agency or testing firm approved by the Public Works Department.
Landscape Irrigation	Irrigation for parks, schoolyards, playgrounds, medians, greenbelts, parkways, roadside landscaping, etc.
Lathrop Manteca Fire District	The fire and emergency safety response district for the City.
Low Impact Development	A system of sustainable landscaping approaches that can be used to replicate or restore natural watershed functions and/or address targeted watershed goals and objectives.
Main Extension:	An extension to the transmission and distribution system that is needed to serve a new development.
Main Replacement:	A replacement of an existing portion of the transmission and distribution system.
Map Act	The same as and is interchangeable with the term Subdivision Map Act as defined herein.
Maximum Day Demand (Potable Water)	The maximum day demand is the average demand multiplied by a factor of 1.7.
Maximum Day Demand (Recycled Water)	The highest daily recycled water demand. Used to size pumps and daily storage/hydro pneumatic tanks.
Maximum Hourly Demand (Potable Water)	The maximum hourly demand is the average day demand multiplied by a factor of 3.4.
Median	The portion of a divided highway separating the traveled way for traffic in opposite directions. A median may be raised, landscaped or painted.
Micro Irrigation	Micro irrigation refers to low-pressure irrigation systems that spray, mist, sprinkle, or drip.

Moratorium Streets	Newly constructed or reconstructed streets within five (5) years of the acceptance by the City.
Overland Release Path	An alignment that allows the passage of floodwater through a development at surface grades independent of underground pipe systems without damaging structures.
Parkway	The area adjoining the outer edge of the roadbed, extending to the right-of-way line in which sidewalks, plantings, utilities, bank slopes and related facilities may be located.
Peak Hour	Used to size irrigation piping system components and other facilities.
Precipitation Depth	The precipitation measured in inches occurring during specified duration of storm.
Private Pipe Extension:	An extension that provides on-site domestic service or fire protection service on the consumer's side of the City's water meter.
Private Street/Road	A roadway within a private development or a planned residential development whereby the street improvements remain in private ownership.
Public Road	Any road, which is open for unrestricted travel by the general public. A public road may or may not be dedicated to or maintained by the City.
Public Works Department	The Public Works Department of the City.
Peak Wet Weather Flow (Sewer)	Peak Wet Weather Flow = (ADWFxPF), where ADWF is the Average Dry Weather Flow and PF is the Peaking Factor.
Recreational Areas	Recreational areas are defined as play areas that do not include equipment for children to play on, such as sand volleyball courts, horseshoe pits, etc.
Recycled Water	Water resulting from wastewater treatment to tertiary Title 22 standards suitable for direct beneficial use or controlled use.

Retention Basin	A drainage basin with no outlet facilities for terminal drainage, that is capable of storing the required storm-water runoff volume and will empty through percolation and evaporation over a specified time.
Road	Includes streets and highways both public and private. The terms streets, road, roadways, and highways are used interchangeably. Road includes the roadbed, all slopes, shoulders, side ditches, curb, gutters, sidewalks, and all other related facilities within the right-of-way.
Road Commissioner	The Public Works Director of the City.
Sensitive Areas	Sensitive areas are defined as children’s play areas and areas with picnic tables, benches, or water fountains.
Service Lateral - Recycled Water	The pipe or tubing, fittings, valves, and appurtenances necessary to convey recycled water from the recycled water main to the City’s recycled water meter or curb stop.
Service Lateral - Sewer	The pipe from the sewer main to the right-of-way or easement line which provides a point of connection for each property.
Service Lateral - Water	The pipe or tubing, fittings, valves, and appurtenances necessary to convey water from the water main to the City’s water meter or curb stop.
Sewer System	Sanitary sewer system or wastewater collection system including pipe, manholes, flushing branches, laterals and cleanouts.
Soils Report	The project geotechnical report prepared by an engineer legally licensed to prepare “Soils Reports” in the State of California.
Standard Plans and Specifications	The Standard Plans and Specifications of the State of California, Department of Transportation (latest edition) including any revisions per the Design and Construction Standards of the City.
Standards	See definition of Design and Construction Standards.

Standard Drawings	Standard Details of the City of Lathrop.
State	As used in the State Standard Specifications, shall mean City
State Materials Manual	The Materials Manual of Testing and Control Procedures of the State of California, Public Transportation Laboratory Manual of Tests, Department of Transportation (latest edition) unless otherwise stated.
State Planning Manual	The Planning Manual of Instructions of the State of California, Public Works Department, Department of Transportation (latest edition) unless otherwise stated.
State Standard Specifications	See previous definition of Standard Plans and Specifications.
Storm Frequency	The probability of the occurrence of a hydrological event of specified severity; also referred to as recurrence interval or return period.
Storm Water Runoff	Water that results from the precipitation which is not absorbed by the soil, evaporated into the atmosphere, or entrapped by ground surface depressions and vegetation and which flows over the ground surface.
Subdivision Map Act	§66410 to and inclusive of §66499.58 of the Government Code of the State of California as currently amended.
Subdivision Ordinance	The Subdivision Ordinance of the City.
Supplemental Water	Potable water, raw water, or ground water used to supplement the recycled water shortfalls.
Supply System - Recycled Water	A general term covering all facilities related to obtaining recycled water and delivering it for agricultural, irrigation, or other end use.
Supply System - Water	A general term covering all facilities related to obtaining potable water and delivering it for residential, commercial, industrial, agricultural, irrigation or other end use.

Tap	Physical connection to a water main which, together with appropriate metering, affects water service to individual consumers.
Terminal Drain	A storm drainage system or portion thereof, which conveys storm runoff into a terminal waterway.
Terminal Waterway	A natural or man-made channel that receives runoff and which by gravity carries storm water to the final receiving body of water.
Transmission Line - Recycled Water	A pipeline together with all appurtenances primarily used to transport recycled water between two points.
Transmission Line - Water	A pipeline together with all appurtenances primarily used to transport raw or treated water between two points.
Traveled Way	The portion of the road for the movement of vehicles, exclusive of shoulders and auxiliary lanes.
Typical Street Cross Section	Is a cross section of the various street types indicating pavement widths, curbs, gutter types and locations, and right of ways as shown on the City Standard Details R-1 and R-2.
Zoning Ordinance	The Zoning Ordinance of the City.

1-3 ACRONYMS AND ABBREVIATIONS

Any acronyms and abbreviations as defined in the Standards shall apply and include but not necessarily be limited to the following:

AASHTO	American Association of State Highway Transportation Officials
AC	Acre
ACI	American Concrete Institute
ACP	Asbestos Cement Pipe
ADWF	Average Dry Weather Flow
AFBMA	Anti-Friction Bearing Manufacturer's Association
AFY	Acre Feet Per Year
AISC	American Institute of Steel Construction
ASCE	American Society of Civil Engineering
ASTM	American Society of Testing and Materials
AWWA	American Water Works Association
BMPs	Best Management Practices
CADD	Computer-Aided Design and Drafting
CALTRANS	California Department of Transportation
CASQA	California Storm Water Quality Association
CBC	California Building Code
CDPH	California Department of Public Health
CEQA	California Environmental Quality Act
CFF	Capital Facility Fees
CPTED	Crime Prevention Through Environmental Design
CSI	Construction Specifications Institute

DU	Dwelling Unit
ECU	Equivalent Capacity Unit
ESCP	Erosion and Sediment Control Plan
FEMA	Federal Emergency Management Agency
FOG	Fats, Oils and Greases
GPD	Gallons Per Day
HGL	Hydraulic Grade Line
HPSV	High Pressure Sodium Vapor
IBC	International Building Code
ISA	Instrument Society of America
IWRMP	Integrated Water Resources Master Plan
LCTF	Lathrop Consolidated Treatment Facility
LED	Light-Emitting Diode
LID	Low Impact Development
LMC	Lathrop Municipal Code
LMFD	Lathrop Manteca Fire District
LPSV	Low Pressure Sodium Vapor
MUTCD	California Manual on Uniform Traffic Control Devices
MWQCF	Manteca Water Quality Control Facility
NEC	National Electric Code
NPDES	National Pollution Discharge Elimination System
OSHA	Occupational Safety and Health Administration
PF	Peaking Factor

PSP	Project Stormwater Plan
PUE	Public Utility Easement
PVC	Polyvinyl Chloride
PWWF	Peak Wet Weather Flow
RCP	Reinforced Concrete Pipe
REAP	Rain Event Action Plan
RWQCB	Regional Water Quality Control Board
SSJID	South San Joaquin Irrigation District
SJVAPCD	San Joaquin Valley Air Pollution Control District
SSMP	Sanitary Sewer Management Plan
SWPPP	Storm Water Pollution Prevention Plan
SWMP	Storm Water Management Plan
UBC	Uniform Building Code
UDC	Urban Design Concept
UPC	Uniform Plumbing Code
VCP	Vitrified Clay Pipe
WDID#	Waste Discharger Identification (number)
WWPA	Western Wood Products Association
WDRs	Waste Discharge Requirements

1-4 VARIANCES

The Director may consider deviations from these Standards. The Design Engineer is advised to obtain preliminary approval from the Director prior to proceeding with any design based on deviations from the Standards. The Design Engineer shall submit written supporting justification and technical documentation with any request for a deviation. The Director, at his/her sole discretion, may approve, modify, or deny any deviation.

1-5 APPEALS

The Design Engineer may appeal any disagreement with the Standards or any changes required by the Department as a result of the Department's review of the improvement plans. All appeals shall be made to the Director for resolution prior to the approval of the improvement plans. All appeals shall be in writing and accompanied by supporting technical data and other supporting evidence. The Director's decisions thereon shall be final.

1-6 EFFECTIVE DATE OF STANDARDS

The Standards are effective upon approval by the Director and shall supersede all prior Design and Construction Standards.

1-7 REVISIONS

The Standards may be revised, amended, or added to, and such revisions, amendments, and additions shall be binding and of full force and effect upon approval by the Director.

1-8 GENERAL REQUIREMENTS

The City requires strict compliance with the Professional Engineers Act of the California Business and Professions Code. All plans, specifications, reports, and documents required by the City shall be signed and stamped with the seal of a Registered Engineer in a discipline appropriate to the project, currently licensed to practice in the State of California.

All facilities covered by these Standards shall be constructed by Contractors holding a valid contractor's license issued by the Contractors State License Board, Department of Professional and Vocational Standards, State of California. The Contractor may hold a General Engineering, Class A license or a specialty license covering the specialty work being performed.

Contractors performing work for the applicant shall be competent with adequate manpower and equipment to accomplish the work in accordance with the approved plans and specifications. A representative of the Applicant or the Contractor shall be present at the job site whenever subcontractors are conducting work.

1-8.1 Conflicts and Inconsistencies between Standards

If Standards, Specifications, Plans, Drawings, and Details referenced conflict with each other, the most stringent shall prevail at the discretion of the Director or City Engineer,

1-8.2 Preparation of Improvement Plans

Improvement plans shall be prepared in accordance with Section 2, Submittal Standards, of these Standards. Designs shall at a minimum comply with all pertinent sections of these

Standards. The Director or the City Engineer may require or impose more stringent requirements in the engineering design as deemed necessary for the adequate protection of the public health and safety. The additional requirements do not relieve the Designer from complying with any other provisions or requirements of the Standards.

The plans and maps shall be drawn in AutoCAD (.dwg) format in the latest release version approved by the City. Upon approval of the plans by the Director, the Design Engineer shall supply the City Engineer with the plans and disk required in Section 1-8.10, Final Plans.

1-8.3 **Approved Plans**

Complete plans and specifications for all public improvements, including street work, traffic signals, traffic striping, traffic signage, asphalt paving, sidewalk, curb, gutter, driveways, water, sanitary sewer and storm drainage facilities, street lights, fire hydrants, monuments, bench marks, landscaping, fences and public utilities to be installed by the developer in the street right-of-way or in an easement dedicated to the City or public utility, shall be submitted to the City Engineer for approval. The signature and seal of the Design Engineer on the plans will signify that he/she has reviewed, approved, and authorized the plans for construction. The signature of the City Engineer must be obtained before the plans are approved. The City Engineer may order any Contractor to cease work on any project at no cost or liability to the City if said Contractor does not have properly approved plans and a City encroachment permit or subdivision agreement in his/her possession.

1-8.4 **Reference to City Standards**

The General Notes and Special Provisions of all plans shall include the following note:

“All construction and materials shall conform to the City of Lathrop Design and Construction Standards”.

1-8.5 **Improvement Plan Submittal**

The initial submittal of improvement plans to the Engineering Division shall consist of the items as identified in Section 2, Submittal Standards, of these Standards. The initial improvement plan submittal shall consist of three (3) black line prints

After the plan check is completed, the City Engineer will return one copy with the corrections or revisions marked on the plans. If the submitted plans are not prepared in accordance with these Standards, or if they are not in keeping with the standards of the profession, the City Engineer may return them as unacceptable, stating the reason for rejection.

1-8.6 **Improvement Plan Re-submittal**

Plans being resubmitted shall consist of two (2) complete sets of revised plans and any

other submittals or supporting information required by the City Engineer, plus the plan set previously marked for correction. The City Engineer may require additional sets.

1-8.7 **Partial Plans**

If the improvement plans consist of only a portion of the ultimate development, the plans shall be accompanied by a master plan showing all topographic features for the entire development. The topographic information shall be at an adequate scale to clearly show the proposed storm drain system and the grades for curb and gutter and asphalt pavement improvements.

1-8.8 **Plan Check and Construction Inspection Fees**

The plan check and construction inspection fees are due in full with the first plan check submittal. The final fees will be adjusted based on the final approved engineer's construction estimate. The final engineer's construction estimate shall be approved by the City Engineer. The fees must be paid before Public Works will release the plans for construction. The plan checking and inspection fees shall be set by resolution of the City Council. Inspection fees for work performed before 8:00 A.M. and after 5:00 P.M. or on weekends or holidays that requires City inspection shall be at an overtime rate. Funds to cover overtime cost **must** be deposited by the contractor or developer before the work is authorized.

1-8.9 **Plan Approval**

Plans are not considered approved for construction until the City Engineer has signed the Mylar title sheet of the original drawings. Plan approval is valid for twelve months from the date of approval. If construction has not begun within the twelve-month period, the approval shall expire and the plans and engineer's estimate shall be resubmitted for review and re-approval. The plan check fee for re-approval of plans shall be twenty-five percent (25%) of the normal plan check fees, unless the plan check fee for re-approval of plans is modified by resolution of the City Council.

1-8.10 **Final Plans**

- A. The following copies are required for final maps and parcel maps: one (1) photographic mylar reproducible copy with one (1) mylar reproducible copy reduced to 8 ½"x11" with two (2) black line prints, one (1) CD containing scanned files of the final map or parcel map in .GIF, .JPG, or .TIF format, and one (1) CD containing approved map in AutoCAD format. A cash guarantee of \$1000 is required prior to the release of the map to the title company to insure the timely completion of the copies and submittal of the CD's and AutoCAD files.
- B. The following copies are required for improvement plans: The Design Engineer shall provide a full set of reproducible drawings for City Engineer approval and the

Mylar title sheet for signatures. From the approved original improvement plans, Design Engineer shall provide a CD containing the improvement plans in AutoCAD and PDF format, five (5) full size black lines, and five (5) half size back lines, before the City will release the plans for construction.

1-8.11 Plan Revisions During Construction

Changes in the plans may be required during construction. The Design Engineer shall first obtain the City Engineer's approval for any revisions in the plans. Revisions to the plan shall be made in the following manner:

- A. The Design Engineer shall submit three copies of the proposed revisions to the City Engineer for review.
- B. The changes shall be clearly shown on the plans with the changes and approval noted on the revision signature block. The Design Engineer and the City Engineer shall both initial the revision block to confirm responsibility and approval.
- C. The changes shall be identified by the revision number in a triangle delineated on the plans adjacent to the change and on the revision signature block.

Minor changes, which do not affect the basic design or contract, may be made upon the written authorization of the City Engineer. ALL changes must be shown on the "As-Built" drawings before the "As Built" drawings are submitted to the City Engineer.

The City may order changes in the plans in order to complete the necessary facilities. Changes in the plans ordered by the City shall conform to all of the above.

1-8.12 Record Drawings (As-Built)

The Design Engineer shall keep an accurate record of all approved deviations from the plans and shall provide a copy of these records to the City Engineer upon completion of the work. The records are to be utilized with the inspector's plans and notes to permit the Design Engineer to prepare a complete and accurate set of "As Built" drawings for the permanent records of the City. "As Built" drawings preparation is the responsibility of the Developer and his/her contractor and Design Engineer.

The following will be required prior to acceptance of improvements by the City Engineer or the City Council:

- A. One (1) mylar duplicate copy of record drawings (a conformed set of drawings that

incorporates all of the changes from the “as-built” drawings); and

- B.** Digital submittal (file share service or storage device) in PDF file type; and
- C.** Signed and stamped document with all vertical control elevations; and
- D.** GIS/AutoCAD
 - 1. Digital submittal (file share service or storage device) of AutoCAD Civil 3D files containing all attributes listed and in compliance with the drafting standards of Appendix I; or
 - 2. Payment of staff time to migrate AutoCAD files to the City’s GIS system pursuant to the City’s Fee Schedule adopted at the time of acceptance.

1-8.13 **Conflicts, Errors and Omissions**

Features of the plans that are contrary to, in conflict with, or do not conform to California State Law, City of Lathrop Code of Ordinances, conditions of approval, or are not in keeping with the standards of the profession are excepted from approval. This condition applies even though such errors, omissions or conflict may have been overlooked in the Public Works Department’s review of the plans.

1-8.14 **Change in Design Engineer**

The Developer may elect to have a licensed engineer or land surveyor, other than the Engineer who prepared the plans, provide the construction staking. The Developer shall provide the City Engineer with written notification of the name of the new individual or firm at least seven (7) calendar days prior to the staking of the project for construction. The Developer shall then be responsible for providing all professional engineering services that may be required during construction, the preparation of revised plans for construction changes, and the preparation of “Record Drawings” upon completion of construction. In the Developer’s notification of a change in the firm providing construction staking, he/she shall acknowledge that he/she accepts responsibility for design changes and “Record Drawing” information as noted above.

1-8.15 **Tunnel Safety Requirements**

Any boring or jacking operation of 100 foot or greater length and involving an opening greater than 30 inches in diameter is subject to the State of California Division of Industrial Safety’s tunnel safety requirements. The Design Engineer shall submit to the Division of Industrial Safety plans and specifications applicable to the tunnel operation, with a letter requesting tunnel classification. This procedure is also recommended to avoid project delay if there is the possibility of any personnel entering the tunnel, regardless of the diameter and length. The letter should identify the **City of Lathrop Public Works Department** as the inspecting agency along with the Department’s mailing address. The

plans shall identify underground utilities and tanks or areas for storing fuel and toxic gases in the vicinity of the tunnel site. The request for classification should be submitted allowing ample time for the Division of Industrial Safety review in order that any special requirements can be included in the project plans and specifications. The Design Engineer shall attend any required pre-construction meeting.

1-8.16 Existing Utilities

The City is a member of the Underground Service Alert (USA - North) on-call program. The Contractor or sub-contractor is required to notify USA at “811” or (800) 227-2600, two working days in advance of beginning any excavation work. All existing utilities are to be shown on the plans. In addition, the Design Engineer shall submit preliminary plans and final approved plans to the utility companies involved. The utility companies shall use this information to properly plan their relocation projects and any needed additional facilities. Copies of the transmittal letters to the utility companies shall be provided to the City Engineer with the first submittal for the plan check. The transmittal letters shall indicate all known utility conflicts, which require relocation. The conflict shall be referenced to stationing and distance from centerline. In addition, the following note shall appear on the first page of the plans that include utility work in asphalt pavement areas:

“Final pavement work shall not occur within street right-of-way prior to completion of utility relocation without the specific approval of the City Engineer.”

1-8.17 Other Agency Notifications

The Design Engineer is responsible for obtaining the approval and necessary permits from governmental or municipal agencies when their facilities or jurisdictions are involved. An approved signature block shall be on the cover sheet of the improvement plans and shall be signed by all affected agencies prior to City approval.

1-8.18 Inspection Requirements

The City Engineer shall inspect all work approved on the improvement plans, and any other improvements for which the City will accept and/or assume maintenance responsibility for after construction. Each phase of construction shall be inspected and approved prior to proceeding to subsequent phases. The City Engineer or his/her representatives shall have access at all times during construction. Any work constructed without inspection, except with specific consent or approval of the City Engineer and his/her representatives, must, if requested, be uncovered for examination and properly restored at the contractor’s expense.

- A. The City shall be given at least three (3) working days’ advance notice of initial construction start-up and at least two (2) working days’ advance notice of specialty inspection requirements needed during the project.
- B. Any improvements constructed without inspection as provided above or

constructed contrary to the order or instructions of the City Engineer will be deemed as not complying with the approved plans and specifications and will not be accepted by the City.

- C. The Design Engineer shall submit to the City Engineer two copies of all cut sheets as soon as they become available for field referencing prior to construction.
- D. After completion of all work and receipt of a request for final inspection, the City Engineer shall inspect the work. The Contractor will be notified in writing as to any particular defects or deficiencies to be remedied. The Contractor shall proceed to correct any such defects or deficiencies at the earliest possible date. At such time as the work has been completed, a second inspection shall be made by the City Engineer to determine if the previously mentioned defects have been repaired, altered, and completed in accordance with the plans. At such time as the City Engineer approves and the Director or the City Council accepts the work, the Contractor will be notified in writing as to the date of final approval and acceptance of the improvements by the City.
- E. On assessment district projects and projects where the City participates in the costs thereof, quantities will be measured in the presence of the City Engineer, Design Engineer, and Contractor.
- F. The City requires that the provisions of the approved plans and specifications be complied with, especially with regard to the quality of workmanship and materials. In the event of any discrepancy or matter of judgment, the decision of the City Engineer will be binding on the Contractor, Design Engineer, and Developer.
- G. All work shall be performed in accordance with accepted workmanship practice, the approved plans and specifications, and these Standards. Any work not accepted by the City shall be replaced until compliance is achieved. Directions given by the City relating to quality of materials and workmanship shall be complied with promptly by the Contractor.
- H. All materials used shall be subject to the inspection and approval of the City at all times, and shall not be used before being inspected and approved by the City Engineer. The Department has the right to require any testing deemed necessary to ensure compliance of the materials with the plans and specifications. The cost of said testing shall be borne by the Contractor. Failure or neglect on the part of the City to condemn or reject work or materials not in accordance with the plans and specifications shall not be construed to imply their acceptance. Materials rejected by the City shall be promptly removed from the project site.

1-8.19 Special Notices and Permits

The Design Engineer shall notify the Contractor of the following notices and requirements:

- A.** The Contractor shall have City approved plans in his/her possession at all times during construction.
- B.** The Contractor shall notify all utility companies affected by the development prior to beginning work.
- C.** The Contractor shall notify “Underground Service Alert” USA North at “811” or (800) 227-2600 not less than two (2) working days in advance of any digging or excavation.
- D.** The Contractor shall be responsible for the protection of all existing monuments and/or other survey monuments and shall notify the City Engineer of any damaged or removed City, County, State or Federal monuments.

If a monument is located within the boundary of the project, the Contractor shall submit the Acknowledgement of Monument Responsibility “Pre-Construction” form, found in Appendix E of these Standards, to the City during the Encroachment Permit Application Phase. In addition, the Contractor shall submit the Acknowledgement of Monument Responsibility “Post-Construction” form, found in Appendix E of these Standards, to the City when the work is complete.

- E.** The Contractor shall apply to the Engineering Division for permits and pay all required fees for the work shown on the improvement plans, and shall notify the Engineering Division at least three (3) working days prior to commencing any work in public right of way and at least two (2) working days prior to any specialty inspection requirements for the project.
- F.** The Contractor shall verify all street names and addresses with the Planning Division before ordering street name signs.
- G.** Except where specifically authorized by valid permits from the State Department of Fish and Game, the U.S. Army Corps of Engineers, and the San Joaquin County Flood Control District, the Contractor shall conduct their operation outside of any floodplain boundaries.
- H.** Floodplain boundaries shall be clearly delineated in the approved plans and in the field prior to construction.
- I.** The Contractor shall conduct their operation entirely outside of any areas where grading is prohibited. Restricted areas shall be clearly delineated in the approved plans and in the field prior to construction.
- J.** The Contractor shall notify the property owner two (2) working days prior to commencing work in an offsite easement.

1-8.20 Faithful Performance Security

The City may require a faithful performance security to guarantee street improvements without an agreement as follows:

- A.** Applicants shall provide the City with a Faithful Performance Security in the form of an acceptable bond or other suitable financial guarantee acceptable to the City Attorney from a financial institution authorized to do and doing business in the State of California. The security shall be valid until the City accepts the improvements. The security shall be the cost plus 20% of the City approved Engineer's Estimate.
- B.** The purpose of the Faithful Performance Security is to provide protection to the City for any expenses it may incur as a result of:
 - 1. Failure by the Contractor to complete the installation.
 - 2. Necessary repairs caused by poor installation techniques.
 - 3. Necessary repairs caused by the installation of defective material.
 - 4. Failure by the Contractor to perform in accordance with the approved plans and specifications.
 - 5. Material liens against the City.

1-8.21 Guarantee of Workmanship, Materials, and Equipment

The applicant shall guarantee that the improvements for subdivisions installed by the contractor (or applicant) be free from any and all defects in materials and workmanship for a period of one year after acceptance by the City Council. This guarantee shall be a bond in an amount of 10% of the Design Engineer's approved construction cost estimate, or other amount determined by the Director. The City may make any necessary repairs and charge the security in the event the Developer or Contractor fails to correct the defects.

1-9 CONSTRUCTION OF IMPROVEMENTS

All work shall be constructed with appropriate materials and workmanship in accordance with pertinent sections of these Standards and in strict compliance with the approved plans and specifications.

1-9.1 Work Within City Right-of-Ways and Easements

Possession of a complete set of City-approved plans and an encroachment permit or subdivision agreement is required before the Contractor performs any work in the City right-of-ways and easements. The Contractor shall be bonded as required by the City. The

encroachment permit shall be issued in accordance with Title 12, Streets, Sidewalks and Public Places, of the Lathrop City Code of Ordinances.

- A. In lieu of the above-required plans, minor work within City right-of-ways and easements may be performed with only an encroachment permit. Minor work generally consists of such items as widening or constructing sidewalks adjacent to existing curb and gutter, constructing driveways, installing driveway culverts, encroachments into the right-of-ways for such items as mailboxes or fences, utility related work and work not requiring cutting of the road surface.
- B. Three (3) working days prior to any work in City right-of-way, a schedule of work shall be submitted for approval to the Engineering Division. All work shall be scheduled within normal working hours. Normal working hours are defined as being Monday through Friday, 8:00 A.M. to 5:00 P.M. No work within a City right-of-way or easement requiring City inspection shall be allowed outside of normal working hours, or on weekends or holidays without written authorization of the City Engineer.
- C. Before any work can commence within the public right of way, a traffic control plan shall be submitted for review and approval.

1-9.2 Resolution of Conflicts between Approved Plans and Standards

In the event there is conflict between approved plans and these Standards, the Contractor shall submit to the City Engineer all conflicts for resolution. The City Engineer will render a written decision as to the governing document and/or design. Such written decision shall be final and binding upon the Contractor at no additional cost or liability to the City. Requirements shown in the plans which are more stringent than the requirements contained in the appropriate sections of these Standards are not to be construed as conflicts. It shall be the Contractor's responsibility to construct such imposed more stringent requirements in strict accordance with the approved plans. These additional requirements in no way relieve the Contractor from complying with any other provisions or requirements of these Standards. Any existing city or private facilities damaged during the course of the work shall be repaired, replaced or reconstructed to equivalent or better condition. Any pedestrian access areas (sidewalk, corner ramps, etc.) shall be replaced to meet current ADA accessibility requirements. The City Engineer will determine the extent to which replacement facilities shall be upgraded.

1-10 SCADA TOWER AND COMMUNICATION SPECIFICATIONS

A Supervisory Control And Data Acquisition (SCADA) tower, when needed, shall be purchased and installed by the developer. The size and type of the tower will be identified by the City at the time of the first plan submittal. The switches, antennas, patch panels,

cabling, and other related components shall be purchased and installed by the City at the expense of the developer.

The programming guidelines for the SCADA Interface can be found in Appendix F of these Standards.

1-11 TRASH ENCLOSURES

The City of Lathrop requires approval and permits for the construction of trash enclosures for commercial, office, industrial, mixed-use, senior housing, and multi-family residential projects. Trash enclosures shall be designed in accordance with the City of Lathrop Standard Details. Trash enclosures may be exempt on a case-by-case basis as determined by the City Engineer.

1-11.1 Capacity

Enclosure areas must have adequate storage space for solid waste, recycling, and compost.

Per Section 42911(b) of the Public Resources Code of the State of California, a local agency shall not issue a building permit to a development project, unless the development project provides adequate areas for collecting and loading recyclable materials. Therefore, all new developments must have sufficiently sized solid waste, recycling, and composting storage space. Compactors, composting systems, food waste bins, and Fats, Oils, and Grease (FOG) bins should also be stored in an enclosure or inside a building.

For assistance calculating solid waste generation levels, consult the CalRecycle website: <https://www.calrecycle.ca.gov/>

The minimum enclosure must accommodate three containers (one each for waste, recycling and compost). It shall be constructed with three solid walls and a metal gate with a man door.

Food Service Establishments (FSEs) (such as bakeries, restaurants, take-outs, and business with cafeterias): Trash enclosures must accommodate the tallow bin. It is recommended that new FSE trash enclosures be plumbed to a grease control device and the sanitary sewer to facilitate clean up.

Mixed-Use Facilities: Residential and commercial waste streams should be collected separately.

1-11.2 Storm water Pollution Prevention

Enclosure areas should be covered to prevent rain from falling on containers, compactors, or the enclosure floor and carrying contaminants to the storm water system. Though recycling/trash containers and compactors are required to be watertight, overfilled containers with partially raised lids allow rain to saturate waste and recyclables, and

compactors that are filled with wet waste commonly leak. Additionally, polluted water can enter the storm drain through leaks or spills when the containers are emptied. The property owner will be responsible for administrative citations and remediation related to storm water contamination.

- A. The cover/roof may be part of the solid waste enclosure or the roof of a building.
 - B. The roof canopy should extend sufficiently outward in all directions so that wind-blown rain will not enter the interior of the storage area.
 - C. The minimum clearance inside a roofed enclosure shall be 7'-6" with a 6'-8" high entryway for pedestrian access.
- D. Roof color and material shall comply with applicable Zoning requirements.

For use not including FOG, storm water runoff from the roof of the enclosure areas should drain away from the enclosure area.

- A. A grade break should be used to prevent run-off from outside of the enclosure area from entering the enclosure area.
- B. There should be no storm drains located inside the enclosure area or in the immediate vicinity of the recycling/trash storage area.
- C. Runoff from the roof of the enclosure area should drain to landscaping or other storm water treatment system before discharging to the municipal storm sewer system.

For use including FOG or any other contaminant to the municipal storm sewer system, enclosure areas should be plumbed to the sanitary sewer so that waste spills, leaks, and wastewater from bin washouts does not run out of the enclosure area and into storm drains. A primer trap or trap with seal protection to avoid evaporation shall be installed.

- A. If FOG is stored in the enclosure, the sanitary drain should discharge to a grease interceptor if there is one nearby. A trap primer is required per Plumbing code.
- B. Spills and leaks should be cleaned up immediately using a spill kit and/or appropriate Best Management Practices (BMP) that utilize absorbents or equivalent "dry" methods.
- C. Educational materials focusing on BMPs for compactors, dumpsters, and FOG bins should be posted in solid waste enclosure and trash compactor areas.

1-11.3 Access

Solid waste enclosure areas should be accessible by garbage/recycling trucks (unless other waste management practices will be implemented):

- A. Provide a minimum 22-foot wide driveway, notwithstanding standards for fire truck access and Public Works and Department of Transportation requirements. For further information, consult with appropriate City Departments, such as Public Works, Transportation, and Fire.
- B. Provide a minimum vehicle turning radius of 34 feet for the inside wheel and 50 feet for the outside wheel (see **FIGURE 1-1**)
- C. Do not allow parked cars and/or parking spaces to block access to the solid waste areas.
- D. Provide a 25' overhead clearance above the enclosure area so that hauler vehicles can access and empty the containers therein.

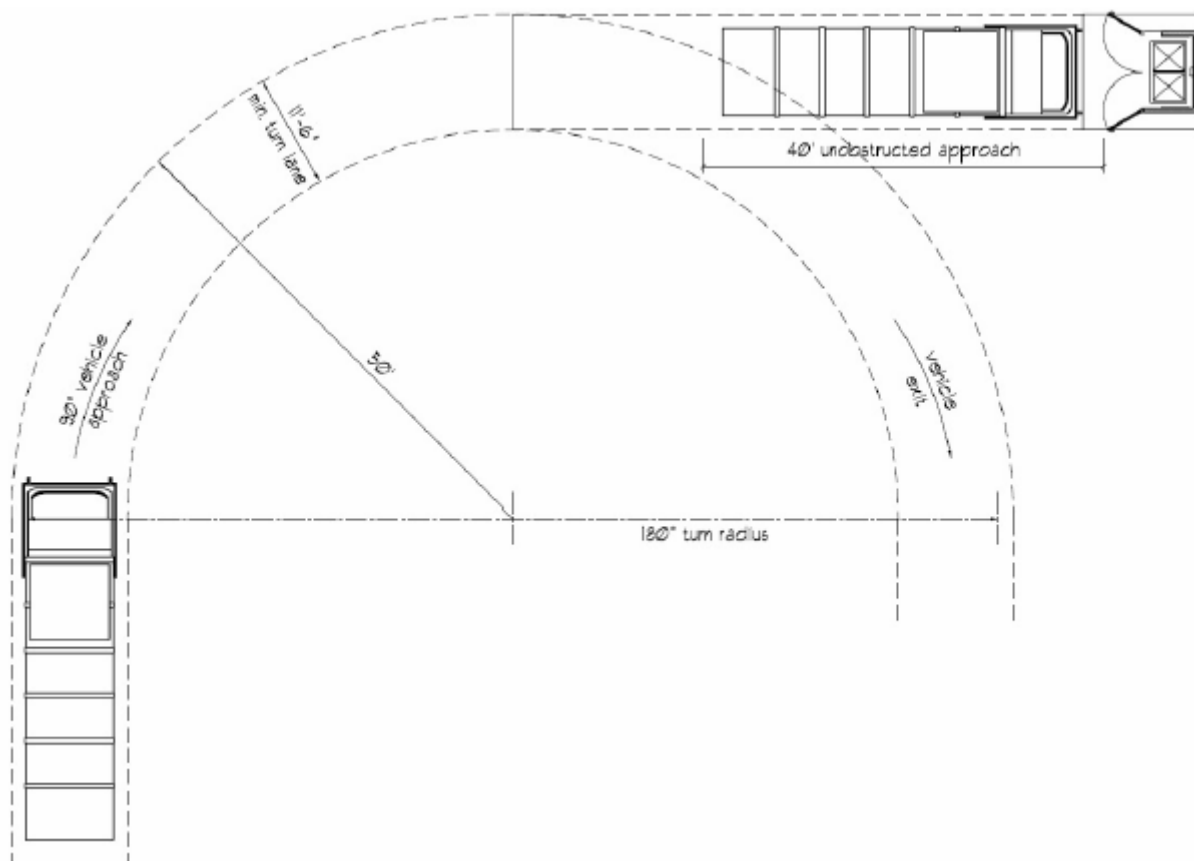


FIGURE 1-1

A stress pad should be installed in front of the solid waste enclosure area. Fortify the 8-foot area in front of the solid waste enclosure area with a concrete stress pad engineered and designed to withstand up to 20,000 pounds of direct force. The pad shall be sloped at 1/8 inch per foot to facilitate proper drainage. The apron surface shall be the at the same elevation as the pad threshold and the surrounding surfaces.

END OF SECTION

SECTION 2 SUBMITTAL STANDARDS

2-1 PURPOSE

The submittal standards are intended to establish the minimum submittal standards for Improvement Plans, Final Maps and Parcel Maps.

2-2 DRAFTING STANDARDS

2-2.1 CADD Drafting Standards

The Design Engineer/Surveyor shall prepare all maps and plans in (Computer Aided Drafting and Design) CADD unless otherwise approved by the City Engineer. All CADD drawings shall generally follow the Standards and Procedures set forth in the Caltrans Plans Preparations Manual and as modified by this Section and Standards Details.

2-2.2 CADD Digital Submission Standards

The Design Engineer/Surveyor shall conform to the requirement in Appendix I for the CADD Digital Submission Standards.

2-3 PREPARATION OF IMPROVEMENT PLANS

2-3.1 Improvement Plan Requirements

- A. Plan and Profile Sheets: All improvement plans shall be prepared on plan and profile sheets on 24" x 36" sheets. Plot Scales: Horizontal 1" = 20' or 40'; Vertical 1" = 2' or 4', only one horizontal or vertical scale per sheet. The profile portion shall be located in the upper-half of the sheet. Where wells are included as a part of the water system, the layout of the well site shall be drawn to a scale no smaller than 1" = 5', with the layout extending at least 50' in all directions from the well location.
- B. Title Sheet: On all subdivision or other improvement plans, a title sheet shall be prepared showing the following:
 - 1. The boundary of the entire subdivision or parcel and project location.
 - 2. Assessment district limits, if applicable.
 - 3. City limits.
 - 4. Street names and right-of-way widths.

5. Section lines, grant lines, and corners.
 6. Adjacent subdivisions, including names, lot lines, and lot numbers.
 7. Property lines.
 8. Public easements.
 9. Vicinity map.
 10. Scale of drawings.
 11. Index of sheets.
 12. Legend of symbols.
 13. Signature blocks conforming to Standard Detail G-1 and situated at the lower right hand corner of the sheet.
 14. Benchmark and temporary bench mark descriptions.
- C.** Title Block: Each sheet within the set of drawings shall have an approved title block showing the sheet title, number, date, scale, and the consulting Civil Engineer's name, signature and license number; the names of all Special Districts or agencies as applicable; the name of the subdivision or assessment district, and the bench mark description or references to bench mark description on the title sheet. The title block shall conform to Standard Detail G-1 and G-2 and shall be located in the lower right hand corner of all sheets.
- All improvement plans shall include signature blocks and be approved by the Lathrop-Manteca Fire District, Public Works Operations and Maintenance Superintendent, Public Works Director and the City Engineer.
- D.** Storm Drainage, Sanitary Sewer, Recycled Water, Grading, and Landscape Plans: The storm drainage, recycled water, sanitary sewer, landscape and domestic water systems shall be shown on all improvement drawings and on an overall utilities' plan layout and on the street plan profile.
1. In plan view, at a minimum, the following shall be shown:
 - a. Location and dimensions of dedicated streets and easements.
 - b. Lots to be served.
 - c. All existing and proposed curbs, gutters, and pavements.

- d. The proposed alignment of the water main and the location of all proposed system facilities such as valves, fire hydrants, fittings, manholes, cleanouts, services, etc.
 - e. All existing and proposed substructure utilities.
 - f. All existing and proposed obstructions and/or appurtenances such as vaults, catch basins, traffic islands, laterals, traffic signals, signs, etc. Length, size, and class of pipe between manholes, junctions, tees, etc.
 - g. Length, size and class of pipe between manholes, junctions, tees, etc.
 - h. Limits of the easement and any temporary construction easements.
2. Profiles for all pipes shall show the following information:
 - a. Flow line slope and grades.
 - b. Flow line and top of pipe profile.
 - c. Existing and proposed ground line.
 - d. All proposed and existing utility crossings.
 - e. Pipe sizes, lengths, class, and slope.
 - f. Special bedding and backfill.
 - g. Utility structures with rim and invert elevations.
 - h. Hydraulic grade line.
 3. Details showing all unusual proposed and existing utility crossings.
 4. Separate grading plans will be required for each subdivision.
- E. Plan Details:** The following details and supplemental information shall be shown on all plans submitted for approval:
1. Right-of-Way – Right-of-way lines, the boundaries of lots fronting on the street, drainage easements, utility easements, planting easements, section lines and corners, land grant lines and temporary construction easements, both existing and proposed, shall be shown

on the plans. All right-of-way and easement lines shall be dimensioned to show the extent of right-of-ways and easements.

2. Topography – All pertinent topographic features shall be shown, such as street lines, medians, driveways, curbs, sidewalks, shoulders, location and size of storm and sanitary sewer lines, high water and frequent inundation levels, water lines, gas lines, telephone conduits, other underground utilities, existing structures, houses, streets, trees 6 inches or larger, large shrubs, traffic signals, street lights and pull boxes, underground electrical conduits, drainage ditches, utility poles, fire hydrants, retaining walls, masonry structures, and all other features of the area which may affect the design requirements for the area. Elevations of the utilities shall be field verified by the Design Engineer especially when a potential utility conflict exists.
3. Contours and Elevations – Existing contours or supporting elevations shall be shown on all plans submitted for subdivision, commercial, industrial improvements, or planned unit developments, the contours or elevations shall extend a minimum of 50 feet beyond the boundary of the site.
4. Profile – The plans shall show the existing profile of all roadway centerline, edge of pavement, or top of curb, drainage, ditches or gutter flow line, storm, water, recycled water and sanitary sewers.
 - a. The plans shall show the existing ground profile for a minimum distance of 100 feet beyond temporary street endings to facilitate setting proper vertical alignment within the proposed improvement limits. The 100-foot minimum shall be increased when requested by the City Engineer.
 - b. All profiles of proposed improvements shall show the centerline elevations at 50-foot maximum intervals and rate of grades, vertical curves and other vertical alignment data. As an alternative, the top of curb profile and grades may be shown instead of the centerline and TC grades provided at each property line on the plan view in lieu of 50-foot intervals. When curb and gutters are added to existing roads, elevations shall also be shown at the edge of the outside traveled way, or if the road has a full paved sections, shall also be shown two feet in from the proposed lip of gutter.
 - c. Any warped surface and vertical curve shall set elevations at 25-foot intervals. All profiles shall be coordinated with City

- stationing if existing within 500 feet of the project. The Design Engineer shall contact the City for such stationing.
- d. Cross sections showing existing and proposed pavement, curb and gutter, and existing ground ten feet beyond the public right-of-way shall be submitted with the plans for checking.
 - e. Grading plans shall show final contours for commercial sites or a typical lot rough grading plan for residential sites.
5. Stationing and Orientation – The stationing on plan and profile sheets shall read from left to right. Stationing shall increase from south to north or from west to east. Negative stationing shall not be used. Plans shall be so arranged that the north arrow points toward the top or right of the sheet, insofar as practical. The beginning and ending stations shall be shown for all streets and utility centerlines. Stations shall be given for all utility structures (i.e. manholes, electroliers, fire hydrants, etc.).
 6. Cut and Fills – Top of cut and toe of fill shall be shown on the plan view.
 7. Bench Marks – City benchmarks should be established and used as the basis for all elevations. The tie to the existing benchmark loop and the bench marks used for the project shall be clearly delineated on the plans both as to location, description and elevations. The datum shall be 1983 North American Datum (U.S.G.S. or U.S.C. & G.S.). The Design Engineer shall contact the Public Works Department for location and elevation of the nearest official benchmark.
 8. California Coordinate System – All centerline monuments shall be tied into the California Coordinate System - 83, Zone III. Conversion factors between the NAD - 83 and the California Coordinate System shall be clearly shown on the plans.
 9. Typical Sections – A typical section for each type of roadway or utility facility within the improvement, setting out the structural features, shall be a part of the plans. The “R” value and T.I. shall be shown with each roadway section. The typical section shall be designed to an R-value of “5”. A revision shall be made to the construction plans as soon as recommendations from the Geotechnical Engineer are approved by the City Engineer.

10. Example of Pavement Design Chart:

STREET NAME	LIMITS FROM/TO	AC	AB	AS	R Value (40 Max)	TI

11. Cross Sections – Cross sections shall be included in the plans, where determined necessary by the City Engineer. When, in limited areas, unusual topographic features or special conditions occur that would affect the work, individual cross sections may be shown on the pertinent plan sheet.

12. Additionally, all plans shall:

- a. Show the approved permanent water source, which can supply sufficient water for chlorination, flushing and hydrostatic testing.
- b. Show sufficient adjacent area to give the relation of new facilities to existing facilities.
- c. Show all traffic signals, signs or other traffic control devices.

- F. Detail Sheets - Drawings with design details shall, at a minimum, conform to the following:

- 1. All detail drawings shall be drawn to an appropriate scale, unless otherwise noted.
- 2. Any detail drawings included in the Design and Construction Standards, which are required of the project, can be referenced by the Standard Detail Number unless modifications are to be made. If modifications are to be made, the modification detail shall be included in the improvement plans.
- 3. Any detail drawings from the State Standard Plans, which may be required for the project, shall be reproduced and included in the improvement plans or special provisions.

2-3.2 Erosion and Sediment Control Plan

- A.** Plan: An Erosion and Sedimentation Control Plan (ESCP) shall be prepared and submitted for all projects that have soil disturbance. The City's ESCP Worksheet for Small Projects shall be used and shall include site map(s), showing the location of drain inlets, erosion and sediment control measures, and pollution prevention measures and identification of construction/contractor activities describing measures for providing erosion and sediment control. The ESCP shall be submitted for review and approval by the City, or if the project will be permitted under the State's Stormwater Construction General Permit, the Stormwater Pollution Prevention Plan (SWPPP) may be submitted in lieu of the ESCP. The erosion and sediment controls identified in the approved plan must be implemented before construction starts.

If the proposed erosion control measures can be adequately described by reference to City Standard Details, a separate plan sheet may not be required. Reference to the City Standard Details and Erosion Control Notes can be placed on the Grading Plan. If, however, in the opinion of the City Engineer, locations or details of erosion control appurtenances cannot be adequately described in notes, a separate Erosion Control Plan must be prepared. The Design Engineer shall consult the City Engineer regarding the need for a separate Erosion Control Plan prior to commencing preparation of project plans.

- B.** Erosion Control Notes: Notes shall be placed on the ESCP, addressing the following:
1. Erosion and sediment control measures shall be effective for the duration of the construction activity.
 2. No storm runoff water shall be allowed to drain directly into the existing underground storm system before the onsite storm drain system is installed.
 3. As soon as is practical after the new onsite storm system is installed, the catch basins shall be installed and drain inlet protection BMPs shall be installed.
 4. Should the proposed onsite storm system not be installed by October 1st, temporary sediment basins shall be constructed around the openings of any existing storm pipes that drain the site, per CASQA BMPs and standards or per a special detail shown on the plan.
 5. The name, address and 24-hour telephone number of the person

responsible for implementation of the erosion and sedimentation control plan shall be provided.

6. Install and maintain stabilized site exits so that track out does not occur. For sites covered by the State's Construction General Permit, the site exit track out controls must be installed and maintained per the CASQA Stormwater BMP Handbook TC-1 specification. Properly grade the access area to prevent runoff and design it to support the heaviest vehicles in use. Other measures to prevent tracking onto roadways may be used if approved by the City. This does not need to be done at driveways, which will be closed by immovable barricades during construction.
7. All erosion and sedimentation control measures shall be maintained until disturbed areas are stabilized. Changes to the ESCP shall be made to meet field conditions, but only with the approval of or at the direction of the City Engineer.
8. All sidewalk and paved areas outside of the construction boundary shall be kept clear of earth material and debris. The construction site shall be maintained so as to minimize sediment laden runoff from entering any storm drainage system.
9. The responsibility of the Contractor to inspect and repair all erosion control facilities at the end of each work day during the rainy season.
10. The responsibility of the Contractor to clean out sediment basins whenever the level of sediment reaches $\frac{1}{2}$ of the design volume.
11. The responsibilities of the Contractor to protect temporary borrow areas and/or stockpiles as specified in CASQA WM-3.
12. The cleaning of paved streets, during and at the completion of construction, shall be performed with mechanical sweepers. The use of hoses or water trucks to "wash down" the street is prohibited unless the drains have been plugged and the water is captured and properly disposed.
13. The ESCP and/or SWPPP, details, notes and calculations if required, must be a part of the plan check submittal package for either Grading Permit only or Final Site Approval. The Design Engineer prior to plan preparation should consult the City Engineer if the need for a separate plan is in doubt.

2-3.3 City Standard Notes

The following City notes, where applicable, shall be conspicuously placed on the plans:

- A.** These plans have been checked by the City of Lathrop and/or its authorized representative, but such checking and/or approval does not relieve the developer from his responsibility to correct errors, omissions or make changes required by conditions discovered in the field during the course of construction.
- B.** All revisions to this plan must be reviewed by the City Engineer prior to construction and shall be accurately shown on revised plans stamped and signed by the City prior to the installation of the improvements.
- C.** All construction and material shall conform to City of Lathrop Design and Construction Standards, the project Urban Design Concept (if applicable), and per the approved plans. The improvements are subject to the inspection and approval of the Public Works Department. Contact Public Works construction inspection at (209) 941-7450, at least three (3) working days prior to start of any work to arrange for inspection.
- D.** Notify Underground Service Alert (USA –North) at “811” or (800) 227-2600 at least two (2) working days prior to excavation. The USA authorization number shall be kept at the job site.
- E.** If necessary to confirm field locations of facilities, exploratory trenching or potholing shall be done at the expense of the contractor
- F.** If a conflict occurs between the City of Lathrop Design and Construction Standards and the recommendations by the Design Engineer and/or Soils Engineer, the more stringent shall apply as directed by the City Engineer.
- G.** Basis of elevation datum shall be provided (if City/County benchmark, give number, location and elevation).
- H.** The existing utilities are plotted from available records. The Contractor shall take precautionary measures to protect these utilities. The Contractor shall not excavate until all utility agencies and the City of Lathrop have been notified and have marked their facilities in the field.
- I.** Existing utilities shall not be interrupted until the utility company has provided alternative service facilities. The Contractor shall cooperate and coordinate his work with the appropriate agencies and utility companies.

- J.** Final pavement work shall not occur within the City right-of-way prior to completion of utility relocation without the specific approval of the City Engineer.
- K.** All utility trenches in existing roadway shall be backfilled and opened to public traffic for a minimum of two weeks prior to placing permanent pavement.
- L.** All construction staking for grading, curb, and gutter, sidewalk, sanitary sewer, storm drains, water lines, recycled water, fire hydrants, electroliers, etc. shall be done by a registered civil engineer or a licensed land surveyor.
- M.** All areas undergoing grading, and all other construction activities shall be watered, or other dust-palliative measures used, to prevent dust, as conditions warrant. Water trucks shall be available at all times. The person responsible for dust control, <insert name> at <insert phone number>, shall be available 24 hours a day.
- N.** Prior to receiving/taking any water from the City of Lathrop water system the Contractor shall acquire a city water meter or city fire hydrant meter. All water usage shall be metered.
- O.** All lines abandoned during construction shall be removed unless otherwise noted on the plans.
- P.** Prior to trenching for any sewer, water, recycled water, or storm drain pipe, the Contractor shall verify, in the field, the size and the location of the existing pipe at the point of connection. Any deviation from the plans shall be resolved by the Design Engineer prior to trenching. Any damage caused by trenching to existing underground utilities shall be the sole responsibility of the Contractor.
- Q.** All trenches shall be backfilled in accordance with City Standard Details. Compaction shall be achieved by mechanical means. No flooding, ponding, or jetting shall be permitted.
- R.** Testing:

 - 1. All independent laboratory inspections called for by the City Engineer will be paid for by the Developer or Contractor.
 - 2. Roadway sub-grade, sub-base, base, and trench backfill compaction testing shall be performed by a soils lab contracting with the City of Lathrop at the Developer's expense.

3. R-Value testing of the pavement sub-grade shall be performed prior to the installation of base rock, or as required by the City Engineer.
 4. A minimum of 48 hours' notice is required to schedule all special inspection/testing services.
- S.** Asbestos cement pipe (ACP) or vitrified clay pipe (VCP) or fittings shall not be used within the City of Lathrop.
- T.** Existing curb, gutter and sidewalks within the project limits that are damaged or displaced, shall be repaired or replaced per the City Design and Construction Standards by the Contractor.
- U.** No trees shall be removed unless they are shown and noted to be removed on the improvement plans. All trees conflicting with grading, utilities, or other improvements, or overhanging the sidewalk or pavement to form a nuisance or hazard, shall be trimmed and properly treated and sealed. The drip line of trees to be saved will be fenced, and no grading shall take place within this fenced area.
- V.** The full structural section of the major streets shall be continued through the intersections.
- W.** Benchmarks shall be furnished and installed by the Contractor at locations shown. The Developer's engineers shall stamp the benchmarks per Standard Detail R-51 and furnish the City Engineer with the benchmark elevation data.
- X.** Street signs shall be installed at all intersections that meet the UDC standards (if applicable) per City Design and Construction standards.
- Y.** Traffic control devices and installations shall be in conformance with California Manual On Uniform Traffic Control Devices, and must meet the UDC standards (if applicable).
- Z.** All street monuments, lot corner, benchmarks and other permanent pipe or monuments disturbed during the process of construction shall be replaced by a licensed civil engineer or surveyor prior to acceptance of improvements by the City.

If a monument is located within the boundary of the project, the Contractor shall submit the Acknowledgement of Monument Responsibility "Pre-Construction" form, found in Appendix E of these Standards, to the City during the Encroachment Permit Application Phase. In addition, the Contractor shall submit the Acknowledgement of Monument Responsibility "Post-Construction" form, found in Appendix E of these Standards, to the

City when the work is complete.

- AA.** ESCPs must be prepared consistent to the City's Design and Construction Standards and Ordinances. SWPPPs must be prepared by a Qualified SWPPP Developer and be compliant with the State's Construction General Permit. Erosion and sediment control measures must be in place at all times during the construction project until final site stabilization is achieved. The person responsible for the daily maintenance of the facilities is <insert name> and can be reached 24 hours a day at <insert phone#>. These facilities shall control and contain erosion-caused sediment deposits and provide for the safe discharge of sediment-free storm water into existing storm drain facilities.
- BB.** If the project is applicable to the State's Construction General Permit, a Notice of Intent (NOI) to comply with the NPDES general permit for stormwater run-off associated with construction activity shall be submitted to the SWRCB via the State's SMARTS system. The WDID# should be indicated on the plans. A Stormwater Pollution Prevention Plan (SWPPP) shall be submitted for approval by the City Engineer.
- CC.** If, during construction, archaeological remains are encountered, construction in the vicinity shall be halted, an archaeologist consulted and the City Community Development Department notified. If, in the opinion of the Archaeologist, the remains are significant, measures, as may be required by the Community Development Director, shall be taken to protect them.
- DD.** Work shall be restricted to weekdays between 8:00 AM to 5:00 PM and weekends by City approval. Work which requires any traffic lane closures or restricting of the traveled way shall be limited to 9:00 AM to 3:30 PM in the commute direction and 8:00 AM to 4:30 PM in the non-commute direction.
- EE.** The overtime cost for inspecting work performed before 8:00 AM, after 5:00 PM, weekends, and holidays, that require City inspection, shall be pre-paid by the Contractor or Developer before the work is authorized.
- FF.** Construction equipment which operates at a noise level in excess of 85 decibels (measured on the A-weighted scale defined in ANSI S-1.4) at a distance of 100 feet from the equipment is prohibited.
- GG.** The contractor shall keep excavations free from water during construction. The static water level shall be drawn down a minimum of 2 feet below bottom of excavations to maintain an undisturbed state of natural soils and allow placement of fill to the specified density. Disposal of water shall not

damage property or create a public nuisance. Contractor shall determine method of dewatering and location for discharge/disposal.

- HH.** Disposal of water into the city sanitary sewer system is strictly prohibited.
- II.** Disposal of water into the existing storm drain system must be approved in writing by the City Engineer prior to disposal.
- JJ.** Contractor shall maintain all streets, sidewalks, and all other public right-of-ways in a clean, safe, and usable condition throughout the course of construction. All spillage of soil, rock, construction debris, etc., shall be removed immediately from publicly owned property. All adjacent property, private or public, shall be maintained in a clean, safe, and usable condition. The Contractor shall provide for safe, unobstructed access to private property adjacent to work throughout the period of construction. Contractor shall provide to the Public Works Department the name and telephone number of the responsible person available 24 hours a day if any problems or conditions are not met.
- KK.** All trash, construction debris and materials shall be contained within proper containers and removed on a weekly basis.
- LL.** The contractor shall keep adjoining public streets and parking areas free and clean of project dirt, mud, and materials during the construction period. The Contractor shall be responsible for corrective measures as directed by the Public Works Inspector at no expense to the City.
- MM.** A building permit is required for construction of all retaining walls over 4 feet in height measured from the bottom of the footing to the top of the wall. Prior to acceptance of the improvements as complete, verification that Building Inspection has signed off on the permit shall be provided to the Public Works Inspector. All wood in contact with the ground shall be pressure-treated, whether a construction permit is required or not.
- NN.** The manner of bracing and shoring excavations shall be as set forth in the rules, orders and regulations of the State of California Construction Safety Orders, Division of Industrial Safety.
- OO.** Contractors may be required at the discretion of the City Engineer to provide drawings or calculations by a registered engineer five (5) working days prior to beginning construction for specially designed bracing and shoring of an excavation where standard pre-manufactured bracing or shoring cannot be used.

- PP.** Contractors shall submit a copy of their current Annual Excavation Permit issued by the State of California Division of Industrial Safety (CAL-OSHA) along with the Contractor's own Trench Safety Plan prior to the start of construction.
- QQ.** Prior to any work being performed, the Contractor shall attend a pre-construction meeting with the City of Lathrop. The Contractor shall provide the City of Lathrop 72 hours' notice to schedule the pre-construction meeting. The Contractor shall also notify the below listed project contacts a minimum of 72 hours in advance of said meeting.

2-4 **STORM DRAIN NOTES:**

- A.** All public storm drain lines shall be Class III or higher class RCP or Polypropylene Pipe Type "S" up to 36 unless otherwise specified on the plans.
1. All pre-cast RCP shall be of wet cast type construction. Use rubber gasketed joints conforming to the requirements of ASTM designations C-76 and C-443 and Section 3 of the Design and Construction Standards. Alternative pipe materials will be evaluated on a case-by-case basis and must be pre-approved.
 2. All Polypropylene Pipe shall be dual wall, Type "S" up to 36" Material for 12" – 36" pipe and fitting production shall be an impact modified copolymer meeting the material requirements of ASTM F2764. Fittings shall be bell-and-spigot meeting watertight joint performance and shall meet requirements of ASTM D3212. Gasketed bell & spigot connections shall utilize a spun-on, welded or integral bell and spigot with gasket meeting ASTM F477.
 - a. Installation: Polypropylene Pipe shall meet Standard Detail R-52 for storm drain flexible pipe. Fittings shall be laid to form a closed concentric joint with adjoining pipe to avoid sudden offsets of the flow line. Pipe sections shall be joined in a way that they meet or exceed performance standards found in ASTM F2764.
 - b. Backfill and Compaction: Follow Standard Plan R-52 to R-56 for flexible pipe for storm drainage applications. Appropriate compaction methods shall be utilized in order to uniformly compact backfill to specified densities. Inappropriate or excessive compaction may damage the pipe and disturb line and grade. Each layer shall be uniformly compacted with mechanical means and guidelines for

flexible pipe. Bedding, shading and haunch for flexible pipe shall be 3/8 x dust or alternative approved by Senior Construction Manager.

- c. Storage and Handling: Store pipes and fittings in a way that protects gaskets from weather. Protect the bell end of pipes from damage. If stacked, take measures to ensure lower pipes are not damaged from excessive weight. Cover pipes to provide temporary sun block, do not store gaskets near electrical or exhaust heat sources.
 - d. The City will reject pipes with cracks or splits gaskets.
- B.** Unless noted otherwise, all storm drain manholes are Type I (per Std. Detail D-8) and all curb inlets shall be Type I inlets (see Std. Detail D-4) or Type II (see Std. Detail D-5). “Santa Rosa” style inlets, which have a grateless inlet, shall only be used with approval from the City Engineer. A Type II manhole (see Standard Detail D-9) shall be used for all pipes greater than 24” in diameter.
 - C.** All storm drain inlets shall be labeled per Standard Detail D-2 “NO DUMPING – FLOWS TO RIVER” using an approved method.
 - D.** Storm drain construction, materials and workmanship shall be in accordance with the requirements of Section 3 of the Design and Construction Standards and the Standard Details.
 - E.** The Contractor is to be responsible for all testing of storm drain facilities. Contractor shall clean, flush and provide video inspection of all storm drain lines to the satisfaction of the Public Works Inspector.

2-5 **STREET NOTES:**

- A.** Prior to placing curb and gutter, sidewalk, asphalt concrete, subbase, or base material, all underground facilities within the right-of-way shall be installed, backfill completed, and the Public Works Department Construction Inspection Division notified that the utility installation has satisfactorily passed acceptance tests by each of the utility companies having facilities within the work areas.
- B.** When widening the pavement on an existing road, the existing pavement shall be saw cut to a neat line, not located in the wheel path of vehicle traffic, and removed back to an existing sound structural section as determined by the City Engineer. An exploratory trench, or potholing, may be required to determine the limits of pavement removal.

- C.** Street striping shall include stop bars, centerline striping or markers, crosswalks and all other markings required by the City Engineer. All striping shall be done with thermoplastic and reflective markers. All striping shall be cat-tracked prior to final installation. Final installation of striping will be allowed only after approval of the striping layout by the Construction Inspector.
- D.** The thickness of subbase, base, and surfacing shall be as approved on these plans.
- E.** Fog seal of asphaltic concrete. The type of fog seal used shall be per Section 37 of Caltrans Standard Specifications latest edition and approved by the City of Lathrop prior to use.
- F.** There shall be a 2.5% cross slope on the construction of all new minor and local streets. There shall be a 2% cross slope on the construction of all other streets.
- G.** All terminated streets without cul-de-sacs shall have a barricade installed in accordance with Standard Detail R-43 of the standard details.
- H.** All manhole rims, lampholes, valves, and monument boxes, etc. shall be adjusted to finish grade after street paving by the Underground Contractor after the final paving course is placed, unless otherwise noted. Cost for this work shall be included in the unit prices for manholes.
- I.** The Contractor shall protect all existing monuments and have the Engineer/Land Surveyor tie out before the setting of all new monuments. All survey monument wells shall be furnished and installed by the Contractor at locations shown. Developer's Engineer/Land Surveyor shall set and stamp all monuments and furnish the City Engineer with a copy of a tie plat for each monument.
- J.** The Contractor shall be responsible for the protection of all existing monuments and/or other survey monuments and shall notify the City Engineer of any damaged or removed City, County, State or Federal monuments.

If a monument is located within the boundary of the project, the Contractor shall submit the Acknowledgement of Monument Responsibility "Pre-Construction" form, found in Appendix E of these Standards, to the City during the Encroachment Permit Application Phase. In addition, the Contractor shall submit the Acknowledgement of Monument Responsibility "Post-Construction" form, found in Appendix E of these Standards, to the City when the work is complete.

- K.** Utility boxes set in paved streets shall have H-20 traffic rating lids.

2-6 SANITARY SEWER NOTES:

- A.** Sanitary sewer construction, materials and workmanship shall be in accordance with the requirements of Section 5 of the Design and Construction Standards and the Standard Details.
- B.** Sewer service laterals shall be 4-inches minimum inside diameter.
- C.** The location of sewer services in new subdivisions shall be marked by the Concrete Contractor with the letter “S” stamped on the top of curb. The underground contractor shall provide sufficient records and shall leave adequate curb marking in the field for the concrete contractor to accurately stamp the letter “S” for all sewer services, prior to placing any sidewalk or curb & gutter. The Concrete Contractor shall verify the locations of all driveways and sewer laterals before pouring the curb, and furnish data to the City’s Construction Inspector showing he has adequate information to accurately field locate and mark the letter “S” to be stamped in his work, prior to final troweling of the concrete. The City of Lathrop’s Construction Inspector shall determine that the letter “S” has been stamped in the proper location.
- D.** All sanitary sewer mains shall pass a leakage test in conformation with Section 5 of the Design and Construction Standards, and the Standard Details, flushed with an approved sewer ball, mandrel tested and television inspected (tapes or other approved media shall be given to the City Engineer) prior to acceptance by the City. All testing shall be performed after the compaction for street base rock and prior to paving.
- E.** Prior to any work on the sanitary sewer lines, a quality control plan shall be approved in writing by the City Engineer. The plan may include special testing by an independent laboratory and continuous inspection of the sewer pipe construction.
- F.** All sanitary sewer manholes shall be vacuum tested prior to backfill per ASTM C-1244.

2-7 WATER NOTES:

- A.** Water lines shall be located a minimum of 10 feet horizontally from sewer mains. Crossing shall meet state health standards. Sewer line needs to be one (1) foot below water line.
- B.** The Contractor is to be responsible for all testing and disinfecting of water lines in conformance with the requirements of the City of Lathrop prior to

final acceptance. All water lines shall be pressure-tested, disinfected, flushed, and tested for bacteria in conformance with Section 4 of the Design and Construction Standards prior to final acceptance by the City. The maximum length of pipeline to be tested at a time shall be limited to 5,000 feet. All new valves shall be exercised during the pressure test.

- C.** Actual connections to existing City of Lathrop water lines will not be permitted prior to completion of sterilization and testing of the water mains. All existing water valves are to be operated under the direction of authorized City of Lathrop personnel only.
- D.** Water services shall be as per Section 4 of the Design and Construction Standards and Standard Details for Water.
- E.** The location of water services in new subdivisions shall be marked by the Concrete Contractor with the letter “W” stamped on the top curb. The Underground Contractor shall provide sufficient records and shall leave adequate marks in the field for the Concrete Contractor to accurately stamp the letter “W” for all water services, prior to the placing of any sidewalk or curb and gutter. The Concrete Contractor shall verify the locations of all driveways and water services before pouring the curb, and furnish data to the City of Lathrop’s field inspector showing he has adequate information to accurately field locate and mark the letter “W” to be stamped in the curb. Prior to the final troweling of the concrete, the City of Lathrop’s Construction Inspector shall verify that the letter “W” has been stamped in the proper location.
- F.** The typical angle meter stop at the end of the water service shall be per Section 4 of the Design and Construction Standards and Standard Details for Water.
- G.** All construction water shall be purchased from the City of Lathrop and shall be metered by use of a City hydrant meter.
- H.** All dead ends, capped or flanged, including future service stubs, tees, elbow bends and blow-offs, temporary or permanent, shall have thrust blocks installed as per Section 4 of the Design and Construction Standards, and per Standard Details for Water, otherwise Megalug® joint restraints must be provided.
- I.** Fire hydrants tees are to be placed at locations approved by the fire district or as shown on the plans.

- J.** Flange joints are required when installing four inch (4”) and larger line valves in steel pipe. No other type of joint shall be used without specific approval of the City Engineer.
- K.** All connections and service taps to existing City of Lathrop mains shall be made without depressurizing the main, unless prior approval is given by the City Engineer.
- L.** Fire hydrants shall be furnished and installed by the Contractor in accordance with the Section 4 of the Design and Construction Standards and Standard Details for Water.
- M.** All nut/bolt kits to be installed below grade shall be 316 grade stainless steel.
- N.** All hydrants shall be numbered on the plans using nomenclature approved by the Public Works Director.

2-8 RECYCLED WATER NOTES:

- A.** All recycled water construction, materials and workmanship shall be in accordance with Section 7 of the Design and Construction Standards and the Standard Details.
- B.** The location of recycled water services in new subdivisions shall be marked by the Concrete Contractor with the letters “RW” stamped on the top of the curb. The Underground Contractor shall provide sufficient records and shall leave adequate marks in the field for the Concrete Contractor to accurately stamp the letters “RW” for all recycled water services, prior to the placing of any sidewalk or curb and gutter. The Concrete Contractor shall verify the locations of all driveways and recycled water services before pouring the curb, and furnish data to the City of Lathrop’s field inspector showing he has adequate information to accurately field locate and mark the letters “RW” to be stamped in the curb. Prior to the final troweling of the concrete, the City of Lathrop’s Construction Inspector shall verify that the letters “RW” have been stamped in the proper location.

2-9 SIGNAL INTERCONNECT CONDUIT NOTES:

- A.** Contractor shall furnish and place one (1) signal interconnect conduit (SIC) on all arterial streets for future use by the City for traffic signal interconnect.
- B.** Conduit shall be 2-inch schedule 40 PVC, unless otherwise approved by the City Engineer.
- C.** Conduit shall have 30-inch minimum cover.

- D. Pull boxes shall conform to Caltrans Standard Plans. Pull box covers shall be marked as shown on the plans.
- E. Trench restoration shall comply with the City of Lathrop Standard Details.

2-10 SPECIAL NOTES:

- A. Existing streets that require reconstruction as a result of the construction traffic shall remain open at all times with adequate detours during reconstruction. Reconstruction of existing streets shall include upgrading the affected pavement area to meet original standards to provide a sound structural section. The City Engineer shall approve all improvements.
- B. Any existing improvements that are damaged during construction shall be removed, replaced, and fully restored to its' original condition at the Developer's cost. All work shall be approved by the City Engineer.
- C. Developer/contractors work shall be in accordance with the SJVAPCD guidelines, included SJVAPCD Regulation VIII and implement control measures based on SJVAPCD compliance assistance bulletin for short term impacts, SJVAPCD shall be contacted to discuss mitigation measures and implement measures from Table 6-4 of the guide for Assessing and Mitigation Air Quality Impacts.
- D. All pressurized plastic pipes shall have trace wires.
- E. Dewatering plans for all trenches shall be submitted for approval by the City Engineer.
- F. All irrigation systems with the City's right-of-ways or parks shall be designed using "Calsense" controllers as approved by the City Engineer.
- G. All ductile iron pipe and fittings shall be wrapped in polywrap.

2-11 IMPROVEMENT PLAN REVIEW CHECKLIST

The Improvement Plan Review Check List as contained in Appendix A shall be completed by the Design Engineer and shall accompany each submittal of the improvement plans.

2-12 IMPROVEMENT BOND ESTIMATE

- A. Developers are required to bond for improvements within the City. The bond shall be based on an improvement estimate approved by the City Engineer.

B. Developer's Engineer shall stamp, sign and submit the bonding estimate.

2-13 RECORD MAPS

All maps required for recordation purposes as determined by the Map Act shall be prepared in strict accordance with the Subdivision Map Act of the State of California, the Subdivision Ordinance of the City and the requirements set forth hereinafter in these Standards.

2-13.1 Checklist for Record Maps

The General Record Map Review Checklist as contained in Appendix B shall be completed by the Design Engineer or Licensed Land Surveyor and accompany each submittal of any map required by the appropriate sections and provisions of the Map Act.

2-13.2 Abbreviations, Symbols and Notes

ABBREVIATIONS:

(M)	Measured Data
(R)	Radial Bearing
(R1)	R.S. 28-10 (Example)
(R2)	P.M. 16-20 (Example)
(R3)	M.&P. 25-5 (Example)
#####	Restricted Public Access
"A"	Book "A" of Deeds
BOB	Basis of Bearings
CALC	Calculated Data
CCS	California Coordinate System-83, Zone III
CNEL	Community Noise Equivalent Level
EVAE	Emergency Vehicle Access Easement
I.N.	Instrument Number
M.&P.	Maps and Plats
O.R.	Official Record
P--	Existing PG&E Electric Line
P.M.	Parcel Map
PSDE	Private Storm Drain Easement
PUE	Public Utility Easement
R.S.	Record of Surveys
SDE	Storm Drain Easement
S.J.C.R.	San Joaquin County Records
SENEL	Single Event Noise Exposure Level
SFN	Searched, found nothing
SSE	Sanitary Sewer Easement

W.C.	Witness Corner
WLE	Waterline Easement
X--	Existing Fence Line

2-13.3 Notes

- A. All references are to San Joaquin County Records and Book or Volume precedes Page.
- B. All distances are measured unless otherwise noted.

2-14 FINAL MAPS

The Final Map Review Checklist as contained in Appendix C shall be completed by the Design Engineer or Licensed Land Surveyor and accompany each submittal of the map required by appropriate sections and provisions of the Map Act.

2-14.1 Certificates, Affidavits, and Acknowledgements

The City requires that certain statements and signatory blocks appear on final maps prepared within the jurisdiction of the City. In all instances below, data to be entered as written is produced in Sans Serif font. Information which requires entry by the Developer, Design Engineer, and/or Land Surveyor appears as *italicized serif fonts*. This information is project specific and other than area, which shows as blank underlined spaces, will require special consideration when supplying said data.

- A. Signatory Exemptions – Where there are easement holders of record:

Pursuant to Section § 66436 of the California Subdivision Map Act, the signatures of the following parties have been omitted:

Name to Party, Type of Interest, Deed Reference

- B. Right to Farm Statement:

RIGHT TO FARM STATEMENT

Per Lathrop City Municipal Code Title 15, Chapter 15.48.04, the City of Lathrop permits operation of properly conducted agricultural operations within the City Limits, including those that utilize chemical fertilizers and pesticides. You are hereby notified that the property you are purchasing may be located close to agricultural lands and operations. You may be subject to inconvenience or discomfort arising from the lawful and proper use of agricultural chemicals and pesticides and from other agricultural activities, including without limitation, cultivations, plowing, spraying,

irrigation, pruning, harvesting, burning of agricultural waste products, protection of crops and animals from depredation, and other activities which may generate dust, smoke, noise, rodents and pests. Be aware also, that this property may be located adjacent to agricultural operations outside the City's jurisdiction. Consequently, depending on the location of your property, it may be necessary that you be prepared to accept such inconveniences or discomfort as normal and necessary aspect of living in an agriculturally active region.

C. Owner's Statement:

OWNER'S STATEMENT

The undersigned, _____, _____, do hereby state that I (we) are the owner(s) of all the land and easements delineated and embraced within the exterior boundary line of the herein embodied final map entitled "_____, City of Lathrop, San Joaquin County, California" consisting of _____ sheets, that (we) have caused said map to be prepared for record and consent to the preparation and recordation of said map; that said map particularly sets forth and describes all the lots intended for sale by number with their precise length and width; that the map particularly sets forth and describes the parcels of land reserved for public or private purposes by their boundaries, courses and extent.

The undersigned do hereby dedicate an easement to the City of Lathrop for public right-of-way purposes, those portions of said lands designated on said map as (*list streets*) as shown on this map.

The undersigned, do hereby dedicate to the City of Lathrop for public purposes a non-exclusive easement together with the right to construct, reconstruct, repair and maintain poles, wires, cables, pipes, and conduits and their appurtenances upon, over and under the strips of land shown upon said map marked "P.U.E." or "Public Utility Easement" as embraced within the exterior boundary line upon said map.

INSERT HERE any dedications for SSE, SDE, PSDE, EVAE, WLE, etc.

The undersigned, do hereby dedicate to the City of Lathrop forever a non-exclusive easement together with the right to construct, reconstruct, repair and maintain public improvements and their appurtenances upon, and under the strips of land shown upon said map marked "P.S.E." or "Public Service Easement" as embraced within the exterior boundary line upon said map.

The areas marked Lot A are common areas and are not hereby dedicated for public use by the general public, but are for the use of the Homeowners of

the Subdivision in accordance with the Subdivision Covenants, Conditions, and Restrictions recorded for Subdivision (*number*).

The undersigned does hereby dedicate to the City of Lathrop a non-exclusive easement for the purposes of repair and maintenance of the sound wall for the areas designated as “Wall Easement” (W.E.) as shown on this map.

The undersigned does hereby relinquish to the City of Lathrop all abutters right of access to (*list lots*) along the lot lines as indicated by the symbol (*insert symbol*) as shown on this map.

The undersigned does hereby dedicate to the City of Lathrop, in fee, Parcels (*list parcels*) for landscape open spaces and parks including public utilities and storm drain facilities, and pedestrian ingress and egress, for the benefit of the public, as shown on this map.

To ensure municipal water service to these parcels, all water rights are dedicated to the City of Lathrop.

This map shows all easements on the premises or of record.

D. Acknowledgement Certificate:

ACKNOWLEDGEMENT CERTIFICATE

STATE OF CALIFORNIA

COUNTY OF _____

On _____, before me, _____, Notary Public, personally appeared _____ and _____, {personally known to me} {proved to me on the basis of satisfactory evidence} to be the persons whose names are executed subscribed to the within instrument, and acknowledged to me that they on the instrument of persons, or the entity upon behalf of which the persons acted, executed the instrument.

WITNESS my hand:

Notary Public in and for the
Above-Mentioned State and County

My commission expires: _____

E. City Engineer’s Statement:

CITY ENGINEER’S STATEMENT

I, _____, hereby state that I am the City Engineer of the City of Lathrop, California and that I have examined this Final Map of “Tract No. _____, Subdivisions of San Joaquin County, (*Name of Subdivision*), City of Lathrop, California” and that the subdivision shown hereon is substantially the same as it appeared on the tentative map (*VTM Number*), and any approved alternations thereof. I further state that this Final Map complies with all applicable ordinances of the City of Lathrop, and any amendments thereto, applicable at the time of approval of the tentative map.

Dated this _____ day of _____, 20__

_____, R.C.E. _____
City Engineer

Registration expiration date: _____

F. County Surveyor’s Statement:

COUNTY SURVEYOR’S STATEMENT

I, _____, hereby state that I have examined this Final Map of “Tract No. _____, Subdivision of San Joaquin County, (*Name of Subdivision*)”, City of Lathrop, California and that the subdivision shown hereon compiles with all the provisions of Chapter 2 of the California Subdivision Map Act, as amended, and that this Final Map is technically correct.

Dated this _____ day of _____, 20__

_____, R.L.S. _____
County Surveyor

Registration expiration date: _____

G. Recorder’s Statement:

RECORDER’S STATEMENT

Filed this _____ day of _____, 20__ at _____ A.M. in Book _____ of Maps and Plats, at page _____, at the request of _____.

Fee: \$ _____

County Recorder/Clerk

Assistant/Deputy Recorder

H. Secretary of the Planning Commission’s Statement:

SECRETARY OF THE PLANNING COMMISSION’S STATEMENT

This map conforms to Tentative Map No. _____

Approved by the Planning Commission on the _____ day of _____, 20__.

Dated this _____ day of _____, 20__

Secretary of the Planning Commission

I. City Clerk’s Statement:

CITY CLERK’S STATEMENT:

I, _____, City Clerk and Clerk of the City Council of the City of Lathrop, State of California, do hereby state that the herein embodied map entitled “_____, City of Lathrop, County of San Joaquin, State of California” consisting of _____ sheets, this statement was presented to said City Council, as provided by law, at a regular meeting thereof, held on the _____ day of _____, 20__, and that said City Council did thereupon by Resolution No. ____ duly passed and adopted at said meeting, approve said map, and authorized its recordation and accepted on behalf of the City of Lathrop, for public use, the dedication of all public utility easements, wall easements, Parcels (*list parcels*) in fee, and the relinquishment of access rights to lots (*list lots*), along the lot lines as indicated by the symbol (*insert symbol*), and accepted the offer of dedication of all streets, avenues and ways as shown on said map subject to the improvements being completed in accordance with Chapter 16, Title 16.16 or the City of Lathrop Municipal Code.

I further state that all bonds or securities as required by law to accompany the within map, if applicable, have been approved by the City Council of the City of Lathrop and filed in my office.

City Clerk and Clerk of the City Council of the City of Lathrop,
County of San Joaquin, State of California

2-15 PARCEL MAPS

2-15.1 Parcel Maps Review Checklist

The Parcel Map Review Check list as contained in Appendix D shall be completed by the Design Engineer or Licensed Land Surveyor and shall accompany each submittal of any map where such map preparation is required by appropriate sections and provisions of the Map Act.

2-15.2 Certificates, Affidavits, and Acknowledgements

The City requires that certain statements and signatory blocks appear on all parcel maps prepared within its jurisdiction. In all instances in the statements below, data to be entered as written is produced in *italicized serif font* as shown. Information which requires entry by the Developer, Design Engineer and/or Land Surveyor appears in *italicized serif font*. This information is project specific and other than areas which show as blank underlined spaces, will require special consideration when supplying said data.

A. Signatory Exemptions – Where there are easement holders of record:

Note # Pursuant to Section 66436 of the California Subdivision Map Act, the signatures of the following parties have been omitted:

Name of Party, Type of Interest, Deed Reference

B. Future Private Irrigation Easements:

Note # A (size) – foot wide private irrigation easement across Parcel (No.) shall be conveyed upon conveyance of ownership of Parcel (No.)

C. Basis of Bearings:

BASIS OF BEARINGS

Note # The basis of bearings for this survey is the (SAMPLE: north line of the N.W. ¼ of Section 3, T.3N., R.4E, M.D.B.&M.) shown on (ex. M. & P.) (ex. R.S.) (ex. P.M.) (Book-Page) as (bearing).

D. Right to Farm Statement:

RIGHT TO FARM STATEMENT

Per Lathrop City Municipal Code Title 15, Chapter 15.48.04, the City of Lathrop permits operation of properly conducted agricultural operations within the City Limits, including those that utilize chemical fertilizers and pesticides. You are hereby notified that the property you are purchasing may be located close to agricultural lands and operations. You may be subject to inconvenience or discomfort arising from the lawful and proper use of agricultural chemicals and pesticides and from other agricultural activities, including without limitation, cultivations, plowing, spraying, irrigation, pruning, harvesting, burning of agricultural waste products, protection of crops and animals from depredation, and other activities which may generate dust, smoke, noise, rodents and pests. Be aware also, that this property may be located adjacent to agricultural operations outside the City's jurisdiction. Consequently, depending on the location of your property, it may be necessary that you be prepared to accept such inconveniences or discomfort as normal and necessary aspect of living in an agriculturally active region.

E. Owner's Statement: If there are several easements, emergency access easements, utility access easements and dedications are present in the Parcel Map which are to be established or multiple dedications to the City are anticipated, utilize the following statement:

OWNER'S STATEMENT

OWNER'S STATEMENT

The undersigned, _____, _____, do hereby state that I (we) are the owner(s) of all the land and easements delineated and embraced within the exterior boundary line of the herein embodied final map entitled "_____, City of Lathrop, San Joaquin County, California" consisting of _____ sheets, that (we) have caused said map to be prepared for record and consent to the preparation and recordation of said map; that said map particularly sets forth and describes all the lots intended for sale by number with their precise length and width; that the

map particularly sets forth and describes the parcels of land reserved for public or private purposes by their boundaries, courses and extent.

The undersigned do hereby dedicate an easement to the City of Lathrop for public right-of-way purposes, those portions of said lands designated on said map as (*list streets*) as shown on this map.

The undersigned, do hereby dedicate to the City of Lathrop for public purposes a non-exclusive easement together with the right to construct, reconstruct, repair and maintain poles, wires, cables, pipes, and conduits and their appurtenances upon, over and under the strips of land shown upon said map marked "P.U.E." or "Public Utility Easement" as embraced within the exterior boundary line upon said map.

INSERT HERE any dedications for SSE, SDE, PSDE, EVAE, WLE, etc.

The undersigned, do hereby dedicate to the City of Lathrop forever a non-exclusive easement together with the right to construct, reconstruct, repair and maintain public improvements and their appurtenances upon, and under the strips of land shown upon said map marked "P.S.E." or "Public Service Easement" as embraced within the exterior boundary line upon said map.

The areas marked Lot A are common areas and are not hereby dedicated for public use by the general public, but are for the use of the Homeowners of the Subdivision in accordance with the Subdivision Covenants, Conditions, and Restrictions recorded for Subdivision (*number*).

The undersigned does hereby dedicate to the City of Lathrop a non-exclusive easement for the purposes of repair and maintenance of the sound wall for the areas designated as "Wall Easement" (W.E.) as shown on this map.

The undersigned does hereby relinquish to the City of Lathrop all abutters right of access to (*list lots*) along the lot lines as indicated by the symbol (*insert symbol*) as shown on this map.

The undersigned does hereby dedicate to the City of Lathrop, in fee, Parcels (*list parcels*) for landscape open spaces and parks including public utilities and storm drain facilities, and pedestrian ingress and egress, for the benefit of the public, as shown on this map.

- F.** Certificate of Dedication: If there is a limited number of such easements, dedications or other such **fee title** conveyance of real property is present in the Parcel Map and where listing of said **fee titles** would not unduly crowd

the title page to the map, utilize the following statement for each transfer in lieu of (E) above:

***CERTIFICATE OF DEDICATION**

The following real property is dedicated by (name and address of sub divider dedicating the property), for the purpose of (name public improvement or construction of public facility):

The City of Lathrop shall reconvey the property to the sub divider if the City of Lathrop makes a determination pursuant to Government Code Section 66477.5 that the same public purpose for which the property was dedicated does not exist, or the property or any portion thereof is not needed for public utilities.

*This certificate applies only to DEDICATION IN FEE (See Section 66477.5 of the Subdivision Map Act) and USE only if applicable.

G. Acknowledgement Certificate:

ACKNOWLEDGEMENT CERTIFICATE:

(STATE OF CALIFORNIA COUNTY OF San Joaquin)

On _____, before me, _____,
Notary Public, personally appeared _____ and
_____, [personally known to me], [proved to me on
a basis of satisfactory evidence] to be the persons whose names are
subscribed to the within instrument, and acknowledged to me that they
executed the same in their authorized capacities, and that by their signatures
on the instrument the persons, or the entity upon behalf of which the persons
acted, executed the instrument.

Witness My Hand:

Notary Public in and for the above-mentioned State and County

My Commission Expires: _____

H. Public Works Director’s Statement:

PUBLIC WORKS DIRECTOR’S STATEMENT

I, _____, hereby state that I have examined this Parcel Map and that the subdivision shown hereon is substantially the same as it appeared on the tentative map, if required, and any approved alternations thereof. I further state that this Parcel Map compiles with all provisions of Chapter 159, Title 15 of the Lathrop Municipal Code of Ordinances, and any amendments thereto, applicable at the time of approval of the tentative map, if required.

Dated this _____ day of _____, 20____

_____, R.C.E. _____
Public Works Director

Registration expiration date: _____

I. City Clerk’s Statement:

CITY CLERK’S STATEMENT

I, _____, City Clerk of the City of Lathrop, California, hereby accept subject to improvement all offers of dedication of street rights-of-way and/or public utility easements pursuant to the authority conferred upon me by the City Council Resolution No. 90-72, adopted September 26, 1990.

Dated this _____ day of _____, 20____

City Clerk

J. County Surveyor’s Statement:

COUNTY SURVEYOR’S STATEMENT

I, _____, hereby state that I have examined this Parcel Map and it complies with all the provisions of Chapter 2 of the California Subdivision Map Act, as amended, and that this Parcel Map is technically correct.

Dated this _____ day of _____, 20__

_____, R.L.S. _____

County Surveyor

Registration expiration date: _____

K. Secretary of the Planning Commission’s Statement:

SECRETARY OF THE PLANNING COMMISSION’S STATEMENT

This map conforms to the Tentative Parcel Map No. _____
Approved by the Planning Commission on the _____ day of _____, 20__.

Secretary of the Planning Commission

L. Recorder’s Statement:

RECORDER’S STATEMENT

Filed this _____ day of _____, 20__, at _____
A.M./P.M. in Book _____ of Parcel Maps, at page _____, at
the request of _____.

Fee: \$ _____

County Recorder/Clerk

Assistant/Deputy Recorder

2-15.3 FEES

Fees for various City functions for the processing of the appropriate application procedure shall be subject to fees established by the City Council. Projects will not be approved, allowed to continue, or applications processed until such time as all required fee, bonds, and/or special agreements have been paid, submitted and signed.

END OF SECTION

SECTION 3 STORM DRAINAGE STANDARDS

3-1 PURPOSE

The storm drainage standards are intended to establish the minimum standards for the design and construction of storm drainage pipes, ditches, berms, channels, detention and retention basins, gutters, curbs, inlets, outlets, outfalls and other storm drainage appurtenances associated with new development projects. All design and construction of new storm drain facilities shall be in accordance with accepted engineering practices, current BMPs (Best Management Practices), and these minimum design standards.

All new developments and significant re-development shall incorporate the requirements of the City's Multi-Agency Post-Construction Stormwater Standards Manual, latest revision. Applicable projects must submit a *Project Stormwater Plan* (PSP) and incorporate into their plan site design measures, source control measures, stormwater treatment control measures, and meet hydromodification requirements, if applicable. A long term Operation and Maintenance (O & M) Plan is required to be submitted with the PSP. The Multi-Agency Post-Construction Stormwater Standards Manual is available on the City's website.

3-2 DEFINITIONS

See Section 1-2 DEFINITIONS.

3-3 STORMWATER TREATMENT AND BEST MANAGEMENT PRACTICES

- A. All new development of any size shall incorporate requirements and principles of the City's Multi-Agency Post-Construction Stormwater Standards Manual and the current Phase 2 MS4 NPDES permit.
- B. The Manual includes the following requirements for applicable new development and redevelopment projects:
 - 1. Site Design Measures that include soil types and infiltration rates, setbacks, environmentally sensitive areas (ESAs), drainage management areas (DMAs), pollutants of concern (POCs), and low impact development (LID) measures.
 - 2. Source control measures that provide specific standards for a variety of activities and property uses. Fact sheets for each source control measure are installed in Appendix E of the Manual and specify required pollution prevention activities, Best Management

Practices, design considerations, and maintenance requirements to ensure effective implementation of the source control measure.

3. Treatment control measures that infiltrate, bioretain, evaporate / transpire, or capture and reuses storm water. Collectively, these are known as non-structural control measures. Structural treatment control measures may only be used if non-structural is proven to be not feasible per the criteria in the Manual.
4. Hydromodification requirements for projects that create or replace 1 acre of permeable surfaces. It requires that the post-construction stormwater runoff flow rate not exceed the estimated pre-project flow rate for the 2-year, 24-hour design storm event. A project that does not result in a net increase of impervious surface area over the pre-project condition is not considered a Hydromodification Management Project.
5. The submittal of a Project Stormwater Plan (PSP) with supporting drawings and calculations. Certain projects will also require that a Site Conditions report, Operations and Maintenance (O & M) Plan, and hydrologic modeling be submitted. The PSP must be prepared and stamped by a licensed professional engineer or landscapes architect.

3-4 DESIGN STORM, DRAINAGE REPORTS AND IMPROVEMENT PLANS

It is the goal of the City to provide 100-year, 24-hour return frequency and duration flood protection for all habitable structures, consistent with the City Code of Ordinances. However, the City Engineer or the governing body may require flood protection of 200-year return frequency for new development based on a determination of “unreasonable risk” in Government Code 65302.7(b). Consequently, all drainage reports and plans must demonstrate a minimum 100-year flood protection criteria unless enhanced risk avoidance is deemed necessary.

- A. A drainage report and grading plan must be submitted for projects larger than two acres. Projects less than two acres will be checked on a case-by-case basis with requirements determined by the City Engineer. Drainage reports shall contain the information required by this section.
- B. The storm frequency to be used in drainage system design will be the storm frequency applicable for the design problem under consideration. The following guidelines give a general rule for determining applicable design storm frequency. The actual storm frequency used will be Flood Protection Level (FPL) as explained in the Definitions section.

1. 10-Year, 24-hour Storm:
 - a. The drainage system for the 10-year, 24-hour storm is to be designed to minimize inconvenience, protect against minor damage, and reduce maintenance costs.
 - b. Improvements to be designed for the 10-year, 24-hour storm shall generally include local drainage facilities for residential, commercial, office and industrial development. This will almost always include all closed conduit design and minor channel sections.
 - c. For design purposes, the precipitation depth for a 10-year, 24-hour storm is **2.35 inches**.
 2. 100-Year, 24-hour Storm:
 - a. The drainage system for the 100-year, 24-hour storm, or as required by the FPL, is to be designed to protect against loss of life or substantial property damage. Improvements requiring the assigned FPL design capacity are open channels, detention and retention basins, minor channels, closed conduit systems and overland releases pathway, where specified in these Standards.
 - b. For design purposes, the 100-year, 24-hour storm is considered to be **3.30 inches**.
 3. FEMA regulations shall be complied with at all times. However, this does not preclude the City from requiring a higher standard to protect the public from project runoff.
- C. All storm drainage facilities shall include provisions for future upstream development. A development shall not discharge at a rate which exceeds the capacity of any portion of the existing downstream system. Calculations for storm drainage design within a development as well as calculations for runoff generated by the upstream areas within the contributing watershed shall be submitted to the City Engineer for approval. These calculations are to be based upon ultimate watershed development and shall include:
1. A hydrology calculation for 10-year and 100-year 24-hour storms, together with assumptions, charts, tables, references and methods used.
 2. Topographic map showing existing and proposed elevations that show on-site and off-site watershed boundaries draining onto the

- site. It shall also include the relationship between proposed development and the remainder of the watershed, including acreages of all sub-areas. (Preferably @ 1" =100' scale)
3. Calculations of pre-development and post-development design runoff of the entire basin.
 4. Maps of the proposed development indicating and supporting calculations for:
 - a. All applicable existing and proposed improvements including pipe size, type, class, length and gradient, shown in plan and profile.
 - b. Runoff coefficients for all areas where runoff is calculated.
 - c. Time of concentration and intensity of rainfall at each hydraulic structure.
 - d. The magnitude and direction (indicated by arrows) of flow in each pipe and flow to each structure contributed by its tributary area. All flow rates shall be in cubic feet per second (cfs).
 - e. Elevation of pipe inverts at structures and the top of elevation at each structure.
 - f. Capacities, depth of flow, and size of proposed gutters, drain inlets and catch basins for each pipe reach. The calculations shall include any bypass flow from upstream inlets.
 - g. The overland release path which prevents flooding to existing and proposed structures in the event of malfunction or overloading of the drainage system. The overland release path shall also be designed to carry the FPL flows that exceed the capacity of the drainage system under saturated conditions. The overland release path shall be shown on the drainage plan for the project. All pad grades shall be a minimum of 1-foot above the FPL water surface or 1-foot above the overland release elevation, whichever is higher. Streets, parking lots, playgrounds, pedestrian areas, pedestrian walkways, exclusive of utility easement and other open space areas may be considered compatible with the overland release.
 5. Tabulation sheet that includes all of the above information and summarizes the design in a clear, concise, professional format.

6. Construction Plan and Profile drawings shall include:
 - a. Water surface elevation called out on profile view at each structure with the hydraulic gradient for the design storm indicated in the profile.
 - b. All flow rates in the cubic-foot-per-second (cfs) called out on profile view for each conduit.
- D. At intersections of pipes, the downstream pipe shall have a crown elevation, which is equal to the crowns of all upstream connecting pipes unless an alternate means is approved by the City Engineer. Pipe diameters shall not decrease in the downstream direction.

3-5 DESIGN STORM RUNOFF

The methodology to be used shall be as those provided in the Hydrology Manual for San Joaquin County, September 1997 Final Draft.

3-5.1 Rational Method

The Rational Method tends to become impractical in large, more complex watershed areas. Characteristics such as varying travel for multiple watershed branches and watershed storage are not addressed adequately by the Rational Method. Therefore, the Design Engineer is required to use a Hydrograph method for determining runoff when the drainage basin is larger than 200 acres or when a detention basin is to be designed. If the Rational Method is used, the peak flow rate for the design storm shall be determined as follows:

$$Q = CIA$$

Where...

- | | | |
|---|---|--|
| Q | = | peak rate of flow in cubic feet per second (cfs). |
| C | = | coefficient of runoff having a value between 0.0 and 1.0 depending on surface characteristics. |
| I | = | the average intensity of rainfall in inches per hour for a duration equal to the critical time, usually the time of concentration. |
| A | = | the tributary area, in acres, corresponding to the critical time above. |

The procedures for determining the values of C, I, and A are given in the following subsections:

- A.** Runoff Coefficient, C: Runoff coefficients shall be calculated by a Registered Civil Engineer and submitted to the City Engineer for approval.
- B.** Rainfall Intensity, I: Peak runoff for the 10-year storm shall be based on the Mean Annual Precipitation of 13.5” and the Rainfall Intensity – Duration Curve, shown in Appendix K. Runoff for the 100-year storm may be determined by multiplying the 10-year peak rate by 1.4.
- C.** Tributary Area, A: The tributary area for each point of computation shall be based on actual field reconnaissance or use of appropriately scaled maps that clearly depict the drainage boundaries. All of the area that will contribute runoff to the drainage system shall be considered, regardless of the limits of the particular development under consideration.
- D.** Critical Flow Time: The critical flow time is the time resulting in the maximum flow rate for a given point in a drainage system. Maximum flow occurs when the product of the contributing area and the rainfall intensity corresponding to the flow time is at a maximum.
 - 1. The time of concentration (T_c) is defined as the interval of time (in minutes) required for the flow at a given point to become a maximum under uniform rainfall intensity. Generally, the time required for water to flow from the most hydraulically remote point in the watershed to the point in question is the time of concentration. Using the intensity corresponding to this time and the entire drainage area in the Rational Method usually results in the maximum flow rate for the point.
 - 2. The monograph shown in Appendix K shall be used to determine the time of concentration to the first inlet of the drainage system. The minimum inlet time is 10 minutes, regardless of land use.
 - 3. When any part of the storm waters is conveyed to the point in question by pipes or open channels, the flow time in these conveyances shall be added to the inlet time to compute the total flow time. In complex drainage situations, more than one computation may be required in order to determine the computation of contributing area and flow time that results in the maximum flow rate.

3-5.2 Hydrograph Methods

Hydrograph methods of analysis are required for the larger, more complex watersheds. A hydrograph method is also required for the modeling of a proposed detention basin. The following is a summary of the hydrologic models available to the Design Engineer and acceptable by the City for the modeling of existing and proposed watershed areas. The use of other programs may require additional information verifying the validity of the program used.

- A. The methodology described by the County of San Joaquin Hydrology Manual, September 1997, Final Draft is an acceptable technique.
- B. Technical Release No. 20 (TR-20):
 - 1. The Soil Conservation Service (SCS) originally developed the TR-20 hydrologic model. The model develops flood hydrographs and routes the flow through stream channels and reservoirs. It is capable of combining hydrographs and determining peak discharges, time of occurrence and water surface elevations. The model is based on the procedures described in the National Engineering Handbook, Section 4, Hydrology (NEE-4)
 - 2. The TR-20 computer program and hydrologic model is to be based on the statistical design storm required by these Standards with rainfall distribution and total precipitation as designed and recommended by the U.S. Soil Conservation Service. The model is to be based upon the Standard Methodologies set forth in the most recent version of the SCS Technical Release No. 20 and Section 4 of the National Engineering Hydrology Handbook.
- C. Technical Release No. 55 (TR-55):
 - 1. Technical Release No. 55 (TR-55) uses a derivation of the TR-20 hydrograph methods to develop flood hydrographs. As a simplified version of the TR-20 model, it allows the designer to evaluate a watershed and develop comparable results without using the more complex model.
 - 2. The input variables required with TR-55 include Curve Number (CN), Time of Concentration (Tc) and drainage area. The model is based on a 24-hour statistical design event. The total rainfall volume and appropriate rainfall distribution for the design storm is to be derived in accordance with the recommendations of the U.S. Soil Conservation Service. The watershed model is to be based on the most recent revision of TR-55 and its standard methodologies.

3. The TR-55 hydrologic model only provides runoff hydrographs and does not include a computer program for routing hydrographs through detention basins. If the TR-55 model is used for a proposed detention basin, an additional program will be required for hydrologic routing. The Storage Indication Method or Modified Pulse Method is an acceptable model for the sizing of detention basins.

D. U.S. Army Corps of Engineers HEC-1:

1. The U.S. Army Corps of Engineers Hydrologic Engineering Center developed the hydrology program HEC-1. The model is capable of analyzing flood events for a wide range of conditions, from small urban watersheds to large, multiple watershed river basins. The basic components of the model include the development of surface runoff for each watershed, channel and reservoir routing and the combining of hydrographs at confluences. The model also contains numerous program options such as Dam Break Analysis, Flood Damage modeling and many others, which in general only pertain to large-scale capital improvements. It is recommended that the soil conservation service methodology to be used in conjunction with the HEC-1 model.
2. The HEC-1 computer model is to be based on the statistical design storm required by these Standards and the Standard Methodologies set forth in the most recent version of the U.S. Army Corps of Engineers HEC-1 hydrologic computer model.

3-5.3 Run-on Flows

Flows entering the proposed development from outside the property are run-on flows. The run-on must be determined and included in the drainage system design. Available drainage reports for off-site developed areas affecting the property must be reviewed and considered in the drainage system planning and design. Run-on entering the site from off-site areas must be computed using parameters for the existing development or based on General Plan Zoning, whichever is greater.

3-5.4 Drainage Diversion

The diversion of natural drainage will be allowed only within the limits of the proposed improvement. All natural drainage must enter and leave the improved area at its original horizontal and vertical alignment unless an agreement, approved by the City Engineer, has been executed with the adjoining property owners.

- A.** Temporary drainage diversions, such as dams and pipe plugs, shall be

located and constructed in such a fashion as to permit their removal during adverse weather.

- B.** The City Engineer shall approve locations and removal procedures for temporary drainage installations, and these installations shall be removed when necessary to prevent damage to adjoining property.

3-5.5 High Ground Water Table

There are areas within the City with high ground water. These areas may require special design features such as trench drains to be incorporated into the project design for storm drainage facilities, street structural sections, detention and retention basins to eliminate the following problems:

- A.** Premature failure of trenched street sections due to saturated sub-grade.
- B.** Seepage around building foundations.
- C.** Infiltration of ground water into storm drain and sanitary sewer lines.
- D.** Seepage into detention and retention basins or levee areas.

The soils report must indicate the highest historical groundwater elevation in the project area or provide the design high groundwater elevation based on review of available information.

3-6 HYDRAULIC CRITERIA**3-6.1 Manning Equation**

The Manning Equation shall be used to determine the capacity of open channels and enclosed gravity conduits:

$$Q = VA = \frac{1.486}{n} R^{2/3} S^{1/2} A$$

Where...

Q	=	Flow rate in cubic feet per second
A	=	Cross sectional area of the flow in square feet
V	=	Flow velocity in feet per second
R	=	Hydraulic radius in feet
S	=	Slope in feet per foot
n	=	Manning coefficient of roughness

Values of the Manning coefficient for various pipes and open channels are given in Table 3-1.

TABLE 3-1
MANNING COEFFICIENT

<u>CONDUIT MATERIAL</u>	<u>MANNING COEFFICIENT</u>
Closed conduits	
Cast iron pipe	.013
Concrete pipe	.013
Corrugated metal pipe, plain	.024
Paved invert	.020
Fully paved	.015
Plastic	.013
Vitrified clay pipe	.013
High Density Polyethylene Pipe	.012
Open Channels	
Lined Channels	
Vegetated	.040
Asphalt	.018
Concrete	.015
Rubble or riprap	.030
Excavated or dredged	
Earth, straight & uniform	.030
Earth, winding, fairly uniform	.040
Un-maintained	.100
Natural channels (minor streams)	
Fairly regular sections	.050
Irregular section with pools	.100

Adapted from Table XIV, ASCE Manual No. 37, 1970

3-6.2 Pipe Flow Criteria

- A. For ease of maintenance, all catch basin laterals shall be not less than 15 inches in diameter. All mains or trunk lines shall not be less than 15 inches in diameter. Minimum allowable pipe size for private storm drain lines connecting to the public system is 12 inches in diameter.
- B. The minimum velocity in closed conduits shall be 2 fps when flowing eight-tenths full. The maximum velocity shall not exceed 20 fps.
- C. The hydraulic grade line (HGL) of the FPL design storm must be computed for all storm drain systems. The HGL for the 10-year frequency storm must be shown on the design profile when it is above the top of the pipe. The HGL for the 10-year frequency storm shall be a minimum of 1.0 foot below the elevation of the inlet grates and manhole covers of all structures within the system and shall be within the street right-of-way for the FPL frequency storm.

3-6.3 **Open Channel Flow**

- A. Maximum velocities in open channels shall be as follows on Table 3-2.

Table 3-2**OPEN CHANNEL MAXIMUM VELOCITY**

<u>CHANNEL MATERIALS</u>	<u>MAXIMUM ALLOWABLE VELOCITY (fps)</u>
Fine sand	2.0
Sandy loam	2.5
Alluvial silt	3.0
Firm loam	3.5
Firm gravel	4.0
Stiff gravel	4.5
Coarse gravel	5.0
Bottom paved channels	8.0
Fully concrete lined channels	10.0

- B. Freeboard must be a minimum of 1 foot measured from the top of channel to the HGL.
- C. At the City Engineers discretion, flows shall be placed in closed conduits where the flow requires a concrete pipe of less than 66-inch diameter.
- D. Water surface profiles are to be computed for both existing and ultimate conditions. Hydraulic grade lines (HGL) shall be indicated on the profile view of the construction plans prior to plan approval. A copy of the HGL calculation or other hydraulic model on a disk and printout verifying HGL shall be submitted to the City Engineer. Unless otherwise approved by the City Engineer, all hydraulic grade line calculations shall begin at the ultimate FPL channel water surface elevation.

3-6.4 Backwater Effects

- A. When obstructions, transitions, junctions, constrictions or other irregularities in an otherwise uniform channel system create backwater conditions in the system, the Design Engineer shall make computations to determine the effects of the backwater condition.
- B. The Design Engineer shall use careful consideration in determining when losses due to channel irregularities are small enough to ignore or when they are large enough to create considerable backwater effects. Such considerations shall be noted on calculations.

3-6.5 Inlet Criteria

Drain inlets shall be constructed per Standard Details D-2, D-4, D-5, D-6 and D-7. The standard curb inlet shall be "Type I" inlet as specified in Drawings D-4. Use of "Santa Rosa" style grate-less inlets requires approval by the City Engineer.

Requirements for inlets are as follows:

- A. Inlets shall be placed so that the length of flow in the gutter does not exceed 500-feet in either direction. The flow rate used to check the depth shall include any runoff that may by-pass upstream grates. Exceptions to the 500-foot limit standard may be granted by the City Engineer.
- B. A clogging factor of fifty percent (50%) shall be used when computing the interception capacity of the inlet.
- C. The connector pipe from inlets at sag points shall be sized to accommodate the design runoff taking into consideration bypass flow from upstream inlets.
- D. Caltrans type OCP or OCPI, Sheet D75B, inlets shall be used in unimproved medians, and may be used in roadside ditches away from driveway locations and in back lot situations.
- E. Curb opening catch basins with grating(s) and debris skimmer, Caltrans type GO, Sheet D74B, shall be used in locations where additional inlet capacity beyond what a single "Type I" inlet can intercept. If further grate capacity is required then Caltrans type GT4, Sheet D74A, may be considered.
- F. Inlets in streets shall be placed at lot lines in residential subdivisions, except at intersections where they shall be placed at the curb return. **Inlets shall not be allowed within street crosswalks or any driveways.**

- G.** A minimum horizontal distance of eight feet (8') along the trunk line must separate laterals.
- H.** Frames and Gates to be specified for pedestrian or Traffic Loading. All grates to be bicycle proof, have a grate locking device, be closed-mesh grates or cast iron frame and grates available for approval from the City Engineer.
- I.** Floor slope to be determined in the field by the City of Lathrop Inspector.
- J.** Top edge of structure to be straight or chamfered per approval from the City Engineer.
- K.** For all turf areas that would require larger heavier maintenance equipment such as mowers, fertilizers and herbicide applications, etc.
- L.** Source is Oldcastle Precast Inc., or approved equal.

3-6.6 **Surface Flow and Allowable Inundation**

- A.** In all cases, the hydraulic grade lines (HGL) for a FPL design storm shall be one foot below the lowest floor of adjacent structures.
- B.** The depth of flow for a FPL design storm shall not extend beyond the street right-of-way and maintain at least a minimum 10-foot wide drivable paved area on major streets for public safety purposes. Also, in the event of pump station failure during a FPL storm, dry access to the pump station needs to be provided.

3-7 **DRAINAGE STRUCTURES**

3-7.1 **Alignment of Drainage Facilities**

- A.** Drainage pipelines shall be located in the street whenever possible. The locations shall be in accordance with Standard Detail No. R-63. Alternate locations using Standard Details R-64 and R-65 shall require approval of the City Engineer.
- B.** Drainage pipelines shall be aligned straight between structures except where parallel to the street centerline per paragraph A above. Long radius curves are permitted for pipe 24 inches and larger. The radius of curvature shall not be less than 100 feet or 80% of the manufacturer's recommendation for curved alignment, whichever is greater. Curves, radii, and length of pipe joints must be shown on the improvement plans.

3-7.2 Easements

- A.** Permanent easements shall be provided for drainage facilities not located in the public right of way. Drainage facilities within easements shall conform to the requirements in Section 4-5.3 Easements.
- B.** Open Channels: Easements for open channels shall have sufficient width to contain the open channel with side slopes, fencing where required, and 15-foot service road when required by the City Engineer. Suitable ramps must be provided for access to the bottom of the channel if the bottom requires maintenance. Open channels shall only be used with prior approval of the City Engineer.

3-7.3 Closed Conduit Design

- A.** All closed conduits shall be minimum Class III to V reinforced concrete pipe providing watertight connections. Polypropylene is approved for up to 36" diameter, greater than 36" diameter requires the approval of the City Engineer. Alternative pipes may be used only with the approval of the City Engineer.
- B.** The specified type of pipe or alternate pipes shall be shown on the plans. If the use of alternative pipe(s) are desired and are not shown on the plans, revised plans must be submitted to the City Engineer for approval.
- C.** Pipe bedding, backfill and cover requirements are shown on Standard Details No. R-52 through R-56. If the minimum cover requirement cannot be provided, the conduit shall be encased in Class B concrete to provide a protective cover and support. Other methods for protecting and supporting the pipe may be used only with the approval of the City Engineer.
- D.** When different size pipes meet at a junction, the pipe crown elevations shall be matched unless otherwise approved by the City Engineer.
- E.** When the groundwater is at or above the bottom of the pipe, the design shall comply with City Standard R-57.
- F.** All closed conduits shall be cleaned and inspected by closed circuit television system. The means and methods for this work is provided in Appendix J. The inspection shall be provided to the City for review prior to final approval.

3-7.4 Manholes and Junction Boxes

- A.** Standard precast concrete or saddle type manholes per Standard Detail Nos. D-8, D-9, and D-10 shall be used where feasible. For cases where special

manholes or junction boxes are necessary, the design must be detailed on the drawings and approved by the City Engineer. In no case shall manholes or junction boxes be allowed which are smaller than 24 inches inside dimensions. All manholes and junction boxes other than inlets shall have standard manhole covers. Slotted manhole covers may be used when approved by the City Engineer to pick up minor drainage in non-traffic areas. These covers will not be allowed in gutters.

- B.** Manhole shall be constructed at junction points, angle points greater than 15 degrees, changes in grade and changes in pipe size. On curved pipes, manholes must be located at both the B.C. and E.C. of the curve.
- C.** All mating surfaces of rings and joints shall be sealed with “RamNek” or gasket applied prior to placing rings, and exterior shall be sealed with “Rubr-Nek” installed on all joints.
- D.** Maximum spacing of manholes shall be as allowed:
 - 1. For pipe sizes 24 inches or less in diameter, the maximum spacing of manholes shall be 400 feet.
 - 2. For pipes greater than 24 inches in diameter, the maximum spacing may be up to 600 feet.
 - 3. For curved pipe with radii less than 400 feet, maximum spacing shall be 300 feet.
 - 4. For curved pipe of radii 400 feet or greater, the maximum spacing shall be 400 feet for pipe 24” or less in diameter and 500 feet for pipe greater than 24” in diameter.
- E.** Manholes shall be sized as follows:
 - 1. Drain inlets may be used in lieu of manholes where the upstream pipe terminates in a drain inlet, and is no more than 15 inches in diameter and 50 feet long and the downstream pipe terminates in a manhole and is no more than 15 inches in diameter.
 - 2. A 48-inch pre-cast manhole, Standard Detail D-8, shall be used for pipes up to a maximum inside diameter of 36 inches. The manhole shall have no more than 24 inches opening for connecting pipes at the same level in any one-manhole quadrant. There shall be a minimum of 5 inches at the inside face of the manhole between the outside of connecting pipes.
 - 3. A 60-inch pre-cast manhole shall be used for pipes up to a maximum

inside diameter of 48 inches. The manhole shall have no more than 36 inches of opening for connecting pipes at the same level in any one-manhole quadrant. There shall be a minimum of 6 inches at the inside face of the manhole between the outside of connecting pipes.

4. A 72-inch pre-cast manhole shall be used for pipes up to a maximum inside diameter of 60 inches. The manhole shall have no more than 48 inches of opening for connecting pipes at the same level in any one-manhole quadrant. There shall be a minimum of 6 inches at the inside face of the manhole between the outside of connecting pipes.
5. A 48-inch saddle manhole may be used on pipes 24 inches in diameter or greater with approved submittal from City.

3-7.5 Open Channels

- A. **Natural Channels:** Natural or grass-lined channels shall have a maximum side slope of 3H:1V. For locations of unstable soils, the maximum side slope shall be at the discretion of the City Engineer or the Soils Engineer's recommendation. The minimum bottom width shall be six feet with no shrubs or trees within the flow limits of the channel.
- B. **Concrete Lined Channels:** Concrete lined channels may be constructed if one or more of the following conditions are met:
 1. The capacity of pipe less and 66-inch in diameter is exceeded;
 2. Where the cover requirements for buried pipe cannot be met;
 3. Where the required pipe or natural channel grade cannot be maintained; or
 4. Where slope lining is required to maintain the desired channel side slope.
- C. **Rock Lined Channel:** Rock lined channels, including gabions, may be constructed in lieu of concrete channels, but must maintain a maximum of 2H:1V side slopes and conform to the Standard Specifications.
- D. **Inlet and Outlet Structures:**
 1. Inlets from channels to pipes shall be designed per Standard Details D-11 and D-12. A trash rack will be required in instances where the City Engineer deems that significant amounts of debris may occur at the inlet. Trash racks shall be designed per Standard Detail D-11 and D-13.

2. Outlets from pipes to natural or grass-lined channels shall include erosion control provisions per Standard Detail D-14.
- E.** Improved channels where the maximum design depth is 18 inches or more and with side slopes 4H:1V or steeper shall be fenced with a six (6) foot high chain link fence constructed per Standard Detail D-18, or where applicable as required by the UDC. The fence shall be located 6 inches within the required drainage area/easement lines. An eighteen (18) foot double gate shall provide access to the fenced area.

3-7.6 Detention and Retention Systems

- A.** Detention basins and retention ponds shall be constructed per Standard Detail D-17. The City Engineer must approve any deviation from this design in writing. The maximum side slope for privately maintained detention basins or retention ponds shall be four horizontal to one vertical (4H:1V) unless otherwise recommended by a Registered Soils Engineer or Engineering Geologist licensed in the State of California. These slopes may be steeper than the four to one (4:1) as long as the soils report supports and recommends the steeper slope. Retention and detention basins accepted for maintenance by the City shall have no side slopes greater than four to one (4:1). Detention basins or retention ponds landscaped with turf that requires mowing shall have a maximum side slope of six horizontal to one vertical (6:1).
- B.** Detention basins and retention ponds in developed areas where the maximum design depth is 18 inches or more with side slopes 4:1 or steeper shall be fenced with an eight (8) foot high chain link fence constructed per Standard Detail D-18, or where applicable as required by the UDC. The fence shall be located 6 inches inside the drainage area/easement lines. A twenty (20) foot double gate shall provide access to the fenced area. Additional fence and gate design features may be required by City Engineer.
- C.** A minimum 12-foot wide access road to the basin or pond is required for maintenance vehicles. For small private developments, a three (3) foot set-back of the fence from the top-of-slope of the basin is acceptable. The access way shall be located around the basin or pond with a fifteen (15) foot minimum inside turn radius at the corners. All access ways shall be located within any required fencing.

3-7.7 Detention Basins

Detention basins shall be incorporated with other public uses whenever possible.

- A.** Detention basins other than those shown on the Storm Drainage Master Plan

may be used on an interim basis pending completion of the Master Plan facility or for staged development only with approval of the City Engineer. Where possible, “free form” should be incorporated into the design.

- B.** All detention basin design volumes shall be computed based on the FPL storm. The contributing watershed area shall be evaluated using standard engineering methodologies detailed in Section 3-5.1, Rational Method. The total volume required for the basin shall be based on hydrologic routing computations detailed in Section 3-5.2, Hydrograph Methods, to be provided by the design engineer demonstrating that the basin will operate properly.

If the hydrologic routing computations are not provided, the volume required for the basin shall be given by the equation (to be calculated by a Registered Civil Engineer and submitted to the City Engineer for approval):

$$V_p = \frac{2.0 (CAR)}{12}$$

Where ...

- V_p = the volume of detention pond required in acre-feet.
 C = the runoff coefficient.
 A = the contributing area in acres.
 R = the 10-year, 24-hour rainfall at 2.35 inches.

- C.** All detention basins shall have outlet facilities providing terminal drainage capable of emptying a full basin within 96 hours.
1. Detention basins with gravity outlet structures will operate without backwater effects under the design storm.
 2. A drainage pump may be designed as the basin outlet control. A backup power generator will be required to accompany any drainage pump.
- D.** The bottom of the basin shall be a minimum of 5 feet above the design high groundwater elevation as recommended in the soils report pursuant to the 2015 Multi-Agency Post-Construction Stormwater Standards Manual, and shall meet all requirements of the State Regional Water Quality Control Board (RWQCB). It is the responsibility of the developer’s Design Engineer to coordinate with the RWQCB and submit evidence of their

approval to the City Engineer.

- E.** A minimum 12" freeboard or 25% over-sizing, whichever is less, shall be required.
- F.** Detention basins shall be designed with gravity inflow and gravity outflow whenever possible. (i.e., large pipe in/smaller pipe out, or overflow in/clap-gated outlet). Detention systems requiring pumping facilities must meet the requirements of Appendix H, Wastewater and Storm Water Pump Station Criteria, of these standards and must be approved by the City Engineer.
- G.** The bottom of a detention basin shall be sloped at a minimum of 1% towards the outlet works. Whenever possible, a low flow channel or pipe through the basin shall be incorporated into the design.
- H.** In accordance with City requirements, landscape design with secondary use facilities shall be included as part of each design system.

3-7.8 Retention Basins

Development will be required to provide terminal drainage where developments are within a reasonable distance of a terminal drainage facility as determined by the City Engineer. When this condition is not available, retention basins utilizing percolation as a means for emptying the basin may be used only with the approval of the City Engineer.

- A.** Retention ponds shall conform to the following design criteria:
 - 1. A project specific soils report evaluating the subsurface soil and groundwater conditions for the retention basin shall be prepared by a qualified Soils Engineer or Engineering Geologist licensed in the State of California. The report shall provide the design high groundwater elevation with justification and substantiating groundwater monitoring data.
 - 2. The bottom of the basin shall be a minimum of 5 feet above the design high groundwater elevation as recommended in the soils report pursuant to the 2015 Multi-Agency Post-Construction Stormwater Standards Manual, and shall meet all requirements of the State Regional Water Quality Control Board (RWQCB). It is the responsibility of the developer's Design Engineer to coordinate with the RWQCB and submit evidence of their approval to the City Engineer.
 - 3. Percolation test results must be provided, with calculations indicating that the retention basin is designed to empty one hundred

(100%) percent of the required volume of storage within ten (10) calendar days. Percolation shall be constrained to bottom only.

4. The retention pond design shall be the responsibility of the Design Engineer, and subject to review and approval of the City Engineer.
5. Permeability and differential head available must be considered for the life of the project, not just present values.
6. The volume of storage required shall be two hundred (200) percent of the computed volume of water to be stored. The volume of retention pond storage is:

$$V_p = \frac{2.0 (CAR)}{12}$$

Where ...

V_p = the volume of retention pond storage required (acre-feet).

C = the runoff coefficient (to be calculated by a Registered Civil Engineer and submitted to the City Engineer for approval).

A = the contributing area in acres.

R = the total rainfall, in inches for the 100-year, 24-hour storm. (Use $R=3.30$ inches)

7. Levees or berms shall not be permitted around retention basins. The top of pond, for calculation purposes, shall be at least 1.0 feet below the lowest top of curb or street centerline in tributary area.

3-7.9 Pump Station

Pump stations shall conform to the requirements in Appendix H for the design of storm water pump stations

END OF SECTION

SECTION 4 WATER SYSTEM STANDARDS

4-1 PURPOSE

These water system standards apply to any facility or supply system in the City that meets any one or more of the following conditions:

- A. The system is or will be in the City right-of-way or other public easement.
- B. The system serves, or plans to serve, water to any land development project that is subject to approval of the City Council, Planning Commission, or Public Works Department.
- C. The system provides water for fire protection in the City of Lathrop.

4-2 WATER SYSTEM EXPANSION/REPAIR

Expansions or repairs of an existing system shall meet the standards provided herein without reducing the supply, flow, or storage presently available to the existing system, unless such reduction does not reduce the quality or quantity below the requirements for the whole system based on those standards, and approval of the Director is obtained.

Calculations shall be submitted with the improvement plan submittal. The calculations shall show existing and projected demands, existing and projected source capacity and storage, and distribution system performance under design flow conditions under the requirements of Section 4-5.4 below.

4-3 DEFINITIONS

See Section 1.2 – DEFINITIONS.

4-4 WATER SUPPLY REQUIREMENTS

4-4.1 Quality

Water supplied for use in domestic water systems in the City of Lathrop shall conform to US EPA Standards (40CFR 141, 142 & 143), the requirements of the California Health and Safety Code and the California Water Works Standards containing the California Administrative Code, Title 22 and any other laws and regulations of the State of California.

4-4.2 **Community Water System**

For those projects for which a new community water system is required, or a connection to an existing community water system is required, the following shall serve as the minimum requirements when determining adequate capacity.

- A. **Water Demand:** Water demand shall be calculated using the water demand factors in gallons per day per dwelling unit (gpd/du) or gallons per day acre (gpd/ac) according to the land use type presented in Table 4-1.

TABLE 4-1

WATER DEMAND FACTORS

Land Use Category	Residential Density (DU/acre)	Water Demand Factor (gpd/DU)
Low Density Residential	1.0 – 9.0	315
Medium Density Residential	9.0 – 15.0	235
High Density Residential	15.0 – 35.0	135
Commercial	-	860
Industrial	-	926
Parks and Open Space	-	2,450
Roadway Landscape Area	-	2,450
Schools / Institutional	-	1,500

- B. **Supply:** A public water system shall be designed to meet the following criteria for water supply.
 1. For developments and subdivisions requiring a public water system, all facilities and services for water supply shall conform to the requirements of the LMFD, the Public Works Department, the City’s Master Plan, Urban Water Management Plan, and applicable state and federal agencies.
 2. Sufficient water shall be available from the water sources, distribution reservoirs, and distribution system to adequately,

dependably, and safely supply the total water demand requirements of all users under maximum conditions. The maximum condition shall be defined as the higher of either maximum hourly demand or maximum day demand plus fire flow. Maximum day demand is defined as 1.7 times the average demand, and maximum hourly demand is defined as 3.4 times the average demand. Average demand can be obtained from the City’s most current Water Master Plan.

C. Water Supply/Demand: If required, approval of SB 610 Water Supply Assessment and/or a SB 221 Written Verifications of Water Supply report(s) and any necessary updates to the City Urban Water Management Plan and/or the Master Plan shall be completed prior to approval of the project.

D. Fire Flow: Fire flow shall meet the requirements of the LMFD and as outlined in Table 4-2:

TABLE 4-2

FIRE FLOW REQUIREMENTS

Land Use	Examples of Specific Developments	Fire Flow Required (2 Hour Duration) (gpm)
Very Low Density – Medium Density Residential	All existing single family residential developments as well as Planned Unit Development and Recreation Residential	1,250
High Density Residential	All existing Apartment and Condominium developments	2,000
General Commercial and Office	Highway, Village, Regional, Service, Neighborhood Commercial designations. Includes Professional Offices and Community Commercial designations.	3,000
Heavy Commercial	Areas designated as Recreation and/or Resorts	4,000

Land Use	Examples of Specific Developments	Fire Flow Required (2 Hour Duration) (gpm)
Industrial	Limited and General Industrial	4,000

- E. Fire Hydrant Spacing shall meet the requirements of the LMFD and as shown in Table 4-3:

TABLE 4-3

FIRE HYDRANT SPACING

<u>PROPERTY TYPE</u>	<u>MAX HYDRANT SPACING</u>
Very Low Density – Medium Density Residential	500’
High Density Residential	350’
Neighborhood and Community Commercial	350’
Offices	350’
Highway and General Commercial	300’
Industrial and Heavy Commercial	250’

- F. Storage Capacity: The requirements of the City’s Water Master Plan shall be used to design new water distribution systems with sufficient storage capacity.

4-5 WATER DISTRIBUTION SYSTEM

Distribution facilities shall be designed to provide the lowest cost over their expected life. This may not necessarily result in the lowest initial cost when long-term operation and maintenance costs are considered. This policy, however, results in a water supply system that yields optimum quality at the lowest cost to the customer. Minimum distance from finished grade to top of pipe is four (4) feet or a minimum of two (2) feet below the top of subbase; whichever is greater.

4-5.1 Materials

- A. All domestic water mains shall be polyvinyl chloride (PVC) C900-16 Class 150.
- B. All fire lines shall be PVC C900-16 Class 200.
- C. All water mains shall be blue or white in color.
- D. Warning tape shall be placed above all pipe per Standard Drawings
- E. All valves or other buried metallic pipes and appurtenances shall be completely wrapped or “bagged” in minimum 10 mil polywrap and tape.
- F. Ductile iron pipe shall only be used as approved by the City Engineer.

4-5.2 Horizontal Location of Water Mains

All pipelines designed for the transmission or distribution of domestic water supply shall be located within right-of-way dedicated for public streets or roads unless the use of an easement is specifically approved by the City Engineer.

- A. Water mains in all new streets shall be located on the north or west side of the street per Standard Detail R-63. Standard Details R-64, or R-66 shall be used only if approved by the City Engineer. When water lines are to be constructed in existing streets, they shall be placed in the same location as new streets when practicable. However, traffic conditions, existing utilities, and other physical features shall be considered.

4-5.3 Easements

Permanent easements shall be provided for water mains not located in public right-of-way. The pipe shall be located in the center of the easement.

- A. The minimum easement width shall be fifteen (15) feet and located all on one parcel. All easements shall have a minimum width in feet equal to the required trench width according to the standard detail for trench backfill plus two (2) additional feet of width for every foot of depth of the pipe as measured from the bottom of the pipe to finished grade. All water lines shall be centered within their easements unless otherwise approved by the City Engineer.
- B. Temporary construction easements may be required for installing mains off-site.

- C. All easements shall include right of ingress and egress over adjoining property for maintenance, replacement and operation. No permanent structures shall be constructed in such easements, except fences and utilities that are subject of any overlapping easement.
- D. Where easements are parallel to a property line, they shall all be on one property and not split by the property line.
- E. Pipelines in easements shall be placed along the center of the easement unless the easement will contain multiple facilities as water, sewer, or storm drainage.

4-5.4 Design of Distribution System

Whenever possible, the distribution system shall be in grid form so pressures throughout the system tend to equalize under varying rates and locations of drafts.

- A. **Water Mains:** System design shall be based on the Hazen-Williams formula with $C = 140$.
 - 1. All mains shall be designed to satisfy the more critical of the two following conditions:
 - a. At maximum day peak hour demand, the operating or “residual” pressure at all water service connections shall be at least 40 pounds per square inch.
 - b. At average maximum day demand plus fire flow, the operating or “residual” pressure in the area of the fire shall not be less than 20 pounds per square inch.
 - 2. Normal operating pressures shall be in the target range of 55 to 65 pounds per square inch, and shall not be greater than 80 pounds per square inch at customer service connections.
 - 3. Maximum velocities shall not exceed 10 ft/sec in design.
 - 4. Maximum flow from any single fire hydrant shall be assumed to be 1500 gal/min for design purposes.
 - 5. A Hardy-Cross hydraulic analysis of any proposed distribution system shall be supplied to the City Engineer upon request.
 - 6. The minimum size pipe shall not be less than 6 inches nominal inside diameter. The minimum pipe size (6”) shall only be used

within cul-de-sacs and end runs of less than 500 feet where future extensions will not occur and no fire hydrants are located.

7. Larger size pipes shall be provided to serve multiple housing, schools, commercial or industrial areas as determined by an engineering study. Minimum size pipes serving commercial or industrial areas shall be 10 inches nominal inside diameter.
8. Dual mains may be required in streets which carry heavy concentrations of traffic, or in right-of-ways which are 84 feet or more in width. State highways or major city arterials generally are in this category.
 - a. In those streets classified for dual mains, the minimum pipe size shall be 8 inches in diameter on each side in residential areas.
 - b. In commercial districts, the sizes of pipe shall not be less than one 10-inch and one 8-inch.
9. The distribution system grid shall contain at a minimum, 12-inch or larger cross-connecting mains at intervals of approximately 1,300 feet, with intermediate 8-inch lines.
10. Dead-end water mains or distribution systems with single tie-in connections are to be avoided. Exceptions are short length streets with cul-de-sacs or temporary dead ends at the end of streets that will be extended in the future. All dead-end mains shall be provided with a fire hydrant.

The minimum size and limits of length of dead end water mains is as follows:

- a. Six-inch diameter dead end main is limited to a maximum length of 100 feet
- b. Eight-inch diameter dead end main is limited to a maximum length of 1,200 feet.
- c. Twelve-inch diameter dead end main is limited to a maximum length of 2,400 feet.

The City will determine where it may be necessary to deviate from these maximum lengths of dead end main.

11. Whenever an area outside a development can be logically served by future extension of a main or mains within the development, such

mains shall extend as close as practicable to the development boundary, and be provided with a fire hydrant as a means of flushing.

12. To facilitate locating the pipe, all non-metallic water mains shall have a No. 10 gauge solid, insulated, soft drawn copper wire laid along the pipe, accessible in each valve box or other access opening to the system. Wire junctions shall be per Standard Detail L-33 & W-3. (See Standard Details for Water). Provide access box for tracer wire where no valves are located within 400 feet. A continuity test shall be performed on all new wire.
13. All ductile iron pipe shall be encased in polyethylene wrapping.
14. Any requirements of this section that cannot be met due to terrain or other factors may be varied with the specified approval of the City Engineer.

B. Horizontal and Vertical Separation of Water Mains:

Water mains and non-potable pipelines shall be placed to conform to the California Code of Regulations Title 22, Division 4, Chapter 6, Section 64572:

If the requirements of the California Code of Regulations cannot be met, a waiver must be submitted and reviewed by the State Water Resources Control Board:

- https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/dwdocuments/2018/main_separation_ltr_to_pws.pdf

C. Valves: Valves shall be of the same size as the pipeline in which they are installed. Valves shall be resilient wedge gate valves for main sizes up to 10 inches and butterfly valves for main sizes equal to or larger than 12 inches.

1. The distribution system shall be equipped with a sufficient number of valves located and spaced such that the following conditions are met:
 - a. Any shutdown of any section of water main will not result in shutting down a transmission main.
 - b. Removing any section of pipe from service will not result in any section greater than 400 feet in multiple family

residential, school, commercial or industrial districts, or greater than 600 feet in other areas.

2. In no case shall more than two fire hydrants be removed from service.
 3. All sections of a main water line should be able to be shut down without going to more than three locations to close valves.
 4. Insofar as practicable, valves shall be located at street intersections opposite the curb return. If it is necessary to locate valves between intersections, the valves shall be installed on a property line.
 5. Water mains shall be valved on each side and outside State Highway and canal right-of-way crossings.
 6. At “tees”, valves will be required as follows:
 - a. Two (2) valves where one leg is less than 8 inches with one valve on the smaller leg.
 - b. Three (3) valves where all legs are 8 inches or larger.
 7. At “crosses”, valves will be required as follows:
 - a. Three (3) valves where one or more leg is less than 8 inches with valves on each of the smaller legs.
 - b. Four (4) valves where all legs are 8 inches or larger.
- D. Fire hydrants:** Fire hydrants shall be placed at street intersections whenever possible, and shall be located to minimize the hazard of damage by traffic. Fire hydrants located at intersections normally will be installed at the curb return. All others should be located on a property line. Any cul-de-sac in excess of 300 feet shall have an additional fire hydrant located equal distance from the intersection to the end of the said cul-de-sac or as required by the LMFD.
1. Fire hydrants spacing shall be in accordance with Table 4-3.
 2. Additional hydrants may be required on property frontage or onsite as indicated by the Uniform Fire Code or LMFD.
 3. The main, valve, and service connection serving a fire hydrant shall not be less than 8 inches in diameter. There shall not be more than

two fire hydrants on an 8-inch main, unless the mains are in a looped portion of the distribution system.

4. The type of fire hydrant installation shall be as specified in Standard Detail W-19 or as required by the LMFD.

E. Service lines: Service lines from the water main to the property line shall be installed at the time the main is constructed wherever it is known or wherever it can be reasonably assumed that a connection is or will be required.

1. Service lines for all residential homes shall be minimum 1½ inch unless a separate fire suppression service is provided. All service lines shall be designed to provide adequate service to the facility to be served, and shall be identified on the plans. (see Standard Details).
2. For residential services for homes equal to or greater than 4,000 square feet, the minimum size of service line shall be determined by Design Engineer and shall be sized to meet domestic, fire, and any other demands as required by the City Municipal Code Section 15.32.070. The design calculations shall be submitted for approval by the City Engineer.
3. Service lines shall be polyethylene pressure pipe with compression type fittings.
4. Service lines shall be equipped with angle ball curb stop or gate valve either side of the water meter.
 - a. A gate valve may be used only when the service is 2 inches in diameter or larger.
 - b. Installation of a valve or meter box is required.
5. Service lines shall not be allowed to tap into transmission lines 12 inches or larger, unless specific written approval is obtained from the City Engineer.
6. The location of water service lines shall be permanently indicated by embedding the letter “W” in the curb, directly above the line. (See Standard Detail R-5).
 - a. It is the developer’s responsibility to mark any curb, which is poured after the installation of the service.

- b. Where curbs do not exist and are not planned during the improvement project, a 2" x 2" x 24" construction grade redwood stake shall be driven into the ground directly above the curb stop at a property line, and shall be painted bright blue and have a "W" stamped in the top.
7. If a lot is served by both treated and untreated water systems, the location of the service lines shall be at opposite ends of the front lot line, or as widely separated as is practical, and with the approval of the City Engineer. Backflow prevention devices are required on the treated water service line of all lots having both treated and untreated systems.
 8. Service lines shall have PVC insulated No. 10 solid copper wire from the water main locating wire to the meter box. The wire shall be looped and accessible in the meter box.
- F. Thrust blocks:** All tees, bends, plugs, fire hydrants and other sections of piping and appurtenances that might be capable of being displaced by the action of either working pressures or test pressures within the water system shall be anchored in place by the use of thrust blocks. Thrust blocking or harnesses shall be built as shown on the Standard Details W-2.
1. The bearing pressures of thrust blocking on the supporting soil shall not exceed the allowable bearing pressure for the soil involved. If the allowable thrust block bearing pressure exceeds the 1000-psf allowable soil bearing pressure as determined from the detail, the thrust block must be modified to reduce actual soil pressures to below allowable and calculations shall be provided to verify the modifications.
 2. Required thrust block bearing areas shall be in accordance with Standard Detail (W-2) or as designed by the Engineer of Record
- G. Valve boxes and vaults:** A valve box or vault or capped standpipe shall be provided for every valve installed below ground surface. The cover for all valve boxes and vaults shall be metallic construction capable of withstanding H-20 traffic loading.
1. Valve boxes shall be placed in accordance with Standard Details for Water.
 2. Design for vaults shall be approved by the City Engineer.

- H. Bacteria sample stations:** Bacteria sample stations shall be installed in all new subdivisions having a public water system. The bacteria sample stations shall be installed on main water lines only and at locations that will be representative of the systems water quality and pressure zones in accordance with Standard Details W-16.
1. Each water system shall have a minimum of two bacteria sample stations with one additional bacteria sample station for every 1000-service connections installed on the water system.
 2. Bacteriological Sampling Taps shall be installed per Standard Details for Water.
 3. Any deviation from these Standards shall be approved by the City Engineer.
- I. Blow-off valves (flush outs):** All blow-off (flush outs) shall be a minimum outlet size of 2" and shall be designed for a minimum operating pressure of 150 psi. A blow-off or fire hydrant shall be installed at the terminus of all dead-end water mains or non-circulating flow water mains.
1. The blow-off shall be sized to provide a minimum of 2.0 ft/sec velocity in the attached main.
 2. Blow-off valves shall be used on temporary dead ends only.
 3. Blow-off valves shall be installed per Standard Details for Water.
- J. Air and vacuum release valves:** Air and vacuum release valves shall be installed in the water system at all points where air pockets may form. (See Standard Details). The design shall insure the release of air automatically from the water main. The valves shall also prevent the entrance of air into the water main when the pressure inside the line is below atmospheric pressure.
1. All valves shall be designated for a minimum of 125 psi operating pressure.
 2. The inlet to each valve shall be provided with a gate valve or corporation stop to provide a positive closure between the drain pipeline and the air and vacuum release valve. The air and vacuum release vent outlet shall be installed 12" above adjacent ground in such a manner as to preclude backflow.
 3. All valves shall be protected by the use of a Hot Box or other equivalent product in accordance with Standard Detail (W-11)

- K. Water Meters:** Meters are required on all services from the public system. Meters shall read in gallons and meet the requirements of the latest revision of AWWA Standard C704 or as required by the City Engineer, whichever is more stringent.
1. All meters selected for the application and approved by the City Engineer or Public Works Director. Meter shall be of the following brand, make and models. The City may change the brand, make and model from time to time so the installer shall verify the current standard with the City prior to installation.
 - a. Residential
 - i) Less than 4,000 sf without fire suppression: Badger Model 25 $5/8$ " x $3/4$ "
 - ii) 4,000 sf or larger or with fire suppression: Badger Model 70 1"
 - b. Commercial, Industrial, and Irrigation
 - i) $1\frac{1}{2}$ " service: Badger Model 120
 - ii) 2" service: Badger Model 170
 - c. All meters on service laterals 3" or greater shall be approved by the City Engineer.
 2. All water meters shall include Badger register reading in US Gallon.
 3. All water meters shall be installed with Integral Orion Transmitter (SE) in US Gallon units.
 4. For subdivision or commercial construction, Orion SE Network Gateway Transceivers may be required to collect water meter transmitter data. The mounting location and method of connection to the City's network shall be approved by the City Engineer or Director.
 5. All meters shall be installed in a meter box, which reaches ground surface.
 6. Meter boxes shall be clearly marked as containing water meters and shall be capable of withstanding vehicular traffic if set near driveways, sidewalks, or other areas subject to vehicular traffic.
 7. Meters shall not be placed in driveways.

- L. Corrosion protection:** In general, all new piping shall be PVC; however, for all steel, cast iron, or ductile iron replacements or new installations approved by the City, the applicant shall provide the City Engineer with a soil corrosion report of the work area conducted by a Corrosion Specialist certified by the National Association of Corrosion Engineers or a Corrosion Engineer registered by the State of California. The soil corrosion report shall form the basis for proposed mitigation measures to be submitted with the plans and specifications for City review.
- M. Check valves:** All check valves shall seat readily and completely to assure water tightness. The face of the closure element and valve set shall be a bronze composition, or other non-corrodible material, which will seat tightly under all prevailing conditions of field use. All check valves, 4-inches and larger, for use on distribution mains, shall be designed for a minimum of 150-psi cold water working pressure.
- N. Corporation valves, curb valves, and bronze fittings:** Miscellaneous bronze fittings (e.g. elbows, insulation couplings) shall be used where appropriate throughout the system, subject to the approval of the City Engineer. Corporation and curb valves and miscellaneous bronze fittings shall conform to the Standard Specifications.
- O. Pipe fittings and joints:** Joints and fittings shall conform to applicable AWWA specifications. Mechanical joints for straight lengths of pipe will be allowed only when specifically approved by the City Engineer.

The City does not intend to unreasonably limit the installation of any type of fittings, joint, or proprietary device. However, installation of any such fittings, not specifically approved by these standards, is subject to the approval of the City Engineer.

Written request for approval of items deviating from the City Standards items shall be made in advance through the City Engineer.

1. Flange joints are required when installing four-inch (4") and larger line valves in steel pipe, four-inch (4") and larger tapping sleeves and other fittings. No other type of joint shall be used without the specific approval of the City Engineer.
2. Mechanical couplings shall be of a gasket, sleeve-type with a diameter to properly fit the pipe.
 - a. Tolerance on pipe and coupling, together with proper bolt and gasket arrangements, shall be sufficient to ensure permanent watertight joints under all conditions.

- b. Where pipes of different outside diameter are connected together, or where pipe is connected to fittings of different materials, great care shall be taken to ensure that the proper ring or adapter is selected.
 3. Repair clamps, repair sleeves, joint clamps, and similar devices shall not be used to repair or join water mains. Pipe damaged during installation shall be removed and replaced.
 4. Adapters, plugs, end caps, bullheads, slip sleeves, anchor boxes, lock-joint gaskets, yokes and rods, and other appurtenances shall be used where appropriate throughout the system, subject to the approval of the City Engineer.
 5. Tapping sleeves or clamps shall be used to tap existing water mains that are in service and under pressure without interrupting service. NO TAP SHALL BE MADE ON ANY EXISTING WATER MAIN WITHOUT THE WRITTEN CONSENT OF THE CITY ENGINEER.
 - a. Notification shall be made a minimum of 2 working days in advance under normal conditions Monday through Friday.
 - b. Care shall be exercised to select sleeves and gaskets that are properly sized to fit the type and class of pipe to be tapped.
 - c. Where four-inch (4") or larger tapping sleeves or clamps are used, a thrust block shall be formed and poured behind the sleeve to prevent possible damage to the main from pressure shocks which develop as valves are first opened.
 6. In-line valves shall be the same size as the main and shall open to the left (counterclockwise) with resilient seat. In-line valves in ductile iron or PVC pipelines shall have push-on ends. Pipelines in connection with tapping sleeves or clamps shall have flange ends.
- P. Testing:** Testing shall meet the following requirements.
 1. Domestic hydrostatic test shall be at a pressure of 150 psi for a minimum of 2 hours.
 2. Fire hydrostatic test shall be at a pressure of 200 psi for a minimum of 2 hours.
 3. Bacteriological testing shall conform to AWWA Section C-651 including two consecutive samples taken at least 24 hours apart.

Samples shall be taken by the laboratory contracted with the City and paid for by the Contractor.

4. All labor, materials and equipment required for testing shall be provided by the contractor. The cost of testing shall be paid by the contractor.

4-5.5 Backflow and Backflow Prevention Devices:

- A. Backflow, which is the flow of water or other liquid or foreign materials into the distribution mains of the water systems from another source, is strictly prohibited and shall be prevented by the installation of an appropriate, approved backflow prevention device, purchased, installed, and maintained by the Owner, all certified, all at his/her expense
- B. Type of protection required: The type of protection that shall be provided to prevent backflow into the approved water supply shall be commensurate with the degree of hazard that exists on the consumer's premises. The type of protective assembly required includes:
 1. Reduced Pressure Principle Backflow Prevention Assembly (RP), Double Check Valve Detector Check Assembly (DC) and an Air-Gap separation (AG). The water user may choose a higher level of protection than required.
 2. The minimum types of backflow protection required to protect the approved water supply at the user's water connection to premises with varying degrees of hazard are given in Table 4-4.
 3. Situations which are not covered in Table 4-4 shall be evaluated on a case by case basis and the appropriate backflow protection shall be determined by the City Engineer and/or LMFD.
 4. Two or more services supplying water from different street mains to the same building, structure, or premises through which an inter-street main flow may occur, shall have, as a minimum, a standard check valve on each water service to be located adjacent to and on the property side of the respective meters.
 5. A check valve shall not be considered adequate if backflow protection is deemed necessary to protect the water system from pollution or contamination. In such cases, the installation of approved backflow assemblies at such service connections shall be required.

TABLE 4-4
TYPE OF BACKFLOW PROTECTION REQUIRED

<u>Degree of Hazard</u>		<u>Minimum Type of Backflow Prevention</u>
Sewage and Hazardous Substances		
(1)	Premises where the public water is used to supplement a reclaimed water supply.	AG
(2)	Premises where there are wastewater pumping and/or treatment plants and there is not any interconnection with the public water system. This does not include a single-family residence that has a sewage lift pump.	AG
(3)	Premises where reclaimed water is used and there is no interconnection with the potable water system. A RP may be provided in lieu of an AG, if approved by the City Engineer.	AG
(4)	Premises where hazardous substances are handled in any manner in which the substances may enter a potable water system. This does not include a single-family residence that has a sewage lift pump. A RP may be provided in lieu of an AG, if approved by the City Engineer.	AG
(5)	Premises where there are irrigation systems into which fertilizers, herbicides or pesticides are or can be injected.	RP
Auxiliary Water Supplies		
(1)	Premises where there is an unapproved auxiliary water supply, which is interconnected with the public water system. A RP may be provided in lieu of an AG if approved by the City Engineer.	AG
(2)	Premises where there is an unapproved auxiliary water supply and there are no interconnections with the public water system.	RP
Fire Protection Systems		
(1)	Premises where the fire system is directly supplied from the public water system and there is an unapproved auxiliary water supply on or to the premises (not interconnected).	RP

**TABLE 4-4
TYPE OF BACKFLOW PROTECTION REQUIRED**

<u>Degree of Hazard</u>		<u>Minimum Type of Backflow Prevention</u>
(2)	Premises where the fire system is supplied from the public water system and interconnected with an unapproved auxiliary water supply. An RP may be provided in lieu of an AG, if approved by the City Engineer and LMFD, or chemical additions to fire suppressant.	AG
(3)	Premises where the fire system is supplied from the public water system and where either elevated storage tanks or fire pumps which take suction from the private reservoirs or tanks are used.	RP
Dockside Watering Points and Marine Facilities		
(1)	Pier hydrants for supplying water to vessels for any purpose.	RP
(2)	Premises where there are marine facilities.	RP
Restricted Entry		
(1)	Premises where entry is restricted so that inspections for cross-connections cannot be made with sufficient frequency or at sufficiently short notice to assure that cross-connections do not exist.	RP
(2)	Premises where there is a repeated history of cross-connections being established or re-established.	RP

4-5.6 Storage Facilities

All steel tanks, standpipes, reservoirs and elevated tanks for water storage shall comply with “AWWA D100” or Standard 12B Bolted or Welded Equivalent and also meet all foundation and seismic requirements of the AWWA Standard. All inspection, repairing, painting and repainting of steel tanks, standpipes, reservoirs, and elevated tanks for water storage shall comply with “AWWA D102”. All above grade steel tanks, reservoirs, and elevated tanks for water storage shall be coated with anti-graffiti coating approved by the City Engineer to full height of structure.

4-5.7 Pumping Stations

Pumping facilities may be needed to provide adequate water pressure in the distribution system. The booster pump station shall be designed and constructed in accordance with the applicable specifications provided in Appendix H, Pump Station Design. (Note – A low flow Pump is not required.)

4-6 WELLS

Public production wells shall be sited so that the draw down from one well does not adversely affect adjacent wells, but in no case shall adjacent wells be closer than 1,000 feet. New wells shall be located within 100 feet of a public street, unless an alternate location is approved by the City Engineer.

- A. On a case-by-case basis, site improvements shall be as required by the Director.
- B. Each new site shall be a minimum of 100 feet by 100 feet and its own separate parcel unless the site is contained within a larger parcel dedicated to the City.
- C. The site shall be improved with a minimum of 10 inches of aggregate base with a 12-foot-wide paved access to the street and a paved turnaround on site. Access and turnaround area shall be paved with a minimum of three inches AC on ten inches AB.
- D. Each site shall be fenced with six-foot high chain link and a twelve-foot wide double gate at the access drive. In residential neighborhoods, the fence shall include slats.

4-6.2 Well Abandonment

Abandon and destroy private water wells in accordance with the provisions of the Department of Water Resources California Well Standards, Bulletin 74 Series and County Environmental Health Department Standards. The well owner shall also provide a well destruction plan prepared by a registered engineer or certified hydrogeologist. The primary purpose of the plan shall be to prevent groundwater movement, utilizing the existing well structure, between the various underground aquifers as well as prevent the direct movement of surface water (via the well structure) into the underlying aquifers. The well destruction plan will be reviewed and approved by the City Engineer prior to commencement of any such work.

The well destruction plan content shall include:

- A.** Copy of original “Water Well Driller’s Report” (State DWR).
- B.** Conduct a down-hole closed circuit television (CCTV) inspection of the well and provide a copy of the recording; include written report of findings.
- C.** Recommended well destruction activities based on the following minimum steps:
 - 1. Remove scaling and other encrustations that are blocking well screens. Purpose is to maximize movement of cement grout through screens into gravel pack.
 - 2. Remove any accumulated fill material at bottom of well down to original completed depth.
 - 3. Mechanically perforate the blank (unscreened) portions of the well casing. Portions within any concrete seal near the ground surface do not need to be perforated.
 - 4. Prepare a CCTV inspection and recording of the well after the above activities.
 - 5. Remove the existing well top block and casing to a depth of 5 feet below ground surface.
 - 6. Fill the well via a tremie pipe with a combination of neat cement and/or cement grout to 2 feet above the top of the exposed casing. The viscosity of the neat cement and/or cement grout shall be low enough to allow for movement through the screens into the gravel pack.
 - 7. Backfill and compact the well head excavation and perform other cleanup activities.
 - 8. Prepare and file a State DWR Water Well Driller’s Report upon completion of well destruction and abandonment activities. Provide a copy to the City.
- D.** The above steps shall be adjusted or additional steps added as required to achieve the primary purpose of eliminating or minimizing inter-aquifer movement of groundwater and surface water intrusions into the subsurface strata via the existing water well structure.

4-7 SECURED FACILITIES

All storage facilities, pumping stations and wells shall be secured in accordance with the requirements of Appendix G, Secured Facilities.

END OF SECTION

SECTION 5 SEWER SYSTEM STANDARDS

5-1 PURPOSE

These Standards are intended to establish the minimum standards for any sewer facility or sewer system in the City that meets any one or more of the following conditions:

- A. The system is or will be in City right-of-way or other public easement.
- B. The proposed system provides, or will provide, sanitary sewers, sewer pump stations, sewage treatment plants and sewer systems to any land development project subject to approval of the City Council, Planning Commission, or Public Works Department.

5-2 DEFINITIONS

See Section 1.2 – DEFINITIONS.

5-3 GENERAL REQUIREMENTS

The design and construction of sewer systems, sewer pump stations, and sewage treatment plants in the City subject to control or permit requirements of the City, shall be in accordance with these minimum design standards. The work shall comply with these standards, except where specific modifications have been approved by the Public Works Director in writing.

- A. Plumbing Code: All work on house laterals, house sewers and building sewers that are outside of public right-of-ways or sewer easements will be governed by the provisions of the Uniform Plumbing Code as amended by these Standards and other applicable ordinances of the City.
- B. Other Standards: Where these Standards do not cover a subject fully, subject to approval by the Public Works Director, additional references (latest edition) which may be used, include but not necessarily limited to the following:
 - 1. “Design and Construction of Sanitary and Storm Sewers” (ASCE Manual of Engineering Practice No. 37 or Water Environment Federation (WEF) Manual No. 9).
 - 2. “Sewage Treatment Plant Design” (ASCE Manual of Engineering Practice No. 36 or WEF Manual of Practice No. 8).

3. “Gravity Sanitary Sewer Design and Construction” (ASCE Manual, Engineering Practice No. 60 or WEF Manual of Practice No. FD-5).
4. Design of Municipal Wastewater Treatment Plants – 4th Edition (ASCE Manuals and Reports on Engineering Practice No. 76).
5. Uni-Bell Handbook of PVC Pipe, Design and Construction.
6. The State of California, Department of Transportation (Caltrans) Standard Plans and Specifications.

5-4 SEWER SYSTEM DESIGN REQUIREMENTS

5-4.1 Sewer Capabilities

Sewers shall be designed to carry the peak wet weather flow rates (PWWF) from all areas tributary to them. The design flow rate at any point shall be the average dry weather flow of all tributary areas times the peaking factor per Figure 5-1. Sewer shall be designed for both size and depth to accommodate developments in upstream tributary areas that would logically be served by them.

A. General: Main sewers shall be designed and constructed to transmit the design flow, which will result from the ultimate development of the entire tributary area even though said area may not be within the project boundaries.

1. Consideration of the type of development anticipated or existing shall be given in arriving at the design flow but in no case shall any sewer mains be smaller than the size required by the General Plan in the areas determined by the City of Lathrop, current Master Plan Studies, with the sewer mains flowing half full. In no case shall any sewer be less than 8” in size except in cul-de-sac and alleys serving six or fewer homes.
2. In no case shall a smaller pipe be used in any location than that upstream of said location. Sewer mains shall be designed to withstand the vertical loads that will be imposed on them.

B. Hydraulic Design:

1. Hydraulic analyses for all sanitary sewers shall be computed using Manning’s formula with a constant “n” value of 0.013.
2. Pipes 15 inches in diameter and smaller are designed for peak flows with a maximum depth to diameter (d/D) ratio of 0.50. Pipes 18

inches in diameter and larger are designed for peak flows at a maximum (d/D) ratio of 0.75.

3. Design velocity and head loss for force mains shall be calculated using Hazen-Williams formula with a roughness constant of 110.
 4. Minimum velocity for any sanitary sewer shall be two (2) feet per second for pipes flowing half full.
 5. Maximum velocities shall not exceed 10 fps.
- C. Minimum Sewer Slope: Minimum slope requirements are necessary to ensure self-cleansing and self-oxidizing velocities in order to avoid significant generation of hazardous, odorous, and corrosive sulfur compounds.
1. Minimum Slopes/Capacity – Slopes of sewers shall equal or exceed those set forth in Table 5-1.
 2. Substandard Slopes – Slopes below the minimum slopes may be used in order to avoid pumping only when specifically approved by the City Engineer. Such approval should be solicited in advance of completion of design.
 - a. Pipe – Pipe in substandard slope areas or for flows less than 2 feet per second and pipe in all areas downstream from substandard slope areas to the point where the peak flow is four times than in the section with substandard slope, shall be corrosion resistant sewer pipe.

TABLE 5-1
MINIMUM PIPE SLOPES

Pipe Size (in)	Minimum Slope ratio (ft/ft)	Capacity at 0.7 depth (MGD)	Capacity in full depth (MGD)
<i>Service Laterals</i>			
4	0.0208 (1/4" per 1')		
6	0.0208 (1/4" per 1')		
<i>Sewer Mains</i>			
6	0.0050	0.22	
8	0.0035	0.38	
10	0.0025	0.58	
12	0.0020	0.85	1.00
15	0.0015	1.32	1.60
18	0.0012	1.95	2.35

5-4.2 Sewer Quantities

- A. The average dry weather daily sewage flow shall be calculated according to the land use wastewater flow factors set forth in Table 5-2.

TABLE 5-2
WASTEWATER FLOW FACTORS

Land Use	Wastewater Flow Factor	
	Historic Lathrop	West Lathrop
Low Density Residential	240 gpd/du	200 gpd/du
Medium Density Residential	180 gpd/du	
High Density Residential	170 gpd/du	
Commercial	590 gpd/ac	
Industrial	355 gpd/ac	
Parks	55 gpd/ac	
Schools / Institutional	245 gpd/ac	

To compute the peak flow from the average flow, the peaking factor in Figure 5-1 shall be used. Designer shall submit calculations for review and approval by the City Engineer.

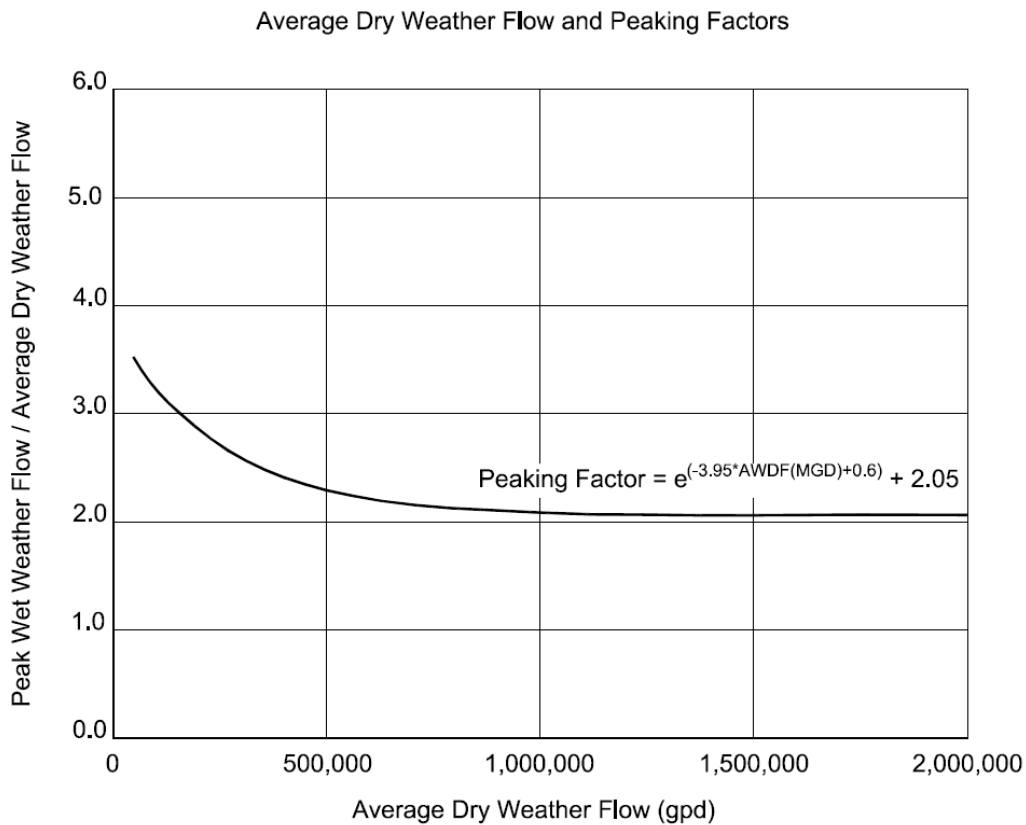


FIGURE 5-1

WASTEWATER PEAKING FACTORS

5-4.3 Sewer Location

A. Roads:

1. Sewer mains in new roads shall be located as indicated in Standard Detail No. R-63. Standard Details R-64 or R-65 shall be used only if approved by the City Engineer. Exceptions to these location requirements may be made only with approval of the City Engineer.
2. Sewer mains shall maintain a minimum twelve (12) inches vertical clearance from other utilities. Sewer mains shall be below other utilities unless approved by the City Engineer.

B. Water-Sewer-Separation: Separation of sewer from water is identified in Section 4-5.4. B of these Standards.

- C. Easement: Sewers within easements shall conform to the requirements in Section 4-5.3.
- D. Future Extensions: When an area outside the proposed project can be logically served by future extension of a proposed sewer, the proposed sewer shall extend to the proposed project boundary or to the end of a paved street in a manner to facilitate the future extension.
- E. Alignment: Alignments shall be parallel to the street centerline whenever possible. Sewers shall be laid on a straight alignment and grade between manholes except that curved sewers may be used subject to the following requirements.
 - 1. All curve data shall be shown on plans.
 - 2. Radius of curvature and joint deflections shall be 80% of the pipe manufacturer's recommendation and approved by the City Engineer; however, in no case shall the radius be less than 200 feet.
 - 3. All deflections shall be at the pipe joints or by specially metered pipe sections. Actual bending of the pipe itself will not be allowed.
 - 4. A manhole shall be constructed at both the B.C. and E.C. of curves where the length of curve exceeds 100 feet, otherwise a manhole shall be required at one end of the curve only.
 - 5. Vertical curves may be used in combination with horizontal curves. Where vertical curves are used, the sewer shall be sized for the flattest slope within the curve.
 - 6. Maximum combined horizontal and vertical deflection at any joint shall be 80% of the manufacturer's recommendation, but in no case more than 3 degrees.
 - 7. The arithmetic sum of all horizontal and vertical deflection in curved sewers between adjacent manholes shall not exceed 22 ½ degrees. Sweep shall be avoided unless approved by City Engineer.

5-4.4 Depth of Sewers

Sewers shall be installed at a depth which will provide suitable service to the properties connected and will allow subsequent installation of water lines in accordance with the water-sewer separation rules so as to minimize special construction of the water lines. Attention to joint spacing on the water lines will be required.

- A.** Standard Depth: Minimum cover for any sewer main shall be five (5) feet from finished grade within the street section or three (3) feet below the street pavement section whichever is greater, and three (3) feet in sewer easements. Any deviation from this cover shall require special design and approval by the City Engineer.
- B.** Maximum Depth: The maximum invert depth of any sewer main shall be 15 feet from finished surface unless approved by the City Engineer and in no case shall any sewer main be deeper than 20 feet. Any sewer main with an invert greater than 15 feet shall be required to use pipe material for pressure pipe such as PVC C900-16, or ductile iron as required herein.
- C.** Exceptions: Special pipe cover shall be used when total cover over public and house connection sewers is less than four (4) feet, and may be required when total cover will not be placed immediately after pipe installations, or when other special conditions exist.
1. Three (3) to four (4) feet of cover shall require the use of ductile iron pipe or approved bedding or encasement specifically designed for the cover conditions.
 2. Less than 3 feet of cover shall require concrete encasement. In no case shall cover less than two and one-half foot (2.5) be permitted.
 3. All pipelines shall be designed and constructed to a load safety factor of 1.5.
 - a. The engineer, during design, shall consider impact and dead loads imposed upon the pipe both during and after construction.
 - b. The construction plans shall show the maximum permissible trench width at the top of the pipe that shall be predetermined by the design engineer.
 - c. No sewer service shall be connected to a main greater than 12 feet in depth. No service lateral shall connect into sewer mains greater than 15 inches in diameter. Where groundwater is expected at or above the bottom of the pipe, the design shall comply with City Standard R-57 & R-58.
 - d. Trench design calculations shall be submitted to the City Engineer for approval for all trenches.

5-4.5 Structures

- A. Manholes: Manholes shall be located at all changes in alignment or grade and at all junctions. Manholes shall be located at the following maximum intervals:

On pipes 12-inch in diameter and under 400 foot intervals

On pipes over 12-inch in diameter 500 foot intervals

1. Drop Manholes: Drop manholes shall be constructed in accordance with Standard Detail S-2 and shall be used wherever sewers enter manholes at more than 24 inches above the outlet elevation of the manhole. The use of drop manholes shall require the approval of the City Engineer.
2. Design: Manholes shall be constructed in accordance with Standard Detail S-1.
 - a. When two lines of the same size enter a manhole, or if flow in a single line must change direction by more than 20 degrees, the invert grade at the exit must be at least 0.20 foot below that of the entrance pipe.
 - b. If the pipes entering and exiting any manhole are of differing diameter, the minimum invert elevation differential (that is, fall in elevation through the manhole) shall be such that the pipes are matched crown to crown. The invert of the entering pipe shall be no higher than the crown of the exiting pipe.
 - c. Drop connections are not governed by the above elevation requirements.
 - d. All manholes installed within 500 linear feet of any pump station or other detention facility shall have a polyurethane or fiberglass coating, or PVC liner recommended by a reputable manufacturer as being suitable for this use, applied to the interior of the manhole.
3. Protection: Where new proposed sewers are to be connected into a manhole that is in active use, the designer shall call for such protection as is necessary to prevent construction debris from being washed into the active sewers. Plugged inlets or other suitable protection shall be called for in the active manhole before beginning manhole modifications or proposed sewer cleaning.

4. Elevations: Finished elevations of frames and covers shall be set flush with finished grades of the completed road surface or 12 inches above immediate surface when more than 10 feet outside of paved roadway. Manhole placed on unimproved lands shall be marked with a green five-foot-high 4x4 post or metallic post designed for that purpose.
- B.** Cleanout Requirements: Dead end 8-inch sewer mains not over 200 feet in length shall terminate in standard manholes or flushing branch. Dead ends over 200' long shall terminate in standard manholes unless future extension of said dead end will include a manhole within distances specified in Item (A) above of the uppermost manhole, in which case a temporary flushing branch may be permitted.
- C.** Structures and Pipes: All structures and pipe placed under public roads shall be of sufficient strength to support with an adequate factor of safety the backfill, road surfacing and H-20 truck loading with impact.
1. Sewers under other pipes and structures shall be protected from damage and shall be constructed so as not to endanger the other pipe structure.
 2. The concrete blanket method is not required where the distance between the outside of crossing pipes exceeds 12" unless required by water sewer separation rule.

5-4.6 Service Laterals

- A.** Requirements: Wherever it is known or can be reasonably assumed that a building sewer connection is required, a service lateral shall be shown on the plans and installed to the property line as a part of the street sewer construction, prior to paving.
1. Service laterals shall be installed whenever possible during construction of the sewer main using prefabricated fittings.
 2. Unused service connections shall be tightly sealed and staked in a manner to facilitate their future location and use.
- B.** Size: Service laterals for single dwellings and small single stores or offices shall be 4 inches minimum or as required by Uniform Plumbing Code. All other service laterals shall be 6 inches or larger and at least equal to the size of the building sewer.
- C.** Depth: Service laterals shall be at the minimum depths herein provided and in addition such depth shall be sufficient to provide a connection to any

point on the lot, within the established building setback lines, with a cover of one foot and a slope of not less than 0.02 and a minimum of 4 feet at the property line. Any exception to this requirement shall be approved by the City Engineer.

- D.** Backflow Prevention: Sewers shall be designed to preclude the backflow of sewage into service laterals. If it is infeasible to install the waste receptacles in any building at least 1 foot higher than the rim elevation of the next upstream manhole, or other structure providing hydraulic relief, then backflow prevention devices shall be installed in the building waste line on the property side of the service lateral cleanout.
- E.** Curb Markings: The location of all sewer service laterals shall be marked by an "S" cast into the concrete of the curb at completion of construction (See Standard Detail R-5)
- F.** Grease Traps: On-site grease trap may be required on service laterals and sized accordingly using the latest edition of the Uniform Plumbing Code (UPC). The City Engineer shall make this requirement on a case-by-case basis.

5-4.7 Pump Stations

The developer shall conform to the requirement in Appendix H for the design of wastewater pump stations.

5-5 MATERIALS

Materials shall be chosen for their strength, durability, and ease of maintenance with due consideration for dead and live loads, flexural strength, and resistance to corrosion.

5-5.1 Pipe Joints

Pipe joints shall be selected to provide positive protection against entrance of roots and groundwater with sufficient flexibility to adjust to the trench bedding. In general, the joints shall be non-rigid and the joint sealer shall be restrained against lateral and axial movements. The installed joint shall provide positive separation between adjoining pipe sections to prevent failure of rigid materials by axial expansion.

5-5.2 Pipe Material

Gravity sewer pipe material shall be Polyvinyl Chloride (PVC) SDR26. Other materials such as ductile iron shall be approved by the City Engineer. Force main sewer pipe shall be either C900-16, Class 150 or greater.

- A. Polyvinyl Chloride (PVC) Pipe: Solid wall PVC pipe and fittings 4 inch through 15 inch shall conform to ASTM D-3034 and shall have a minimum cell classification of 12454-B or 13364-A or 13364-B as defined in ASTM D-1784. Additives and fillers shall not exceed 10 parts by weight per 100 parts of PVC resin in the compound.
1. PVC pipe and fittings shall be installed in accordance with ASTM D-2321 the Uni-Bell Handbook of PVC pipe, the Water Environment Federation Manual FD-5 and City standards.
 2. All pipe and fittings shall be suitable for use as a gravity sewer conduit, with provisions for expansion and contraction at each joint.
 - a. All joints shall be made with flexible elastomeric seals meeting the requirements of ASTM D312-81, and shall be capable of passing all tests specified in said standard and within these specifications.
 - b. A factory-applied reference mark shall be provided on the spigot end to ensure proper positioning in the adjoining bell.
 - c. The pipe shall be uniform in color, opacity, density, and other physical properties.
 - d. Pipe shall be marked in accordance with ASTM D3034 for a gravity sewer.
 - e. All pipe shall be green or white in color with caution green tape placed one to two feet above pipe.
 - f. Polyethylene sleeves may be required by the City Engineer at joints.
 3. Laterals shall be wye type and shall be complete fittings.
 4. Solvent type joints for pipe or saddle, Y or T, are not allowed at any time.
 5. Flexible pipe not installed within 120 days of the latest test shall not be used without prior written approval from the City Engineer.
 6. Written certification, by the manufacturer, shall be submitted showing that all pipe and fittings meet the requirements herein.

7. Pipe stored on the job site shall be covered with canvas or other opaque material to protect it from the sun's rays. Air circulation shall be provided under the covering.

5-5.3 Concrete

All concrete for sewer structures and sewer pipe encasement shall be Class II per Section 90 of the Standard Specifications unless otherwise shown herein or approved by the City Engineer.

5-6 TRENCHING, BACKFILL AND BEDDING

5-6.1 Trenching, Backfill and Bedding

Trenches shall be excavated to a width that will provide adequate working space, but not less than the minimum design width. Trench walls shall not be undercut. Trench width shall be per Table 5-6.

TABLE 5-6

NARROW TRENCH WIDTH, MINIMUM

<u>Nominal Pipe Size Inches</u>	<u>No. of Pipe Diameters (O.D.)</u>	<u>Trench Width, Minimum Inches</u>
4	7.0	28
6	5.0	30
8	4.0	32
10	3.4	34
12	3.0	36
15	2.6	39
18	2.3	42
21	2.2	45
24	2.0	48
27	1.9	51
30	1.8	54
33	1.7	57
36	1.6	60
42	1.6	66

- A.** The trench walls can be sloped where indicated by the City Engineer to reduce trench wall failure as long as the measured width at the top of pipe does not exceed the maximum design trench width.
- B.** Trenches, other than for Class "D" bedding, shall be excavated to provide space for the pipe bedding.
- C.** Bell holes shall be excavated to prevent point loading of the bells or couplings of pipe laid.
- D.** Sheet, shore, and brace trenches, as necessary, to prevent caving or sliding of trench walls, to provide protection for workmen and the pipe, and to protect adjacent structures and facilities.
- E.** Sheeting shall not be removed below the top of pipe if the resulting slope of the native soil increases the trench width to such an extent that the load on the pipe exceeds the safe field supporting strength of the pipe and bedding system.
- F.** When a movable box is used, secure the installed pipe to prevent it from moving when the box is moved.
- G.** The use of pea gravel as bedding or backfill is NOT allowed at any time.
- H.** Trenches within the historic water table or where groundwater is encountered shall comply with the following conditions:
 - 1. The bottom of the trench shall be kept entirely free of water.
 - a. Dewater and dispose of the water so as not to cause injury to public or private property, or to cause a nuisance or menace to the public.
 - b. The dewatering system shall be installed and operated so that the groundwater level outside the excavation is not reduced to the extent that would cause damage or endanger adjacent structures or property.
 - c. The static water level shall be drawn down a minimum of two foot below the bottom of excavation to maintain the undisturbed state of natural soils and allow the placement of any fill to the specified density.
 - d. Dewatering systems shall operate continuously until backfill

has been completed to one foot above the normal static groundwater level.

2. The contractor shall control surface water to prevent entry into excavations. At each excavation, a sufficient number of temporary observation wells to continuously check the groundwater level shall be provided.
3. Sumps shall be no deeper than five feet and shall be at the low point of excavations. Excavations shall be graded to drain to the sumps.
4. The control of groundwater shall be such that softening of the bottom of excavations, or formations of "quick" conditions or "boils", does not occur.
 - a. Dewatering systems shall be designed and operated so as to prevent removal of the natural soils.
 - b. The release of groundwater at its static level shall be performed in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill, and prevent flotation or movement of structures, pipelines and sewers.
 - c. If an NPDES (National Pollutant Discharge Elimination System) permit is required for disposal of water from construction dewatering activities, it shall be obtained prior to any dewatering activities.
5. Gradation and relative size of the embedment material and adjacent material must be compatible to minimize migration of fines. If bedding and backfill will allow migration of adjacent finer materials, a non-woven geo-textile is required.

5-7 TESTING AND ACCEPTANCE

5-7.1 Requirements

All sewer lines shall be tested for obstructions and cleaned by cleaning ball and flushing. An approved commercial sewer cleaning ball shall be used, which shall be controlled by a tag line or rope or sewer rods and permitted to move slowly through the sewer.

All labor, materials and equipment required for testing shall be provided by the contractor. The cost of testing shall be borne by the contractor.

- A.** All obstructions or irregularities shall be removed or repaired by the contractor.
 - 1. All testing, cleaning, and repairing shall be done to the satisfaction of the City Engineer.
 - 2. The contractor shall provide all necessary materials and utilities for the tests and shall dispose of all waste, including water, at his own expense.
 - 3. The water shall not be allowed to enter existing sanitary sewer systems.
- B.** In addition to other tests specified, PVC gravity sewer pipe shall be tested for deflection as follows:
 - 1. A 5 percent deflection test shall be performed within 30 days following installation. The maximum allowable 30-day deflection shall be determined based on the pipe manufacturer reported ID less 5 percent and compared to the measured ID 30 days following installation.

5-7.2 Leakage

After laying, backfilling, and compacting, all sewers and manholes shall be tested for leakage. The program of testing must fit the condition as mutually determined by the City Engineer and the contractor.

- A.** The contractor may use either an air or vacuum test as specified below and shall furnish all labor, tools, and equipment necessary to make the tests and to perform any work incidental thereto.
- B.** The contractor shall take all necessary precautions to prevent any joints from drawing air or water while pipelines or their appurtenances are being tested. The contractor shall, at his own expense, correct any excess leakage and repair any damage to the pipeline and its appurtenances or to any structures indicated by or resulting from these tests.
- C.** Air Test Procedure
 - 1. Pressurize the test section to 3.5 psi and hold above 3.0 psi for not less than five minutes.
 - 2. Add air if necessary to keep the pressure above 3.0 psi.

3. At the end of this five-minute saturation period, note the pressure (must be 3.0 psi min.) and begin the time period.
4. The pipe fails a test if the pressure drops 0.5 psi in less than the time given in Table 5-7.

TABLE 5-7**AIR TEST PIPE HOLD TEST**

Sewer Main Size (in)	Minimum Time (min)
4	4
6	4
8	4
10	4
12	4
15	8
18	8
22	8
24	8

5. When the prevailing groundwater is above the sewer being tested, pressure shall be increased 0.43 psi for each foot of the water table above the flow line of the sewer.
6. If the time for the pressure to drop 0.5 psi is 125 percent or less of the time given in the table, the line shall immediately be re-pressurized to 3.0 psi and the test repeated.
7. For 8" and smaller pipe only: if during the five-minute saturation period pressure drop is less than 0.5 psi after the initial pressurization and air is not added, the section undergoing test shall have passed.

8. If the test is not passed, the leak shall be found and repaired to the satisfaction of the City Engineer and the length of repaired line retested.
 9. House sewers shall be considered part of the lateral to which they are connected with no adjustment of test time allowed to compensate for the small diameter of the house sewers.
 10. The pressure gauge used shall be supplied by the contractor, shall have maximum division of 0.10 psi, and shall have an accuracy of 0.04 psi.
 - a. Accuracy and calibration of the gauge shall be certified by a reliable testing firm at six-month intervals or when requested by the City Engineer.
 - b. In addition, the City Engineer may compare the contractor's gauge with a City owned gauge at any time.
- D. Manholes:** Vacuum test manholes in accordance with ASTM C1244 prior to backfill using the following general procedure:
1. Start vacuum and seal leaks, if necessary
 2. Attain a vacuum of 10" Hg
 3. Time Pressure drop to 9" Hg. The time must be held for at least the minimum time shown in the following table to be considered a passing test:

TABLE 5-8
VACUUM TESTING CONCRETE MANHOLES (ASTM C1244)

Depth (ft)	Diameter (in)								
	30	33	36	42	48	54	60	66	72
	Times (sec)								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	34	39	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	115
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

4. Release vacuum and backfill

- E.** Televising of Sanitary Sewers: Following the placement and densification of backfill and completion of other required testing, but prior to the placing of pavement, the Contractor at his expense shall provide Closed Circuit Television (CCTV) equipment to inspect the inside of the total length of the gravity sewer mains. The means and methods of the CCTV inspection is

provided in Appendix J. The contractor shall provide a record (DVD or USB memory card of the CCTV logs) in digital format to the City Engineer. Contractor shall obtain the preferred media and format from the City prior to submitting the materials. Any defective pipe or conditions that are discovered by the CCTV inspection shall be corrected by the Contractor at no expense to the City. Any corrective method proposed by the Contractor shall be approved by the City Engineer prior to the performance of the corrective work.

Defective pipe or conditions shall include the following:

1. Breaks or cracks in the pipe.
2. Joint offsets.
3. Protruding, folded or otherwise deformed gaskets.
4. Standing water exceeding the following:

Pipe (diameter)	Depth
6"	1"
8"	1.25"
10"	1.3"
12"	1.75"
15" or larger	2.5"

- F.** Repair Work: When test results indicate damaged pipe, the repair shall be as recommended by the manufacturer and as approved by the City Engineer.
- G.** Force Main pressure testing shall be completed by maintaining a minimum pressure of 150 psi for a minimum of 2 hours.

5-7.3 Final Cleaning

Upon completion of all testing, but prior to the CCTV inspection above, the Contractor shall clean the sewer in such a manner as to insure that no foreign matter or debris has been left in the sewer. All foreign matter and debris shall be removed and disposed of in a manner acceptable to the City Engineer.

END OF SECTION

SECTION 6 ROADWAY STANDARDS

6-1 PURPOSE

The roadway standards are intended to establish the minimum standards for public and private roadways, alleys, driveways, bike paths and all associated appurtenances such as sidewalks, curbs, gutters, street lights, signs, barriers, etc., associated with new development projects. Design and construction of all new roadway facilities shall be in accordance with accepted engineering practices and these minimum design standards.

6-2 DEFINITIONS

See Section 1-2 DEFINITIONS.

6-3 OTHER STANDARDS

While it is not possible to set rigid design standards for every possible design situation, design of roadway improvements shall adhere to sound engineering principles and good civil engineering practice. The Highway Design Manual, AASHTO Design Manual, and CA MUTCD may be used for guidance for situations not covered by these Standards. In all cases, final approval of any design is left to the discretion of the City Engineer.

6-3.1 Roadway Types

Road types shall be as specified in the conditions of approval for a project, the City of Lathrop General Plan, or any special purpose plan for a road or area. Where no road type is specified, the City Engineer shall select the appropriate type and width of roadway to be constructed based on the planned ultimate width of right-of-way or a traffic study.

6-4 TRAFFIC STUDIES

A written traffic study may be required under, but not limited to, the following conditions:

- A. Ministerial Projects - The City Engineer may require a written traffic study for ministerial projects that may be expected to generate fifty or more vehicle trip ends during any hour.
- B. Discretionary Development Projects - A written traffic study shall be prepared when required during the entitlement phase or as a condition of approval of a development project.

- C. Supplemental Study - The City Engineer may require a written supplemental traffic study if the property use is changed so that the average daily trip generation is increased by more than 15% over that indicated in an existing traffic study.

6-4.2 Preparation

At the City Engineer's option, the City may prepare or contract for the preparation of any traffic studies required by this Section, or the City may direct the Developer to have the study prepared. The Developer shall deposit with the City funds for all costs, as estimated by the City Engineer, prior to the preparation of any required traffic study.

6-4.3 Content of Traffic Study Reports

To provide consistency and facilitate review, the following format shall be followed for organizing information gathered, traffic assumptions, analysis, findings and mitigation measures for traffic study reports:

- Introduction
- Existing circulation system
- Existing traffic conditions
- Projected build out traffic volumes
- Trip generation
- Trip distribution and assignment
- Project traffic
- Project plus existing impacts
- Cumulative traffic conditions
- Cumulative impacts
- Mitigation measures for project plus existing impacts
- Mitigation measures for cumulative impacts
- Traffic Indexes

6-4.4 Trip Generation Rates

Daily trip generation rates by land use are based on data from the Institute of Transportation Engineers, Caltrans, the Federal Highway Administration, and other jurisdictions within San Joaquin County.

6-5 DESIGN STANDARDS**6-5.1 Soils Report Required**

- A.** All public and private roadway designs shall be based on the results of a soil investigation performed by a Registered Geotechnical Engineer or a Registered Civil Engineer with expertise in soil investigations.
 - 1. The report will address roadbed foundation conditions, grading considerations, slope stability (for slopes in excess of 5 horizontal to 1 vertical) and special conditions expected such as highly organic or soft soils or shallow groundwater, which may affect design or construction.
 - 2. The report shall specifically determine the design resistance (“R”) value of native materials at the proposed sub-grade elevation to allow proper design of the roadbed structural section.
- B.** The City Engineer may find that (1) the project is located in an area of consistent soil characteristics and (2) the City has knowledge from other sources of the soil characteristics, including the "R" value, and waive the requirement for a soils report.
- C.** The maximum allowable (“R”) value for the purpose of roadway design shall be forty (40).

6-5.2 Structural Section

- A.** Thickness: All roadway designs shall be approved by the City Engineer and based on the recommendations of the required soils report. Soil samples shall be taken at 500 feet intervals or less, as directed by the City Engineer, along the street alignment at sub-grade depth. If no soils report is available, all streets must be designed for an R-value of 5.
 - 1. The thickness of the structural section elements of Traffic Index (TI) higher than 7 shall be based on the Design of the Pavement Structural Section in the Highway Design Manual. A prime coat shall be placed when required by the City Engineer.
 - 2. When the depth to groundwater is 5 feet or less, prepare the subgrade in accordance with the State Standard Specifications Section 24. The amount of lime to be used to be determined by Design Engineer and approved by City Engineer.
 - 3. The minimum asphalt concrete (AC) thickness of 3 inches and the minimum Class II Aggregate Base (AB) of 6 inches shall be used on

all streets with a Traffic Index (TI) of less than 5 regardless of R value.

- 4. The minimum AC thickness of 4 ½ inches and the minimum Class II AB of 8 inches shall be used on all streets with a TI of 5 to 7.
- B.** Traffic Indexes (T.I.): Traffic Indexes shall be determined in the traffic study report or as required by the City Engineer.

The following minimum shall apply:

<u>TYPE OF STREET</u>	<u>T. I.</u>
Cul-de-sac (12 or fewer lots)	4.0
Cul-de-sac (13 or more lots)	4.5
Local Residential	5.0
Collectors	6.0
Local Commercial	9.0
Arterials	11.0
Local Industrial	12.0

The City Engineer shall determine the Traffic Index on other roads on an individual basis.

6-5.3 Design Speed

- A.** Design of all roads shall be consistent with the design speeds expected and shall follow the recommendation of the traffic report. The minimum design speeds for road design shall be as follows:

<u>ROADWAY CLASSIFICATION</u>	<u>MINIMUM DESIGN SPEED (mph)</u>	<u>MINIMUM DESIGN CURVE RADIUS (ft)</u>
Cul-de-sac	-	-
Local Residential	30	350
Local Industrial/Commercial	40	800
Collectors	40	800
Minor Arterials	50	1400

<u>ROADWAY CLASSIFICATION</u>	<u>MINIMUM DESIGN SPEED (mph)</u>	<u>MINIMUM DESIGN CURVE RADIUS (ft)</u>
Major Arterials	60	2600
Expressways	70	4200

- B.** The City Engineer may require higher or lower design speeds at locations where special circumstances or physical conditions justify a different design speed.

6-5.4 Horizontal Layout

- A.** Intersections: Streets located on opposite sides of an intersecting street shall have their center lines directly opposite each other; otherwise the center lines shall be separated by not less than 150 feet for local roads and 300 feet for collectors, major and minor arterials and expressways, unless separated by a median. Curved streets with radius less than 2400 feet shall have at least 50 feet of centerline tangent from the projected curb line of the intersecting street.
- B.** Curb Return Radii:
1. Residential - The minimum radius for residential streets shall be 30 feet at face of curb.
 2. Commercial - In the downtown area on minor streets, the minimum radius shall be 30 feet. In other areas and on arterial streets, the radius shall be as determined by the City Engineer.
 3. Industrial - The minimum radius shall be 50 feet. The maximum radius shall be 60.

A chord cut-off shall be used when handicap ramps are installed at corners.

- C.** Minor Streets: Minor streets shall be laid out to discourage use by through traffic.
- D.** Block Lengths: Block lengths shall not exceed 1,000 feet, except as approved by the City Engineer.
- E.** Continuation of Existing Streets: The centerlines of new streets shall be aligned with those of existing streets when continuing an existing street.

- F. Horizontal Curves: Minimum curve radii design of curved arterial and collector street shall be based on the Highway Design Manual.
 - 1. Tangent Length Between Curves
 - a. The minimum tangent length between reversing curves shall be 250 feet for expressways, minor arterials and arterials. The absolute minimum for all other classifications shall be 100 feet or as approved by the City Engineer.
 - b. The tangent section between curves shall be sufficiently long to allow full transition from a super elevation cross section to a normal cross section and back to a super elevation cross section.
 - c. Broken back curves are not allowed.
 - 2. Compound Curves - The use of compound curves should be avoided where possible. Where special topography or other conditions exist, the City Engineer may authorize their use.
- G. Property Line Corner Cutoff: The property line corner cutoff at street intersections shall be as follows:

<u>Type of Intersection</u>	<u>Property Line Cutoff (ft)</u>
Local or Collector	25 x 25
Major or Minor Arterial To Major or Minor Arterial or Expressway	75 ft. radius
All others	30 x 30

- H. Intersection Angle: Streets shall intersect at an angle as near to ninety (90) degrees as practical. The central angle on the curb return curve of adjacent corners shall be within five (5) degrees of each other.
- I. Cul-de-sac Streets: Cul-de-sac streets shall not exceed 500 feet from the centerline of the intersecting street to the center of the turnaround. A cul-de-sac street shall serve no more than twenty (20) dwelling units.
 - 1. Cul-de-sac streets shall be terminated by an improved turnaround having a minimum face of curb radius of 51 ft. (see Standard Details R-28 and R-29). Streets in industrial areas shall use a minimum radius of 60 feet.

2. Alternate turnaround including hammerheads, loops, offset bulbs and other geometric designs may only be used under special circumstances and only with the written approval of the LMFD and City Engineer.

J. Sight Distance at Intersections: Streets shall not be designed with intersections on the inside of curves or at any location in general where sight distance will be inadequate for drivers to tell if they can safely enter the traffic flow or cross the street. Sight distances shall comply with Lathrop Municipal Code Section 17.04.080 or the Highway Design Manual, whichever is greater.

6-5.5 Profile Standards

- A.** Minimum Grades: The minimum flow line grade for PCC gutters shall be grades of vertical curves. Curb and gutter elevations on vertical curves shall be adjusted to meet a 0.40% minimum grade.
1. Where matching existing conditions, minimum grades may be reduced only with the approval of the City Engineer. All grades less than 0.4% shall be water tested to insure positive drainage prior to acceptance by the City.
 2. The minimum fall around curb returns shall be 0.20 feet.
 3. The minimum flow line grade for asphalt concrete gutters shall be 1.00%.
 4. The minimum flow line grade for dirt ditches shall be 1.00%.
 5. Grades on opposite sides of the street shall be the same, wherever practical.
- B.** Maximum Grades: The maximum grade for top of curb shall be 6 percent. The maximum street slope shall be 6 percent.
- C.** Cross Slopes: The standard cross slope for minor and local streets shall be 2.5%. The standard cross slope for all other streets shall be 2%. The cross slope shall be within the following limits, whenever possible: Minimum cross slope shall be 1.5% and maximum cross slope shall be 3.0%.
1. For street widening projects, the cross slope shall match the cross slope of the existing pavement.

- D.** Vertical Curves: Vertical curves shall be required, whenever the algebraic difference of grades is 1% or greater for local streets, and 0.5% or greater for collectors, arterials and expressways.
1. Minimum Length - The minimum length of vertical curves shall be determined by consideration of passing and stopping distance requirements, headlight sight distance, drainage control and aesthetic appearance. Minimum length of vertical curves shall be as specified in the Highway Design Manual.
- E.** Sight Distance: Sight distances shall be as specified in the Highway Design Manual and/or AASHTO.
- F.** Intersections: When two streets intersect, the lesser classification street approach shall have a maximum slope of plus or minus 3.0 percent for a minimum distance of 50 feet back from the curb line of the intersecting street.
1. The typical crown section of the higher classification street shall be maintained through the intersection with the lesser street meeting the crown slope at the projected edge of the outside travel lane. The crown slope may be reduced to 1.0 percent in the intersection if necessary to provide drainage.
 2. Sufficient elevations shall be shown on the plan or profile to clearly indicate how it is to be constructed. As a minimum, the elevation at the centerline intersection point and at grade breaks on the centerline of side streets shall be shown.
 3. Intersections shall be designed to drain all water to drainage inlets without ponding or draining water across intersections. The City Engineer may require detailed design submittals for problem intersections.
- G.** Construction: Construction of any new street shall begin from the centerline towards the edge of pavement. If an existing street is being widened, the contractor shall install the paving by tying into the sound structural section of existing paving, irrespective of the fact that the right-of-way adjoining the curb and gutter may remain unpaved.

6-5.6 Curb, Gutter and Sidewalk

Curb, gutter and sidewalk in residential, commercial or industrial areas shall conform to Standard Details R-6, R-7, R-8 and R-9. Where sidewalks are not required, curb and gutters shall be poured monolithically with a 6-inch minimum

top of curb width. Concrete shall be six sack Class “A” 3000 psi at 28 days; ¾” maximum aggregate size with one (1) pound of lamp black per cubic yard. The mix design shall be submitted for approval by the City.

- A.** Valley gutters are not allowed on any road except cul-de-sacs, and only then with the approval of the City Engineer.
 - 1. The developer shall submit evidence that the intersection cannot reasonably be drained to an underground system before valley gutters will be considered. (See Standard Detail R-21)
- B.** Vertical curbs may be required by the City Engineer at such locations as deemed necessary to control drainage, delineate travel ways, provide for safe pedestrian and vehicular passage, etc. (See Standard Detail No. R-7).
- C.** Disabled access ramps shall be constructed at all curb returns in residential and commercial areas and at such other locations with sidewalks as required by the City Engineer. The City Engineer will determine ADA upgrade requirements for projects adjacent to existing public roadways. The goal is to achieve ADA accessibility for the length of the frontage on all adjacent public roadways. Reconstruction or repair projects that damage existing pedestrian facilities (sidewalk, corner ramps, etc.) will be required to reconstruct to current ADA standards. Ramps shall conform to Standard Details No. R-14, R-15, R-16, R-17, R-18 & R-19 and shall conform to Americans with Disabilities Act (ADA) guidelines, with Federal and State laws, rules and regulations.
- D.** Sidewalk widening may be required by the City Engineer in areas such as school zones, local commercial areas, bus stops, rural postal drop boxes, near bicycle ways and trails, or other areas deemed appropriate.
- E.** If a sound wall is required adjacent (property owner side) to the right-of-way, the sound wall shall be built on the private property side of the property line.
- F.** The City Engineer may require the sidewalk be separated from the curb and gutter by a landscaping strip. The developer shall submit complete detail of proposed dimensions and landscaping.
- G.** If street trees are required to be planted within the public paved sidewalk area, the designs shall include cast iron tree grates to protect the trees. The tree grates shall be Polyethylene Grate II or an approved equal.
- H.** Edge drains shall be installed for developments that are adjacent to a levee

to prevent the weeping of water into the pavement subgrade.

6-5.7 Driveways

Driveway design shall conform to Standard Details R-22 thru R-27. Maximum driveway slope with separated sidewalk shall be 10 percent, measured at any point in the driveway, except in unusual terrain and specifically approved by the City Engineer.

- A.** No driveway will be allowed within 5 feet of a side property line on a commercial development. The City Engineer may approve exceptions for joint driveways in unusual cases. The City Engineer may require joint driveways with a joint use driveway agreement. The agreement shall be provided prior to approval of improvement plans.
- B.** The minimum width for a residential and duplex driveway shall be 12 feet. Maximum residential and duplex driveway width shall be 25 feet.
- C.** Driveway Transitions:
 - 1. Driveway transitions shall start a minimum of 10 feet from the end of the curb return (see Standard Detail R-24). The setback to the driveway in areas where the speed limit is more than 25 mph shall be as required by the City Engineer.
 - 2. Driveway transitions shall clear all public facilities such as electroliers, traffic signal standards, utility poles, fire hydrants, etc., by a minimum of 5 feet.
 - 3. Any relocation of the facilities required to maintain such clearance shall be at the expense of the owner installing the driveway.
- D.** The near edge of a driveway shall not be closer than 50 feet to the end of existing or future traffic median. Medians shall be reconstructed and/or lengthened to conform to this section, as determined by the City Engineer.
- E.** A minimum of 4 feet of full height curb should be maintained between the transitions of adjoining driveways. A minimum of 2 feet of full height curb shall be maintained between property line and driveway transition.
- F.** The City Engineer may require increased visibility requirements for driveways servicing a significant amount of truck traffic.
- G.** Major commercial driveways, which will service significant traffic volume, shall be considered as intersecting streets and shall conform to appropriate

street offset requirements. The City Engineer shall determine where the application of these provisions applies.

- H.** Driveways near major arterial intersections shall be no closer than 150 feet from the present or future intersection curb return. The City Engineer may grant exceptions. Permission should be obtained as early as possible, prior to submission of improvement plans or development plans.
- I.** All driveways and private streets accessing public streets shall be paved to the street asphalt paving with the full asphalt concrete section.
- J.** Driveway Construction: Concrete shall be six sack Class “A” 3000 psi at 28 days; $\frac{3}{4}$ ” maximum aggregate size with one (1) pound of lamp black per cubic yard. The mix design shall be submitted for approval by the City. (see Standards Detail R-5).
 - 1. Commercial and industrial driveways shall have #4 reinforcement steel bars 18 inches on center the entire width of the driveway and ramp (see Standard Details R-22).
 - 2. There shall be a minimum of 6” of Class 2 aggregate base rock compacted to 95% of relative compaction beneath the driveway (see Standard Detail R-5).
 - 3. The City Engineer may require high volume commercial and industrial driveways to be designed and constructed based upon the loads for which they will be subjected to.

6-5.8 Survey Monuments

- A.** Required Locations: The developer shall place permanent survey monuments at the following locations:
 - 1. At the intersections of all street centerlines for new streets.
 - 2. At the beginning and end of all horizontal curves.
 - 3. At all subdivision boundary corners, lot corners and at other locations designated by the City Engineer to allow any lot or portion of improvement to be retraced or located.
 - 4. For street widening or partial width improvement, centerline curve monuments will not be required if required improvements stop short of the street centerline. Intersection monuments are required in all cases.

5. At all section corners, quarter corners and centers of sections.
- B.** Monument Type: Street centerline monuments shall conform to Standard Detail R-51.
1. Property corner and right-of-way monuments shall be a minimum of 3/4- inch I.P.S. galvanized iron pipe, capped and tagged 30 inches long for right-of-way and 24 inches long for property corners.
 2. Section corner, quarter corner and centers of section monuments shall be a minimum of a 1 1/4-inch I.P.S. galvanized iron pipe 30-inches in length, capped and tagged. When monuments are within the road right-of-way they shall be placed in a monument well per Standard Detail R-51.
- C.** Map Act Compliance Required: Qualifications of persons setting monuments, ties to nearby permanent objects and preparation of all required maps to be recorded shall rigidly adhere to the requirements of the State of California Subdivision Map Act, and the Professional Engineers and Land Surveyors Act.
- D.** Protection of Existing Monuments: The Contractor shall be responsible for the protection of all existing monuments and/or other survey monuments and shall notify the City Engineer of any damaged or removed City, County, State or Federal monuments.

If a monument is located within the boundary of the project, the Contractor shall submit the Acknowledgement of Monument Responsibility “Pre-Construction” form, found in Appendix E of these Standards, to the City during the Encroachment Permit Application Phase. In addition, the Contractor shall submit the Acknowledgement of Monument Responsibility “Post-Construction” form, found in Appendix E of these Standards, to the City when the work is complete.

6-5.9 Vertical Control

All vertical control shall be based upon City or USGS datum. Placement of new benchmarks as required by the City Engineer shall be based upon City datum. Benchmarks shall be set to conform to Standard Detail No. R-51.

- A.** The number of benchmarks required shall be based upon a line of sight basis. A minimum of one (1) new benchmark shall be set per new development, unless waived by the City Engineer.
- B.** Developer’s engineer shall supply the Public Works Department with Leitz 8134-16 domed survey markers two weeks prior to intended placement for

numbering. Prior to acceptance of improvements developer's engineer shall supply the Engineer with a letter sealed and signed with all vertical control elevations.

6-5.10 Signage

All signs and traffic markings shall conform to the CA MUTCD.

- A.** Barricade Requirements: Barricades shall be required at the end of the paved sections, concrete sidewalks and pathways (or traveled way for non-paved street) of all terminating streets.
 - 1. Barricades shall comply with Standard Detail No. R-43. Cul-de-sac streets shall use Type "B" barricades.
 - 2. All other street terminators shall use Type "A" barricades.
- B.** A non-vehicular warning sign (use sign W11-2 per CA MUTCD) shall be placed at all transitions from developed sidewalks to undeveloped roadways to alert road users in advance of locations where unexpected pedestrian entries into the roadway might occur.
- C.** Street Sign Locations: Street names and street name sign locations shall appear on plans submitted for approval. Sign details shall be as shown on Standard Detail No. R-47 and R-48. Street name signs shall be located as follows:
 - 1. "Tee" Intersections - One street name sign shall be located on the near right-hand corner of the non-through street approach of a "Tee" intersection.
 - 2. Minor Four-Way Intersections (less than 70 ft. right-of-way) - One street name sign is required at each intersection where both intersecting streets have a right-of-way width of less than 70 feet. The signs shall be located on one of the far right-hand corners of the intersection relative to the street having the greater right-of-way width or relative to the more important street if the right-of-way widths are equal.
 - 3. Major Four-way Intersections (70 ft. or greater right-of-way) - two street name signs are required at each intersection where one or both of the intersecting streets has a right-of-way width of 70 feet or greater. The signs shall be located on both far right-hand corners of the intersection relative to the street having the greater right-of-way width or relative to the more important street if right-of-way widths are equal.

4. For street signs on non-symmetrical intersections, expressways, major arterials and freeways, the City Engineer shall approve the location.
5. Mast arm street name sign details shall be per Section 6-5.11 Traffic Signals.

6-5.11 Traffic Signals

A. General

1. A registered engineer shall design all traffic signals. The need for new traffic signals shall be based on the warrants contained in the latest edition of the CA MUTCD.
2. Traffic signals shall be designed in accordance with these Standard Specifications and the latest editions of the following:
 - a. Caltrans Standard Specifications and Caltrans Standard Plans, including all standard symbols contained therein.
 - b. CA MUTCD.

B. Signal Standard Types

1. Traffic signal standards, posts, and mast arms shall be of the types listed in the most recent edition of the state standard plans and shall meet 100 m.p.h. wind load design.
2. The typical luminaire arm length used shall be 15 feet.

C. Vehicle and Pedestrian Signal Types

1. All vehicle signals and pedestrian signals shall have terminal block components and be of the types listed in the latest edition of the state standard plans.
2. All mast arm mounted vehicle signals shall be 12" in diameter and mounted with side attachment (MAS).
3. Protected left turn signals shall be all arrows.
4. All vehicle visors are to be half tunnel type.
5. All vehicle and pedestrian signals must be the LED type.
6. All back plates for vehicle signals are to be louvered back plates.

7. Programmed visibility vehicle signals shall not be used without prior approval of City engineering staff.
8. Pedestrian signal heads shall be of the "countdown" variety and shall conform to the CA MUTCD.

D. Vehicle Signal Alignment

Typical vehicle signal alignments are listed below. Case-by-case variations may occur.

1. For single left turn lanes with protected left turn movement, the left turn signal shall line up with the center of the left turn lane as close as possible.
2. For dual left turn lanes (which shall have a protected movement), the left turn signal shall line up with the extension of the line between the two left turn lanes as close as possible.
3. When a protected left turn signal is used, the signal for the through movement shall line up with the center of the lane group as close as possible, regardless of the number of through lanes. When 50' or 55' mast arms are used, only one MAS signal shall be used for the through movement instead of two signals as shown in the Caltrans Standard Plans (unless there are four through and right turn only lanes).
4. For one through lane with permissive left turn, the MAS signal shall line up with the center of the left half upon approach of the through lane, as close as possible.
5. For two through lanes with permissive left turn, the MAS signal shall line up with the center of the #1 through lane (i.e., the lane adjacent to the left turn lane), as close as possible.
6. When a 4 section MAS signal is used, it shall line up with the center of the left half (upon approach) of the #1 through lane, as close as possible.

E. Number and Size of Vehicle Signal Indications

Typical indications are as follows:

1. For Protected Left Turn Movements: One 3-section all arrow MAS and one 3- section all arrow far left side pole-mounted signal.

2. For Intersections with a Left Turn Pocket (For Permissive Left Turn Movements): There shall be an additional far (left) side 3-section pole mounted head. Signal head shall be all circular indications.
3. For Through Movements (With Protected Left Turns): One 3-section MAS, one 3-section far right side pole-mounted signal, and one 3-section near right side pole mounted signal. (Near side signals may not be required if the intersection is less than 100' wide, approach speeds are 30 mph or less, and it is not needed to meet continuous sight distance requirements).
4. For Through Movements (With Permissive Left Turns): One 3-section MAS, one 3-section far left side pole-mounted signal, one 3-section far right side pole-mounted signal, and one 3-section near right side pole-mounted signal. (Near side signals may not be required if the intersection is less than 100' wide, approach speeds are 30 mph or less, and it is not needed to meet continuous sight distance requirements.) If left turns are not permitted the far side left pole mounted signal head is not required.
5. For Split Phased Situations: One 4-section MAS (w/Green Arrow), one 4-section far left side pole-mounted signal (w/Green Arrow), one 3-section far right side pole-mounted signal, and one 3-section near right side pole-mounted signal.
6. For Right Turn Arrow Overlap Situations: Same as above except the far right side and near right side pole-mounted signals shall be 5-section with green and yellow arrows. Overlaps required prohibited U-turn on associated protected left movements. Right turn arrow overlaps shall not be provided without prior approval of the City Engineer.
7. For Size of Vehicle Indication: As a general guideline, size of vehicle indication shall be in accordance with the CA MUTCD but an individual indication's size may be adjusted by the City Engineer.

F. Vehicle Detector Layout and Inputs

1. Iteris Next Vector Modular Video Detection System or equivalent system subject to approval by the City Engineer shall be used for all new and upgraded traffic signals.
2. For locations where Video Detection is not suitable, the following loop standards shall apply:

- a. Typical vehicle detector layout shall be Type D at limit line for all movements and Type E at all other locations. Distance separating loops from edge to edge shall be 10'.
- b. Detector slots shall be filled with black elastomeric sealing,
- c. Right turn only loop detectors are to be used for side street right-turn lanes and for major street right-turn lanes that intersect with other major streets. No loop detectors are needed for right-turn lanes on major streets that intersect with minor streets.
- d. Detector hand holes shall be provided. Hand holes shall be placed so they line up the roadway stripes. All hand holes shall be per ES 5D of the Caltrans Standard Plans

G. Conduit

Conduit requirements shall conform to the following (unless restricted by push button post size):

1. Service run conduit shall be 2 ½- inch minimum diameter.
2. Conduit from the main pull box to the controller shall be two (2) 3-inch diameter conduits minimum.
3. Any signal run and interconnect conduit shall be 2-inch minimum diameter.
4. All street crossing conduit runs shall be a minimum of 3-inches.
5. A minimum of 4 conduits shall be installed on arterial roadways to provide signal interconnectivity and to support other communications requirements.
6. Interconnect conduit sweeps shall be a minimum of 36”.

H. Conductors

All conductor runs for each signal phase to each terminal block on a pole shall be direct from the controller home run pull box. The conductor schedule shall not allow for splicing at intermediate pull box location.

I. Pull Boxes

Refer to Caltrans Standard Plans No. ES-8.

1. The minimum size for pull boxes shall be #5. However, #6 pull boxes shall be used at the ends of street crossings and when four or more conduits enter the box. Covers shall be concrete and marked "Traffic Signal".
2. Larger pull boxes shall be required as follows:

CONDITION	SIZE
Any pull box with 12 or more cross sectional inches of conduit entering a pull box	20" x 42" dual lid pull box may be required.
Home run pull box for a 2, 3, or 5, phase signal	20" x 42" dual lid pull box shall be required.
Home run pull box for a 8 phase signal	30" x 48" dual lid pull box shall be required.

3. Traffic signal interconnect conduit shall be installed in separate concrete pull boxes and their covers shall be marked "IC" or interconnect.
4. Pull boxes subjected to vehicular travel shall be installed with one quarter inch steel plate covers (galvanized after fabrication) with a diamond-type surface in accordance with ES-8 of the Caltrans Standard Plans.
5. Interconnect pull boxes to be spaced at 350' max with top of pull box to be set at existing grade.

J. Controller Cabinets Location

1. Controller cabinets shall be approved by the City. Both controller cabinet and service pedestal should be located such that the conduit from the service point to the service pedestal does not require trenching across a street.
2. The entire intersection should be visible by the operator from the controller cabinet.

K. Protected Vs. Permissive Left Turn Phasing

Protected left turn phasing should be provided under the following conditions:

1. For an intersection with one through lane and a left turn pocket, a protected left turn phase may be required at the discretion of the City Engineer, or if any of the guidelines for protected left turn phases are met (or are expected to be met as a result of a development project) as outlined in Section 4D.19 of the CA MUTCD (e.g. collisions, delay, volume, and misc.).
2. Where there are two or more opposing through lanes and the left turning vehicle occupies a dedicated left turn pocket, or where dual left turns are provided.
3. Where the travel distance through the intersection for left turn vehicles is more than 100 feet, and the 85th percentile speed of opposing traffic is 45 mph or more.
4. Where there are three or more opposing through lanes.
5. Where the left turn queue recurrently occupies the #1 through lane, and where dual left turn lanes cannot be provided, and where left turn lane can't be extended.

Protected/Permissive phasing, as discussed in Section 4D.20 of the CA MUTCD, if proposed, would need prior approval of the City Engineer.

L. Traffic Signal Interconnect

1. Traffic signal interconnect shall be provided for new signal installations, and for modification of existing signals which currently do not have interconnect. The interconnect cable shall be in its own conduit. The interconnect cable shall not be spliced anywhere other than in traffic signal cabinet.
2. The interconnect shall connect the subject signal with at least one existing traffic signal. If the subject signal is between two existing signals, the interconnect shall connect all three signals.
3. In cases where interconnect conduit is or will be provided, but for some reason interconnect cable is not being provided, the interconnect conduit shall be provided with a green #14 AWG pull wire.

M. Mast Arm Street Name Signs

Mast arm street name signs shall be located facing each approach. These signs shall have a minimum lettering size of 8". Other lettering sizes shall not be used without prior approval by the City Engineer. All mast arm street

name signs at signalized intersections shall be illuminated white lettering with a blue background.

N. Emergency Vehicle Preemption (EVP)

All new traffic signals shall have (EVP) for all directions of approach on public streets. Each direction shall have a separate detector. Detectors shall be optical in nature and Global Traffic Technologies Opticom equipment or approved equal.

O. Signal Phasing

The phases following in the Standard NEMA order with Phase 2 shall be for eastbound traffic and phase 8 for northbound traffic.

P. Advance Flashing Beacons

Advance flashing beacons shall be included at the discretion of the City Engineer. Typically, they are located on roads with speed limits 45 mph or greater when there are no controlled intersections over the previous mile. All flashing beacon assemblies shall have two beacons flashing in alternating sequence.

Q. Illumination Requirement

Average illumination at signalized intersections for:

1. Crosswalks shall be 0.15 foot-candles minimum.
2. Middle of intersection shall be 0.60 foot candles minimum.

R. Miscellaneous Appurtenances

1. Bicycle push buttons shall be included for all approaches unless otherwise specified by the City Engineer.
2. Audible signal for the blind shall be required at new intersections and existing intersections that have been modified.
 - a. Audible signal shall be Caltrans approved model DS100 Series by Novax Industries Corporation, or approved equal.
 - b. Audible signal shall have Button Actuated Timer and initial timer setting shall be 3 seconds or as directed.

Signal Hardware

Enclosure Type:	Extruded, ruggedized
Number of Sounds:	Dual Sound
Sound Level Adjust:	Internal adjustment
Sound Inhibit Voltage:	24 VDC interface
Sound program:	Chirp/Cuckoo
Color:	Hunter Green

3. Walking man (international symbol) type plate shall be used for all pedestrian push buttons.
4. Additional pedestrian push buttons on medians of four or more lane roads may only be installed where the center median/pedestrian refuge area is a minimum of six feet in width.
5. Pedestrian activation shall be large button “ADA” type with a two-inch (2”) diameter button.
6. Countdown pedestrian signal heads shall be used at new signals and for signal modifications, unless otherwise approved.

S. Preparation of Plans

Traffic signal plan sheets shall conform to these Standard Specifications, including submittal requirements, AutoCAD files, etc. Signal Plans can be part of a larger Improvement Plan set. Traffic signal plans shall have a title sheet followed by a signal and listing sheet for each intersection. Signing, striping, and interconnect information may be included on the signal and lighting sheet, or may be included on separate sheets, depending on ease or readability. The format, symbols, and content shall follow the recommendations as outlined in the CA MUTCD and Standard Plans. Plans shall include:

1. Title Sheet: The title sheet shall include the following:
 - a. Title of project, which shall include the location.
 - b. A vicinity map (not required to be to scale) with north arrow.
 - c. Pertinent signature blocks and revision block.

- d. A legend for symbols not found in the Standard plans (e.g., Utility lines, etc.).
 - e. Below the legend, place the following note: NOTE: SEE CALTRANS STANDARD PLANS ES-1A AND ES-1B FOR EXPLANATION OF OTHER SYMBOLS.
 - f. General Notes and Construction Notes.
 - g. Name, addresses and phone numbers for the utility companies and City Services.
2. Signal and Lighting Sheet: The signal and lighting sheet shall be drawn at a scale of 1 inch equals 20 feet (1" = 20'), and shall include the following:
- a. A north arrow.
 - b. The plan shall be orientated to show the major street to be laid out horizontally on the plan sheet, with the north arrow to be either pointed up or to the right. The phase diagram shall show phases per the CA MUTCD with Phase 2 to be for eastbound traffic and the remainder of phases in regular NEMA order.
 - c. Existing and proposed field conditions which include, but are not limited to, the following: underground and overhead utilities, driveways, fire hydrants, poles, signs, fences, street lights, edge of pavement, curb and gutter, sidewalk, right-of-way line, PUEs roadway striping, medians, centerline, pull boxes, wheelchair ramps, trees (particularly those needing trimming), adjacent topography, etc. Existing field conditions, appurtenances, etc., shall be dashed and screened. Proposed shall be solid and bold.
 - d. Complete traffic signal design, including but not limited to, the following: conduit runs, detector loops with input designations, detector hand holes, vehicle and pedestrian signals (with phase designation), luminaries, pedestrian push buttons (with phase designation), controller, service pedestal, service point, emergency vehicle detectors, signing, striping, interconnect, and location for phone line service.
 - e. On a separate sheet the service equipment schedule and wiring diagram with legend, pole and equipment schedule, and conductor and conduit schedule (per the CA MUTCD Tables

4D-105 and 4D-106 (CA)). The schedule shall include rows showing percent fill values, and conduit quantity/size. The 26% fill limit shall apply for new facilities, 40% for reconstruction.

- f. Phasing for emergency vehicle preemption (and railroad preemption where applicable). Protected left turn phases shall be combined with the concurrent through movement during EVP.
 - g. Conduit shall not be shown to pass through detector loops.
 - h. Right-of-way lines and easements to be shown on ALL plans.
 - i. All submittals for review shall be two complete sets of plans and specifications, with comments from previous submittals.
3. Utility Relocation Plan (as required). Shall show all existing and proposed underground and overhead utilities.
 4. Striping and Signing Plan (40, 50 or 100 scale): Shall include all existing signs, curb and pavement markings, and shall show disposition of each (removal, relocate or remain). Shall show all necessary parking removal signs and curb markings.
 5. Signal Interconnect Plan (if necessary).
 6. Civil Plan (20 or 40 scale): To include all paving, structural section, concrete, drainage, sanitary sewer, and earthwork items.
 7. Signal Hardware.

Draft special provisions are to be provided to the City for review.

The City uses the following:

- a. Service pedestal: Type III-AF; See Caltrans Standard Detail ES-2D
- b. PG&E Service: 120/240 volt, single phase
- c. Cabinet: Type 332 Anodized aluminum, with 210 conflict monitor (monitor reds)
- d. Controller: Shall be Per Section 86-3, "Controller Assemblies" of the State Standard Specifications. Controller shall be furnished by Contractor.

- e. PROM board: 412-F System Memory module with 27C1001 EPROM and full complement of RAM
 - f. Software: Bi-Tran Systems program # 233
 - g. Other components: Detector units- Model 222 only
 - h. LED Signal Heads: LED signal heads are required for all new red vehicular and pedestrian signal indications.
8. Battery Backup System: Shall meet the following requirements:
- a. The Battery Backup System shall be Tesco Traffic 27-22BBS by Tesco Controls, Inc. or approved equal.
 - b. Pedestal shall be of anodized 1/8" aluminum.
 - c. System shall include a Generator Transfer switch with BBS bypass and 30-amp external reverse service plug.

T. Surveillance Cameras

All traffic signals shall be designed for and equipped with Surveillance Cameras. All signal designs shall be submitted to the City for review and approval by the City Engineer.

- 1. Equipment Box: A 30" W x 18" D x 36" H equipment box shall be mounted near the controller cabinet and requires a 120V power supply. A conduit loop connecting the equipment box and controller shall be installed.
- 2. Conduit: Minimum 2" conduit shall homerun from the Equipment Box to each signal with a mast arm. Fiber pull tape shall be installed from the Equipment Box to each mast pole.
- 3. Camera Mounting: One camera is required for each two lanes of travel and shall be mounted using an approved bracket. Camera's shall be facing the departure from the intersection to ensure a clear line of sight between the camera and rear license plate of the vehicle.
- 4. SCADA Connection: Fiber optic cable shall be installed to connect the Equipment Box to the closest existing City SCADA connection.
- 5. Material Procurement: The City will order and supply the cameras and cable from the Equipment Box to the camera at the expense of the developer.

6-5.12 Striping and Markings

All traffic striping, legends and markings material and method of placement shall conform to the current Section 84 and 85 of the California Standard Specifications, subject to the approval of the City Engineer and shall conform to the current CA MUTCD and these Specifications. All striping shall be thermoplastic.

A. Marking Fire Lanes

1. Curb or edge of paved portion of the area abutting such fire lane, is to be painted with a red stripe at least four (4) inches in width, designating the fire lane area, and causing the words "FIRE LANE - NO STOPPING" to be painted in white letters at least four (4) inches high, at intervals of no more than 25 feet.
2. A sign will be posted at each entrance and every 75 feet in between, stating "NO STOPPING - FIRE LANE". The sign is to meet the requirements of the California Department of Transportation sign number R26F. The sign is also to state "CVC 22500.1".

6-5.13 Bridges and Overpasses

A Registered Civil and/or Structural Engineer shall design bridges and overpasses. The City Engineer will approve all design assumptions. The design width of overpasses and bridges shall be the full width of the right-of-way unless the City Engineer approves narrower widths.

6-5.14 Bikeways

Bikeways may be required on any street based on the adopted Bicycle Transportation Plan, or as part of a Specific Plan approved by the City. Typically, all arterial road and collector road corridors will include either on or off street bicycle facilities.

When on-street bike lanes (Class II) are required, an additional six to ten feet (6' to 10') of right-of-way and pavement shall be required. If the additional right-of-way is not available or improvements are made to an existing facility without adequate right-of-way to support a Class II facility, bike routes (Class III) shall be established. Where an off-street bike path (Class I or IV) is required, additional right-of-way and pavement requirements shall be determined by the City Engineer.

- #### A. *General.*
- Bikeways shall be designed in accordance with Chapter 1000, Bikeway Planning and Design, of the Highway Design Manual, CA MUTCD, and as specified in the most recent edition of the City of Lathrop

Bicycle Transportation Plan.

- B.** *Bikeway Locations.* Bikeways shall be planned and constructed only where locations are designated in the City's current Bikeway Master Plan, or as part of a Specific Plan approved by the City.
- C.** *Bikeway Description.* Bikeways include all facilities provided primarily for bicycle travel. Specific types are defined as follows:
1. **Bike Path (Class I Bikeway).** A Class I Bikeway is for the exclusive use of bicycle and pedestrian travel on a right-of-way completely separated from any street with motorized vehicular crossings minimized. The minimum paved width for a bike path shall be eight (8) feet for one-way movement and ten (10) feet for two-way movement. A minimum two (2) foot wide graded shoulder shall be provided along both sides of the finished bike path for Class 1 Bikeways.
 2. **Bike Lane (Class II Bikeway).** A Class II Bikeway provides for a striped lane for one-way bicycle travel on each side of a street or roadway. The minimum paved width for a bike lane shall be five (5) feet when there is no curb and gutter and six (6) feet when curb and gutter are present (4' paved and 2' curb and gutter). Bike lane striping shall be discontinuous at all street intersections per CA MUTCD.
 3. **Bike Route (Class III Bikeway).** A Class III Bikeway provides a designated and preferred route for bicyclists on the roadway which is shared with motor vehicle traffic. Bike Routes are not appropriate for roadways with high motor vehicle traffic speeds or volumes. Bike routes are established along streets in areas not served by other Bikeway classes. Use of shared road signing and striping per CA MUTCD increases safety for cyclists, motorists and pedestrians.
 4. **Separated Bikeway (Class IV):** A Class IV Bikeway provides a route for the exclusive use of bicycles. The exclusive right-of-way is separated from motor vehicles and pedestrians by a vertical feature (barrier, median, delineators, etc.).
- D.** *Bikeway Access.* For all Class I Bikeways, access ramps must be a minimum of ten (10) feet wide and shall be designed in all areas to allow two bikes with trailers to pass at any point. Bollards shall be used at all locations where a bikeway (or multi-use path) intersects with or has access to a roadway and at other locations as designated by the City Engineer.

6-5.15 Fire Apparatus Access Roads

The California Fire Code requires that fire apparatus access roads be provided for every facility, building or portion of a building constructed or moved into or within the jurisdiction when any portion of the facility or any portion of an exterior wall of the first story of the building is located more than 150 feet from fire apparatus access as measured by an approved route around the exterior of the building or facility. The fire apparatus access road must be in accordance with attached exhibits "A, B, C and D" of these adopted standards.

All fire apparatus access roads must be detailed on Building Permit construction drawings. Drawings without fire access road details on the plans will be accepted to start the permit process, but will not be approved until details are provided, or a letter of acceptance is received from the applicable Fire District.

When buildings are fully protected by an automatic fire sprinkler system, the Fire Jurisdiction having Authority may make modifications to the fire road requirements when there are 2 or less units to be served by the access road/driveway.

If you should have any questions about these requirements, please contact the Lathrop-Manteca Fire District, located at 800 East J St., by phone at (209) 858-2331. www.lmfd.org

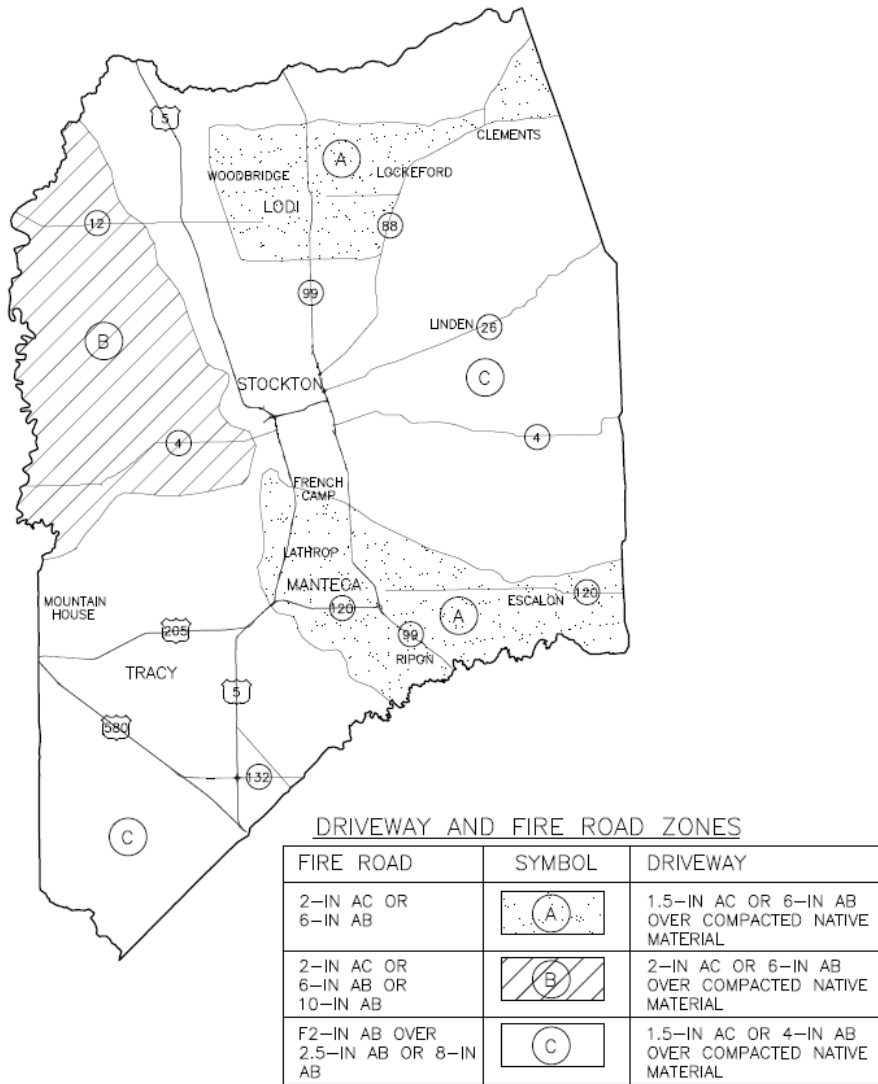


FIGURE 6-1

FIRE APPARATUS ACCESS ROAD ZONES

- A. Requirements for roads or driveways serving 2 or less dwellings or structures on a single parcel.
 - 1. Definition: Fire Apparatus Access Roads are roads that are designed and constructed to provide vehicular access to two (2) or less structures on a single parcel, and are greater than 150 feet in length from the edge of the public or private right-of-way road

- surface. Three (3) or more structures or dwelling units on one or more parcels shall comply with "Exhibit D".
2. Surface: Fire apparatus access roads shall be designed and maintained to support the imposed loads of fire apparatus with a relative compaction of not less than ninety (90) percent and shall be provided with a surface as to permit all weather driving capabilities. The Chief in some jurisdictions may require a compaction test by a registered professional soils engineering firm.
 3. Public Way: Public way is any street, alley, or similar parcel of land essentially unobstructed from the ground to the sky, which is deeded, dedicated, or otherwise permanently appropriated to the public for public use.
 4. Refer to Figure 6-1 (Fire Apparatus Access Road Zones) for structural section.
 5. All roads to have 20' minimum unobstructed width with all-weather surfacing.
 6. Adequate drainage shall be provided and be shown on the roadway plan.
 7. Minimum vertical clearance over all roadway surfaces shall be 13 feet, 6 inches.
 8. The turning radius on dead end roads may be greater than 51' and need to be designed to handle the turning radius of the largest fire apparatus. The fire chief of the district shall make this determination.
 9. A turnaround shall be provided no further than 150 feet from the dead end of a fire road. See "Exhibit C" for details.
 10. Turnouts. Dead-end roads shall have turnouts spaced at a maximum of 1320-foot intervals.
 11. All materials shall be aggregate road base class 2 minimum or an approved equivalent.
 12. All parking is prohibited on minimum width fire access roadways. The local fire district may require that signs be posted.
 13. Bridges, box culverts, or low water crossings shall be designed for HS20-44 loading by a civil or structural engineer.

14. When a fire apparatus access road is required for structures, it shall be constructed and approved prior to receiving a foundation inspection, or utilities being released for modular or mobile homes.
15. It shall be the responsibility of the owner or authorized agent to receive an approval from the Fire District prior to requesting such foundation inspection or release of utilities from the Building Department. Without these approvals, your construction progress may be delayed.

B. Requirements for planned unit developments.

1. Definition: A planned unit development or a planned residential unit development is a residential subdivision or portion of land resulting in three (3) or more dwelling units as approved and recorded in accordance with local planning and zoning regulations.
2. Private Road: A private road is any roadway or street serving one or more parcels and is not deeded, dedicated or otherwise appropriated to a public agency for use by the general public.
3. Public Way: Public way is any street, alley, or similar parcel of land essentially unobstructed from the ground to the sky, which is deeded, dedicated, or otherwise permanently appropriated to the public for public use.
4. Roads installed per this standard shall be named and the appropriate county department shall apply addresses. Public roads shall comply with the requirements of San Joaquin County Public Works and the signage shall be installed accordingly. Private roads shall be named and the signage shall be brown with white lettering and reflective in nature. Road names and addresses shall be approved by Community Development Department.
5. Surface: All requirements of Figure 6-1 (Fire Apparatus Access Road Zones) for surface requirements, structural sections, and material specifications shall apply and additionally the compaction requirements shall be ninety-five (95) percent for P.U.D.'s and the finished surface shall be asphaltic concrete pavement or equivalent.
 - a. Private roadways in P.U.D.'s shall have an agreement delineating maintenance and repair responsibilities by the landowners utilizing the access roadway(s) for ingress and egress and such document shall be recorded in the Official Records of the County of San Joaquin.

6. Road widths shall be as approved by the Chief or as follows:
 - a. 20-foot minimum unobstructed width when parking is not allowed and may be so posted when required by the Chief.
 - b. 28-foot minimum unobstructed width when parking is allowed on one side of the street and may be so posted when required by the Chief.
 - c. 36-foot minimum unobstructed width when parking is unrestricted.
 - i) Rollover curbs are acceptable and preferable.
7. Minimum vertical clearance over all roadway surfaces shall be 13 feet, 6 inches.
8. The turning radius on dead end roads may be greater than 51' and need to be designed to handle the turning radius of the largest fire apparatus. The fire chief of the district shall make this determination.
9. A turnaround shall be provided no further than 150 feet from the dead end of a fire road. See "Exhibit C" for details. Turnouts. Dead-end roads shall have turnouts spaced at a maximum of 1320-foot intervals.
10. Access-control devices: when required fire department access is restricted by the installation of a gate or other means, the Chief shall approve of the device and may require the installation of a Knox-Box similar device to gain emergency access.
11. Bridges, box culverts, or low water crossings shall be designed for HS20-44 loading by a civil or structural engineer.
12. When a fire apparatus access road is required for P.U.D., it shall be constructed and approved by the local fire authority before the County Surveyors office will file a map for record.

6-6 STREET LIGHTS

Street lighting shall be required in all new developments. The cost of installing, relocating, repositioning or reconfiguring streetlights as a result of new construction shall be paid by the developer.

- A. The developer shall install a City owned street lighting system.
- B. Either a Landscape and Lighting Assessment District or a City Service Area shall pay for the maintenance of street lighting in new developments.

The plans shall show and identify all existing lights in the immediate vicinity of the project, all streetlights and pull boxes to be installed, street light numbers, all conduit runs and size, the service point for the new streetlights, all wire and fuse sizes, and voltage drop.

On subdivision plans, the streetlights shall be shown in the plan views and on a separate sheet. In addition to the above, regardless of the fact that duplications may be involved, the following shall be required on the streetlight portion of subdivision plans:

- A. Utility poles
- B. Public utility easements
- C. Intersecting property lines of adjacent properties
- D. All existing streetlights on both sides of any streets

6-6.1 Design Standards

- A. Street lighting shall be designed in conformance with the Standard Details E-4 thru E-9. Alternative lighting shall be as specified in the project's Specific Plan.
- B. All intersections shall have at least one streetlight. Whenever possible, streetlights shall be placed on the far side of the intersection to silhouette objects in the intersection area.
- C. All cul-de-sacs exceeding 100 feet in length, measured from the street light location at the intersection to the right-of-way line at the end of the bulb, shall have at least one street light located at the end of the bulb.
- D. Street light spacing, measured along the street centerline, shall conform to Standard Detail E-9.

1. Streetlight spacing for 84-foot and wider streets shall be based on a both-sides arrangement (See Standard Detail E-9). Spacing on streets less than 84-feet shall be based on an alternate sides arrangement.
 - a. The both-sides spacing arrangement is a system whereby the streetlight spacing relates to the distance between streetlights all on the same side of the street.
 - b. The alternate-sides arrangement relates to the distance between streetlights taking into consideration the street lights on both sides of the street.
- E. All street light poles shall be painted in accordance with Section 86-2.16, "Painting" of the State Standard Specifications, except as modified herein.
1. A prime coat of a red iron oxide type primer or approved equal shall be applied with a minimum of two coats.
 2. The finish coat shall be an air dried alkyd resin enamel as manufactured by Tresco Paint Company or approved equal with the color as required by the Standard Details, and applied in a minimum of two coats to achieve a minimum dry film thickness as required by the paint manufacturer.
 3. Factory finish on new equipment will be acceptable if of proper color, and if equal in quality to the specified finish. The finish coat on standards and mast arms may be applied in the field.
 4. Failure to comply with any part of the foregoing painting specifications shall be sufficient cause for the City Engineer to require the Contractor to completely remove all applied coats and reapply required prime and finish coats in accordance with these Design Standards.
 5. The Contractor shall provide protective devices such as tarps, screens or covers, as necessary, to protect curb and gutters, glassware, adjacent buildings, parked automobiles, and other property or persons from all cleaning and painting operations. Paint or paint stains, which result in an unsightly appearance on surfaces not designated to be painted, shall be removed or obliterated by the Contractor at his expense and to the satisfaction of the City Engineer.

- F.** Luminaires: The type of street light and the appropriate wattage shall be specified on the plans and consistent with Standard Details E-4 through E-9. The luminaires shall be Light Emitting Diode (LED).
- G.** Service: All street light systems shall have underground service provided.
- H.** Photo Cell: A single photocell shall be required for multiple service poles containing four or more lights. All other light systems shall have a photocell in each luminary.

6-6.2 Master Planning

Master planning is the determination of streetlight locations between control points. Control points are locations of proposed or existing streetlight at street intersections (see Section 6-6.2 B, Design Standards), activity area that require lighting or safety lighting and existing streetlights.

- A.** The purpose of the master planning is to provide uniform lighting between control points.
 - 1. On 84-foot and wider streets, master planning shall apply to only one side of the street.
 - 2. On streets less than 84 feet in width, master planning shall apply to both sides of the street.
- B.** The procedure for master planning is outlined as follows:
 - 1. Determine the nearest intersections each way from the street light locations required.
 - 2. Determine the location of the streetlights at the intersections and any other control points that will impact the location of streetlights. Whenever possible, streetlights should be placed on the far side of the intersection, railroad crossings, pedestrian walkways, and any other area where there may be a need to silhouette objects or activities in the area (back light the object or activities so that they can be seen).
 - 3. Determine the location of any existing permanent streetlights situated in the area being master planned.
 - 4. Determine the distance between the street lights above, control points, and/or adjacent existing streetlights, whichever are nearest to the street locations being determined.

5. Divide the distance into the most possible equal spaces between lights that can be obtained in conformance with the spacing requirements in Standard Details E-9.
6. Compare the light locations to intersecting property lines, driveways, pedestrian lanes, and utility obstructions as follows:
7. If the location falls close to a property line and the street light locations can be adjusted to the property line while staying within the maximum spacing allowed, then the adjustment should be made.
8. Generally, streetlights should be situated at intersecting property lines for residential lots and parcels with minimal frontage (75 feet or less). The light spacing may have to be unbalanced, with additional lights being added to attain this and still comply with the maximum spacing allowed.
9. Street light locations shall be adjusted to miss driveways, fire hydrants, trees and existing utility obstruction by at least five feet.
10. Streetlight locations on 84-foot and wider streets may be adjusted to obtain a more uniform light distribution, if there are existing streetlights on the opposite side of the street.

6-7 **CRIME PREVENTION THROUGH ENVIRONMENTAL DESIGN (CPTED) LIGHTING PRINCIPLES**

These principles should be used by developers of property within the City of Lathrop to assist them in obtaining approved plans. 1 Foot candle power minimum in open parking lots, more for parking structures. It means 1 ft candle evenly distributed per square inch of parking surface.

Care should be taken to avoid patches of darkness at the ground level.

Use Light Emitting Diode (LED) luminaires.

Illuminate entrances, fire escapes etc. with bright white lights.

Parking lots should be illuminated with bright white lights that allows for uniformity (not allowing any dark access in the parking lot).

Implement a maintenance policy.

Parking lots should be illuminated so that one can identify a human face @ 33 ft (3 foot candles vertically above the surface).

Wire cages or industrial strength shatter resistant lenses should be placed over the light to deter vandalism.

Position lights to avoid glare area and blind spot.

6-8 STREET OPENING AND PAVEMENT RESTORATION IN MORATORIUM STREETS

In general, street opening and pavement restoration performed in City streets shall be done per Standard Detail R-53. However, newly constructed or reconstructed streets within five (5) years of the acceptance by the City shall be termed Moratorium Streets and trench repairs within these streets will subject to the additional terms and conditions as set forth below:

6-8.1 Lateral Repair Limits

- A. If the distance from the street centerline to the curb line is less than 20 feet, the trench repair shall extend to the centerline of the streets as per Standard Detail R-62, Example 1. If the distance is wider than 20 feet, the trench repair shall extend an additional 20 feet or to the centerline or the next traffic lane line, whichever is greater as per Standard Detail R-62, Example 2.

6-8.2 Longitudinal Repair Limits

- A. Pavement resurfacing will require 10 feet of grinding and cap as measured from both edges of the trench.

6-8.3 Paving

- A. After the trench has been backfilled and immediately prior to placing asphalt concrete, the existing asphalt concrete shall be saw cut or milled according to City Standards, to a vertical face. New AC paving shall be butt joined to the existing asphalt concrete vertical face. No feathering of new paving to existing paving is allowed. The vertical faces shall be tack coated. Placement of the final two (2) inches of AC wearing surface shall be done by a paving machine or spreader box. Asphalt concrete shall be delivered and compacted in accordance with the Standard Specifications and Plans.
- B. For trenches in moratorium streets with chip seal or slurry seal coatings, the entire lane(s) shall be resurfaced with these coatings.

END OF SECTION

SECTION 7 RECYCLED WATER SYSTEM STANDARDS

7-1 INTRODUCTION

The City's recycled water system consists of the land application sites, ponds, pump stations, and distribution system which provides disinfected tertiary treated recycled water for use on agricultural fields, in percolation basins, and on non-residential irrigation sites.

7-2 PURPOSE

The purpose of these recycled water system standards is to establish procedures, specifications, and limitations for the safe and orderly development and operation of recycled water facilities and systems in the City serviced area.

7-3 DEFINITIONS

See Section 1-2 DEFINITIONS:

7-4 CITY SUPPLIED RECYCLED WATER INFORMATION

Recycled water is supplied by the City for use in approved agricultural and landscaping irrigation sites and on approved percolation basins in the City of Lathrop.

7-4.1 Water Quality

The City's recycled water produced from the Consolidated Treatment Facility is disinfected tertiary recycled water as defined by Section 60301, Title 22, California Code of Regulations. It conforms to the Water Recycling Criteria contained in Title 22, California Code of Regulations and is safe for use to irrigate designated agricultural fields and landscape areas and parks that may be open to public access.

7-4.2 The City recycled water distribution system pressure is designed to operate at a lower pressure than the City's potable water system. Designers should contact the City's Public Works Department for obtaining the pressure range anticipated at their specific point of connection.

7-5 REQUIREMENTS FOR DETERMINING ADEQUATE STORAGE CAPACITY AND LAND APPLICATION AREAS FOR RECYCLED WATER SYSTEMS

For those projects for which a new recycled water system or a connection to an existing recycled water system is required, the following shall serve as the basis to determine the necessary storage volume and application area for land disposal of

effluent. If requested, a spreadsheet can be provided to assist in the required calculations.

- A. An annual water balance analysis shall be used to estimate minimum total storage volume and minimum total application area for land disposal of effluent.
- B. The annual water balance shall be broken down on a month-by-month basis.
- C. Monthly rainfall, reference evapotranspiration, and storage basin evaporation amounts used in the water balance shall be as shown in Table 7-1, corresponding to a year with 100-year return frequency annual precipitation. Storage basin evaporation shall be the reference evapotranspiration multiplied by an evaporation discount actor of 90%.

TABLE 7-1

CLIMATOLOGICAL DATA ADJUSTED FOR 100-YEAR PRECIPITATION

MONTH	RAINFALL (in)	REFERENCE EVAPO- TRANSPIRATION ^(a) (in)
October	1.17	3.33
November	2.14	1.60
December	2.61	0.86
January	5.13	0.9
February	4.37	1.73
March	2.85	3.38
April	1.63	5.04
May	1.38	6.45
June	0.24	7.54
July	0.05	8.02
August	0.08	7.11
September	0.28	5.19
Total	21.8	51.15

^(a) Evapotranspiration of clipped grass.

- D. The reference evapotranspiration (ET_o) values presented in Table 7-1 have been adjusted based on historical data corresponding to 100-year annual precipitation. They are lower than average values to reflect the increased number of overcast days in a year with 100-year annual precipitation. These adjusted ET_o data shall be used to estimate the monthly evapotranspiration rates of landscaping and crops that will be used in the application areas. The

evapotranspiration for a given crop (ET_c) shall be estimated using a crop coefficient (K_c) times the reference evaporation (ET_o). K_c values for some common crops are included in Table 7-2. K_c values for crops not included in Table 7-2 shall be subject to approval by the City of Lathrop.

- E.** In addition to the design average dry weather flow (ADWF), additional flows due to infiltration and inflow (I&I) into the wastewater collection system shall be included in the water balance calculations. The additional I&I flows are assumed to be 8% of the ADWF and are applied year-round.
- F.** The evaporation losses from the effluent storage basins shall be estimated using the storage basin evaporation values indicated in Table 7-1, applied to the bottom surface area of the basins (area inside toe of sloping sides). As an alternative to using the bottom area, the basin water surface area can be used if it is calculated based on the actual configuration of the basin(s) and the storage volumes, calculated on a month by month basis.
- G.** Precipitation falling on each storage basin and within its runoff catchment area shall be assumed to be accumulated in the basin. The runoff coefficient (fraction of rainfall collected in the basin) for the inside slopes of the basin and for levee roads and any other areas draining into the basin shall be 1.0.

TABLE 7-2

CROP COEFFICIENTS (Kc) FOR SOME COMMON CROPS

	<u>RYE</u> <u>GRASS</u>	<u>TURF</u>	<u>TREES AND</u> <u>SHRUBS</u>
October	1.00	0.75	0.59
November	1.00	0.69	0.58
December	1.00	0.60	0.51
January	1.00	0.61	0.51
February	1.00	0.64	0.56
March	1.00	0.75	0.57
April	1.00	1.04	0.61
May	1.00	0.95	0.58
June	1.00	0.88	0.60
July	1.00	0.94	0.60
August	1.00	0.86	0.60
September	1.00	0.74	0.60

- H. For the purpose of the water balance calculations, it shall be assumed that no irrigation shall take place between December and February each year. The purpose of this is to allow for soil drying before the first irrigation (ETc supplied from soil moisture due to preceding rainfall).
- I. A leaching requirement of 10% shall be assumed.
- J. For each month, the irrigation demand in inches of applied water for each crop shall be calculated as:

$$(ETc - Precipitation) / ([Irrigation Efficiency/100] \times (1 - Leaching Requirements))$$

In months for which the precipitation exceeds the ETc, the irrigation demand shall be zero. Irrigation efficiencies shall be based on the types of irrigation systems and shall not be less than the values given in Table 7-4. If the irrigation efficiency for a given technique is not included in Table 7-4, the minimum irrigation efficiency and leaching requirement to be used shall be subject to approval by the City of Lathrop.

TABLE 7-4

Minimum Irrigation Efficiencies for Different Irrigation Systems

<u>TYPE OF IRRIGATION SYSTEM</u>	<u>MINIMUM EFFICIENCY</u>
Surface Irrigation	
Basin	80%
Border	65%
Furrow	60%
Sprinkler Irrigation	
Hand Move or Portable	65%
Traveling Gun	60%
Center Pivot & Linear Move	75%
Solid Set or Permanent	70%
Drip/Micro Irrigation	
With Point Source Emitters	75%
With Line Source Products	70%

- K. The water balance shall be reviewed and approved by a professional civil engineer licensed by the State of California.
- L. The water balance shall be reviewed and approved by the Department of Public Works of the City of Lathrop.

7-6 USES OF RECYCLED WATER

- A.** Recycled water shall only be used for purposes approved by the RWQCB and as described in the WDRs.
- B.** All potential uses of recycled water shall be reviewed by the City Engineer. If recycled water use is allowed or required, the facilities shall be constructed in accordance with the procedures and requirements set forth in these Standards. All potential uses other than those stated in this section shall be considered by the City Engineer on a case-by-case basis. Uses shall be in accordance with Section 60304, Title 22, California Code of Regulations.
- C.** There shall be no direct cross-connection between the domestic potable water system and the recycled water system.

7-7 RECYCLED WATER SYSTEM EXPANSION AND REPAIRS

Expansions or repairs of an existing system shall meet the standards provided herein without reducing the supply, flow, or storage presently available to the existing system, unless the City approves such reduction. Expansions and repairs of an existing system shall also be in accordance with all Regional Water Quality Control Board Waste Discharge Requirements, California State Water Resources Control Board, Division of Drinking Water (SWRCB-DDW) and all applicable state and federal agency requirements.

7-8 RECYCLED WATER SYSTEM INFORMATION AND REQUIREMENTS

Recycled water distribution systems shall include piping throughout the development to provide irrigation of greenbelts, parks, and schools.

To maintain the recycled water distribution system within design operating pressures, a network of pump stations and storage ponds are utilized. When the pressure in the distribution system falls below the low level set point, the pumps at the pump stations are activated, sending water from the storage ponds into the distribution system and to the irrigation sites. When the pressure rises above the high level set point, the pressure relief valves at the storage ponds open, allowing the recycled water from the distribution system into the storage ponds. Pumps will be deactivated when no longer required to sustain system pressure or convey water to or from storage.

7-9 CITY ACCEPTANCE

Upon completion of the final inspection by the City, submission of record drawings, signing of a recycled water agreement, designation and training of a Site-Supervisor, and payment of any outstanding monies, the irrigation system will be

accepted by the City. At that time, service connection to the recycled water line may be made.

7-10 SUBMITTAL REQUIREMENTS

Refer to Sections 1 and 2 of the City's Design and Construction Standards for general submittal requirements. Below are submittal requirements specific to construction of recycled water facilities and distribution systems.

7-10.1 Submittals for Recycled Water Storage Pond Design

If required by the City, the following shall be prepared and submitted to the City with recycled water storage pond designs:

- A. A topographical map of the site depicting surrounding water courses, dwelling units, buildings, roads, earthquake fault lines, springs, wells and areas with restricted public access. Contour intervals shall be one foot.
- B. A geotechnical report prepared by a licensed Geotechnical Engineer. The report shall include the design high groundwater that will be used as a basis of design. The groundwater gradient and direction, design high groundwater elevation, seasonal depth to groundwater, and groundwater quality shall be provided.
- C. A watershed map that depicts the hydraulic grade line (HGL) for the 100-year design storm and run-off channels.

7-10.2 Groundwater Information

If required by the City, a report shall be submitted to the City providing information on the area to be irrigated. Information shall include but not be limited to the groundwater elevation and the composition of the existing groundwater including but not limited to the amount of Total Dissolved Solids (TDS).

7-10.3 Drawings

Detailed plans for the recycled water facilities and irrigation systems where recycled water is proposed for use shall be reviewed and approved by the City and inspected during construction to assure compliance with these standards.

- A. Prepare and submit a scaled drawing that shows:
 - 1. Specific areas of use;
 - 2. Areas of public access;

3. Surrounding land uses;
 4. Wells – color code monitoring, drinking, and agriculture well sites within 1,000 feet of use area;
 5. Surface waters; and
 6. Color-coded sites with limited public access.
- B.** Drawings of recycled water facilities, distribution lines, and irrigation systems shall include the following information:
1. Detailed plans showing all piping networks including recycled water, sanitary sewer, auxiliary non-potable water, and potable water lines, and storm drains (with catchments), wherever recycled water lines coexist with any of the other above mentioned lines;
 2. Type and location of the outlets and plumbing fixtures that will be accessible to the public;
 3. Point(s) of connection;
 4. The meter location, size (in inches), address, and civil station number;
 5. Location, size, and type of backflow prevention devices;
 6. Location and size of all irrigation lines;
 7. Location of isolation and line valves;
 8. Location of irrigation control valves;
 9. Location of quick couplers;
 10. Location of control wires;
 11. Direction of drainage;
 12. Setbacks;
 13. Related equipment as specified by the City Engineer; and
 14. Reference to standard details.
 15. Site Boundaries

16. Site Address
- C.** Include in the drawings a table stating the following:
1. Total available area;
 2. Net available area (with setbacks);
 3. Means of application;
 4. Types of plants, crops, etc.;
 5. Agronomic nutrient application rates;
 6. Agronomic water application rates;
 7. Monthly projection of agronomic application rates based on both plant water and nutrient needs; and
 8. Demand (in acre-feet).
- D.** The developer shall provide an irrigation plan showing irrigation zones and anticipated flow per zone to determine maximum peak demand in gallons per minute, which will specify sizing of the main extension system.
- E.** Exterior drinking fountains and other public facilities shall be shown and called out on drawings. If no exterior drinking fountains, picnic tables, food establishments, or other public facilities are present in the design area, then specifically state on the plans that none are to exist.
- F.** Irrigation Equipment Legend. For irrigation systems, a legend showing the pertinent data for the materials used in the system shall be recorded on the plans. The legend shall include a pipe schedule listing pipe sizes and materials of construction, a listing of valve types including quick couplers, and the following information for each type of irrigation emitter:
1. Manufacturer and model number,
 2. Flow rate (gpm),
 3. Operating pressure (psi),
 4. Irrigation emitter pattern, and
 5. Sprinkler spray radius (feet), if applicable.

7-10.4 Record Drawings

Record drawings of recycled water facilities and irrigation systems shall conform to and be submitted to the City in accordance with Section 1 of the City's Standards.

7-11 RECYCLED WATER DISTRIBUTION SYSTEM DESIGN REQUIREMENTS

The design criteria herein are provided as a service to the applicant and its engineer and are intended to conform to DDW requirements, Title 17 and 22 of the California Code of Regulations, the City's Waste Discharge Permit, and AWWA Guidelines. However, the ultimate responsibility lies with the designers or developers for conformance with all regulatory requirements.

7-11.1 General Design Requirements

- A.** All recycled water facilities and services shall conform to the requirements of the Public Works Department, and all applicable state and federal agencies and be designed using accepted design procedures and formulas. The most restrictive and stringent regulation shall prevail when there is discrepancy.
- B.** All recycled water facilities and irrigation systems using recycled water shall comply with the following:
 - 1. California Department of Public Health: "Title 17" – Division 4 of the California Code of Regulations.
 - 2. California Department of Public Health: "Title 22" – Division 4 of the California Code of Regulations.
 - 3. California Regional Water Quality Control Board Waste Discharge Requirements.
- C.** All recycled water facilities shall be installed to restrict public access so that the general public cannot draw recycled water from the system.
- D.** Recycled water lines shall not enter any dwellings.

7-11.2 Pressure

City recycled water system facilities shall be designed to have a minimum static pressure of 45 psi at peak hour flow.

7-11.3 Piping

Design of recycled water pipelines shall conform to Section 4 of the City's Standards, unless otherwise described differently below:

- A.** Depth and Minimum Cover: The top of recycled water mains shall be a minimum of four (4) feet below the finished street grade or two (2) feet below subgrade, whichever is greater unless otherwise approved by the City Engineer.
- B.** Location of Recycled Water Mains:

 - 1. Recycled water mains in new and existing streets shall be located 2' west or north of street centerline as shown on the Standard Details for Roads. However, traffic conditions, existing utilities, and other physical features shall be considered. Any deviations require prior approval from the City Engineer.
 - 2. All pipelines designed for the transmission or distribution of recycled water shall be located within the right-of-way dedicated for public streets or roads unless the use of an easement is specifically approved by the City Engineer. Easement requirements are specified in Section 4-5.2 of the City's Standards.
 - 3. Common trench construction of recycled water mains with sanitary sewer or potable water lines are prohibited.
- C.** Horizontal and Vertical Separation: Recycled water mains shall be installed to maintain a 10 feet minimum horizontal separation from all potable water. Any deviations from these separation requirements require prior approval from the City Engineer and SWRCB-DDW. Recycled water mains shall be installed a minimum of 1 foot below all potable water lines. Recycled water main separations from potable water mains are shown in Standard Detail RW1. Reference Title 22, Division 4, Chapter 16, Article 4, Section 64572. Contact the City Engineer for onsite separation requirements for private systems.
- D.** Transverse Crossings: Where recycled and potable water pressure main line piping cross, the recycled water piping shall be installed below the potable water piping in a purple-colored PVC sleeve which extends a minimum of 5 feet on either side of the potable water piping. Conventional (white) PVC pipe may be used for sleeving material if it is taped with 3-inch-wide purple warning tape that reads "CAUTION: RECYCLED WATER – DO NOT DRINK" in English and Spanish.
- E.** All pipes that carry recycled water shall be purple or wrapped in purple polyethylene vinyl sleeve conforming to AWWA C105 specifications and

Health and Safety Code 116815. Recycled water pipes shall be colored and marked in accordance with Section 7-16.

- F.** All recycled water piping shall be installed in accordance with the Uniform Plumbing Code and all other local governing codes, rules, and regulations.
- G.** Distribution requirements for recycled water main are specified in Section 4-5.3. Requirements for backflow and backflow prevention devices are specified in Section 4-5.4.
- H.** The minimum size of recycled water mains shall be four (4) inches in diameter. Smaller mains shall be used only when individually approved by the City Engineer.
- I.** PVC constant pressure main line piping shall be rubber-ring joint, PVC AWWA C900-16 (or latest edition).
- J.** Irrigation mainline pipe shall be Schedule 40 PVC solvent weld purple pipe with bell ends.
- K.** Irrigation lateral lines shall be Class 200 PVC solvent weld purple pipe with bell ends.
- L.** Irrigation sleeving shall be Schedule 40 PVC purple pipe.
- M.** All riser pipes for valves or blow-offs on recycled water lines shall be purple piping.

7-11.4 Appurtenances

A. Recycled Water Blow-offs

Recycled water blow-offs shall be piped directly to a sanitary sewer manhole and installed in accordance with the Standard Details for Recycled Water.

B. Recycled Water Meters

A recycled water meter shall be installed on each recycled water service lateral see, Standard Details for Water.

1. The size and actual placement location of each meter shall be reviewed and approved by the City.
2. The entire meter assembly, including valves and pipes, shall be purple in color.

C. Pressure Sustaining/Pressure Relief Valves

For pond fill lines and agricultural field irrigation systems, pressure sustaining/pressure relief valves shall be installed downstream of the recycled water meter and as shown on the Standard Details for Irrigation. Pressure sustaining/pressure relief valves shall be capable of controlling downstream pressure to an adjustable set point.

D. Strainers and Filters

Strainers or filters shall be installed in order to protect meters, valves, or irrigation equipment such as sprinklers. Strainers shall be placed upstream of meters and pumps and downstream of the seasonal storage ponds.

1. Strainers that have automatic backwash features will not normally be allowed unless it can be demonstrated to the City that the backwash water will not cause runoff and is disposed of in a manner approved by the City.
2. All recycled water that enters the recycled water distribution system from an open reservoir shall be filtered through a filtration process similar in performance to the filters used at the recycled water plant or, as a minimum, screened through a micro strainer with a 200-mesh screen.
3. The maximum strainer size is 100-mesh for placement upstream of pumps (i.e., particles larger than 127 microns are prevented from passing).
4. The maximum strainer size is 30-mesh for placement upstream of sprinkler and drip irrigation systems (i.e., particles larger than 533 microns are prevented from passing).
5. Sprinklers shall be able to pass any particles which will pass through a 30-mesh screen.
6. Sprinkler irrigation systems shall have a “Y” or basket strainer located downstream of the meter.
7. The strainer drain valve shall operate with a recessed key slot.

E. Recycled Water Sample Stations

Recycled water sample stations shall be installed where determined by the City. The sampling station shall consist of a 3/4-inch service connection stubbed out at least twelve (12) inches behind the sidewalk; an in-line

corporation stop with a valve box and cover, and an above-grade lockable sampling station. The above-grade lockable sampling station shall be as shown on Standard Details for Water. The sampling station shall be purple in color and shall be center mounted on a four (4) inch thick concrete slab, two (2) feet square in area.

F. Hose Bibs and Quick Couplers

1. Hose bibs are prohibited on the recycled water system.
2. Quick couplers shall be labeled as CAUTION: RECYCLED WATER – DO NOT DRINK and not be used for connection to the Potable Water System.

G. Recycled Water Monitoring Wells

As required by the City's RWQCB waste discharge permit, a monitoring well installation work plan shall be prepared by a licensed professional engineer or hydrogeologist for City and RWQCB approval prior to the construction, abandonment, or replacement of any monitoring well that is part of the City's monitoring well network.

General monitoring well design shall comply with the City Standard Details. The design is consistent with San Joaquin County Environmental Health Department and State of California Monitoring Well Standards. A description of the monitoring well design includes:

1. The well casing, perforated over the targeted depth interval for monitoring.
2. The annular spacing between the perforated well screen and borehole, filled with a filter pack.
3. A transition seal placed on top of the filter pack.
4. A sanitary seal which extends upwards from the top of the transition seal to the land surface.

7-12 RECYCLED WATER IRRIGATION SYSTEM DESIGN REQUIREMENTS

Recycled water irrigation systems shall conform to the following general design requirements, as well as the specific requirements for design of agricultural and landscaping recycled water irrigation systems.

7-12.1 General Recycled Water Irrigation System Design Requirements

- A. Obtain prior approval for all proposed changes and modifications to any facilities. Such changes must be submitted to and approved by the City and designed in accordance with these guidelines and standards.
- B. Recycled water shall not be allowed to flow from the designated use areas as surface flow or into the storm drain system or waters of the United States.
- C. Land application areas irrigated with recycled water shall be designed with flat surfaces to prevent runoff.
- D. Misting and carrying of sprays by wind must be considered when designing the irrigation system. No overspray into public facilities and areas not approved for recycled water use is permitted. Modifications to sprinkler head types and line pressures must be made at the time of system start-up to mitigate the effects of misting and spray drift caused by wind.

7-12.2 Agricultural Recycled Water Irrigation

City approved agricultural recycled water irrigation areas shall be flood (also called furrow) type.

A. Agricultural Irrigation System Components

In general, agricultural recycled water irrigation systems shall consist of the connection to the recycled water main, irrigation supply system, and tail water return system.

1. Connection to Recycled Water Main

Each connection to the recycled water main shall consist of an isolation valve, pressure sustaining/pressure relief valve, pressure gauges, and flow meter. No bypass of these components are permitted without the approval from the City Engineer. See Standard Details for Irrigation.

- a. Isolation valve shall be solid wedge, resilient seat, gate valve, suitable for distribution system pressures. Provide 125 lb flange, above grade application or restrained joint fittings for buried application.
- b. Pressure sustaining/pressure relief valve shall be CLA-VAL or favorably reviewed equivalent and shall be suitable for recycled water designed to maintain a pressure of 35 to 80 psi.
- c. A pressure gauge shall be installed on each side of the pressure sustaining/pressure relief valve.

- d. The flow meter shall be as favorably reviewed by City Engineer. A flow meter using SCADA and telemetry, or an alternate method approved by the City Engineer, is required to capture daily recycled water flows.

2. Irrigation Supply System

- a. Piping: All piping from the irrigation main through the irrigation supply components up to the air gap shall be pressure rated, PVC AWWA C900-16 (or latest edition) for buried service and PVC or DIP or Steel pipe with 125 lb flanges at the valves.
- b. Air Gap: The pressure piping shall terminate above ground with an air gap prior to the irrigation piping. See Standard Details.
- c. Irrigation Pipe Materials: All piping downstream of the air gap shall be:
 - i) Centrifugally cast Reinforced Concrete Pipes (RCP) with rubber gaskets or
 - ii) Polyvinyl Chloride (PVC) shall be glue and socket for pipe diameter less than 8 inches and rubber gaskets for pipe diameter 8 inches through 36 inches. PVC piping shall be solid wall with a minimum working pressure of 80 psi pressure.

3. Irrigation Distribution Systems

The flood irrigation shall consist of lateral pipes distributing water through the fields and controlled by valves. Lateral spacing shall be such that water is applied uniformly. Spacing shall be computed based on soil hydraulic properties, slope, water use rates, and system efficiencies.

Site grading shall provide for water distribution and runoff without ponding of recycled water. The overall site shall drain to a ditch draining to the tail water return pumping station. See Standard Details.

4. Tail Water Return System

The tail water return system shall consist of a sump with a submersible or self-priming centrifugal pump. The design shall consider screening of water flowing into the sump as well as the

pump discharge. A portable trash pump with a sump may also be used to return tail water. Tail water shall be returned to the irrigation pipe for distribution back through the irrigation system. See Standard Details.

7-12.3 Landscaping Recycled Water Irrigation

City approved landscaping recycled water irrigation areas may be sprinkler or drip irrigated, in accordance with the requirements and restrictions described below.

A. Types of Landscaping and Allowable Irrigation Methods

1. Park, school, and streetscape landscape strip irrigation systems may utilize a combination of spray and drip irrigation.
2. Medians irrigated with recycled water within residential areas shall be through drip or bubbler irrigation.

B. Recycled Water Irrigation Area Boundary

The recycled water irrigation area boundaries include the perimeter of the irrigation area, handicap ramps, and the perimeters surrounding sensitive and recreational areas. Sensitive areas include children's play areas and areas with picnic tables, benches, or drinking water fountains. Recreational areas are defined as play areas that do not include equipment for children to play on, such as sand volleyball courts and horseshoe pits.

C. Frontline Sprinklers

The closest sprinklers to an irrigation area boundary, including sensitive and recreational area boundaries, are called frontline sprinklers. Frontline sprinklers shall be a minimum of 5 feet from the recycled water irrigation area boundaries except for sensitive area boundaries, where the distance shall be a minimum of 10 feet. The frontline sprinklers shall be half-circle sprinklers pointed away from the boundaries. The frontline sprinklers shall be low-angle sprinklers with a radius of no greater than 10 feet and should include a pressure-compensating device, in order to create larger droplets.

D. Irrigation in Buffer Areas for Sensitive and Recreational Areas

The region between the frontline sprinkler and irrigation area boundary is called the buffer area. Landscaping within the buffer area between the recycled water irrigation area boundary and the frontline sprinklers is at the discretion of the designer. However, the buffer area shall not have a spray irrigation system (it may have a bubbler or drip irrigation system). If the buffer is landscaped with turf, it shall have a subsurface irrigation system.

E. Landscaping Irrigation System Components

In general, landscaping recycled water irrigation systems shall consist of the connection to the recycled water main, irrigation controllers, irrigation distribution piping, irrigation emitters, and any required tubing associated with the emitters.

1. Connection to Recycled Water Main

Each connection to the recycled water main shall consist of an isolation valve, backflow prevention device, and flow meter. No bypass of these components are permitted without approval from the City Engineer. See Standard Details for Irrigation.

- a. Isolation valves shall be solid wedge, resilient seat, gate valve, suitable for distribution system pressures. Provide 125 lb flange for above grade applications or restrained joint fittings for buried applications.
- b. The flow meter shall be as favorably reviewed by City Engineer.
- c. All piping from the irrigation main through the irrigation supply components shall be pressure rated, PVC AWWA C900 for buried service and PVC or DIP or Steel pipe with 125 lb flanges at the valves.

2. Irrigation Controllers

- a. Each irrigation distribution system shall consist of an electrically operated control valve with anti-siphon valve.
- b. The controller shall be a Calsense controller compatible with the City's existing irrigation controllers.
- c. Irrigation with recycled water in public use areas shall only be allowed between 10:00 pm and 6:00 am.
- d. The controller shall be linked to the City's irrigation SCADA system and programmed to shut off the irrigation system (or not allow it to come on) during a high wind event.
- e. Irrigate in a manner such that the application rate will not exceed the infiltration rate of the soil. Timers will be adjusted so as to be compatible with the lowest soil infiltration rate present. This procedure may be facilitated by the efficient

scheduling of the automatic control clocks, (i.e., employing the repeat function to break up the total irrigation time into cycles that will promote maximum soil absorption).

- f. The irrigation system controller shall be able to be programmed to match the irrigation rate with the evapotranspiration rate for the irrigated plants/turf and should be operator-adjustable. Therefore, there shall be no ponding. Given that irrigation rate will match the use by the plants/turf, the catch basins are only for the conveying of storm water from the recycled water irrigation area. Where varying soil types are present, the design of the peak rate of recycled water application shall be compatible with the lowest infiltration rate present. No recycled water shall be applied to the irrigation area during periods when soils are saturated or during periods of rainfall.
- g. Copies of the soils test reports shall be made available to the City upon request.
- h. Controllers shall be equipped with removal handles or locking mechanisms to prevent public access or tampering.

3. Irrigation Control Valves

Irrigation control valves shall be housed in purple plastic boxes with purple covers with "Recycled Water" imprinted on the lid, and shall be equipped by removable handles or locking mechanisms to prevent public access or tampering. All valves should also be tagged with purple identification tags reading "RECYCLED WATER - DO NOT DRINK" with the international symbol.

4. Strainers and Filters

Strainers and filters shall be installed in accordance with the Section 7-11.4.

5. Irrigation Distribution Piping

- a. All piping from the irrigation main through the irrigation supply components shall be PVC AWWA C900 or Schedule 40 for buried service. Schedule 40 PVC Piping shall have screw fittings or glued pipe with couplings at valves. All above ground PVC pipe shall be painted for protection from sunlight and be in accordance with requirements in Section 7-16.

- b. Micro-irrigation laterals shall be of PVC or polyethylene. Laterals shall be buried at a shallow depth and rise to the emitter.
 - c. Cover Depth
 - i) Sprinkler Type: Piping shall be buried at a sufficient depth to allow turf aeration.
 - ii) Drip Type: Piping shall be buried from 1 to 3 feet and painted when exposed.
6. Irrigation Emitters

There are two main types of irrigation emitters: sprinkler (or spray) type and drip type. Sprinklers operate under higher pressure, generally have higher flow rates, and spray recycled water up and over the irrigation area. Drip types operate under lower pressure, generally have lower flow rates, and provide water to the base of plants.

- a. Sprinkler Type
 - i) Sprinkler heads shall be popup type and designed to allow mowing and sports use. Sprinklers shall be designed for even coverage within the irrigated area.
 - ii) Sprinklers shall be connected to buried PVC distribution piping.
 - iii) All sprinklers used in recycled water facilities shall have their exposed surface colored purple to associate them with recycled water use. The exposed surface shall be colored purple through the use of dyed plastic or rubber. All spray heads shall have purple caps with the words "RECYCLED WATER - DO NOT DRINK" imprinted.
 - iv) Adjust sprinkler heads to eliminate overspray onto adjacent hardscapes, patios, decks, pools, fences, etc.
- b. Drip Type
 - i) The drip irrigation system shall consist of connection(s) to the main recycled water distribution system, lateral piping, supply, sub-supply, and emitter piping.

- ii) Conventional drip type emitters shall be above ground and may be installed on flexible polyethylene risers.

7. Site Grading and Retention Basins

- a. Site grading shall provide for water retention at the plants and runoff control through use of swales leading to a retention basin within the irrigated area.
 - b. Individual emitters shall discharge into a depression or basin at each plant. The entire area shall drain to a containment area where runoff is contained.
- F.** In accordance with Title 22, California Code of Regulations, all piping and irrigation shall be designed so that spray, mist or runoff shall not enter dwellings, designated outdoor eating areas, or food handling facility and shall not contact any drinking water fountain. See Sections 7-12.4 or setback requirements.
- G.** Drinking water fountains shall not be located in landscaped areas irrigated by spray-type irrigation devices. Concrete patios, walls, shrubbery irrigated by drip or bubbler systems, or other barriers shall be used to physically separate drinking fountains from areas irrigated by spray-type irrigation devices.
- H.** All areas irrigated with recycled water shall be provided with appropriate signage.

7-12.4 Setbacks

When irrigating with recycled water, comply with the following minimum setback criteria.

<u>Description</u>	<u>Minimum Setback</u>
Recycled water land application area to domestic water supply well	50 feet
Recycled water agricultural land application area to surface water	25 feet
Recycled water land application area to irrigation canal drainage course	50 feet
Recycled water storage pond to domestic water supply well	100 feet
Frontline sprinklers to Sensitive Areas	10 feet
Frontline sprinklers to Recreational Areas	5 feet

7-12.5 Cross Connection and Backflow Prevention

- A. Cross connections between potable water facilities and recycled water facilities are forbidden.
- B. Backflow prevention devices shall be installed as required by the City Engineer on a case-by-case basis if there exists a potential for back-siphonage or backpressure of water into the recycled water distribution system, which could impact the quality of the recycled water. Backflow prevention devices shall be installed in conformance with Section 4-5.4.
- C. If a facility has both potable and recycled water service is it considered a “dual-source” site and required to have an AWWA-approved backflow preventer device on the potable water service as close to the meter as possible.
 - 1. Pond recycled water and supplemental potable water inlet: the potable water service connection must have an AWWA-approved air-gap backflow preventer (see Standard Details) for Recycled Water). All backflow prevention must be approved by the City.

2. Recycled water to irrigate and potable water to domestic uses (i.e. park): A reduced pressure principle backflow prevention device is required on the potable water service as close to the meter as possible. All backflow prevention must be approved by the City.

7-13 RECYCLED WATER STORAGE POND DESIGN REQUIREMENTS

The following design requirements apply to the design and construction of seasonal storage ponds.

A. Pond Design Requirements

1. Pond embankments shall be no steeper than 3:1 (horizontal to vertical). Pond embankment for interior of basin may have a slope of 2.5:1 (horizontal to vertical) with supporting recommendations from a geotechnical engineer. The basin bottom shall be gradually sloped for drainage. See Standard Detail RW-5 for Typical Cross Section.
2. The top of the embankment shall be a minimum of fifteen (15) feet wide and should be covered with gravel. The perimeter of the pond shall have a ten (10) foot access road covered with gravel. Gravel shall be ¾" maximum sized aggregate. The gravel layer thickness shall be a minimum of three (3) inches.
3. Each storage pond shall hold no more than 1,500 acre-feet and shall have a berm height from the toe of the outside slope of less than 15 feet.
4. A minimum distance of 1 foot shall be maintained between the design high groundwater level elevation and the basin bottom design. High groundwater level elevation must be determined by a certified hydrogeologist.
5. A freeboard of two (2) feet minimum during 100-year precipitation conditions shall be required for all storage ponds. The storage pond should remain operational after such conditions, with no structural damage.
6. Seepage collars shall be installed to junctions where piping exits and enters the basin dike.
7. The storage ponds shall be fenced (eight (8) feet minimum in height) with a material approved by the Community Development Director and shall include a gate sized for vehicular access. The gate shall

be secured by a lock with keyhole matching City maintenance personnel existing keys.

8. Controls for algae and other floatable solids shall be constructed. Examples of adequate controls include aeration and recirculation.
9. Outlet structures shall be designed for flexibility in operations.
10. Each storage pond shall have an electrically operated control valve reporting to the City's SCADA system.
11. Each storage pond shall be graded and a sump shall be provided such that the pond can be completely drained.

B. Pond Lining

A geomembrane liner is required for all storage ponds. The geomembrane liner shall be 40 mil high density polyethylene (HDPE).

C. Storage Pond Inlet

Extend recycled water main using PVC C900-16 (or latest edition) pipe. Feed the storage pond using an isolation valve (gate), pressure sustaining/pressure relief valve, and back pressure solenoid controls.

Install a magnetic type flow meter that totalizes flow, displays the flow rate, and can digitally transmit the totalized flow and flow rate to the City's SCADA system.

Piping discharge shall be above the basin liner and adequate erosion measures at the discharge point shall be constructed. Examples of adequate erosion control measures include rip-rap beneath the inlet piping, concrete splash pads, or wear sheets for geomembrane liners. All piping penetrations shall be made with a liner boot around the pipe.

D. Supplemental Water

Where supplemental water is provided by potable water, the supplemental water inlet shall have an air gap.

The air gap shall be at least two pipe diameters above the pond edge or 12 inches, whichever is greater. (See Standard Details for Recycled Water).

E. Pond Level Monitoring

1. Pond level shall be monitored and transmitted to the City's SCADA

system.

2. SCADA control shall be used to stop pumps at low water level and close inlet valve at high water level.
3. A high water alarm shall be transmitted to the City's SCADA system.
4. An aluminum staff gauge must be present at each pond. Length intervals shall be marked in units of tenths of a foot, and be easily readable.

F. Setbacks

No impoundment of disinfected tertiary recycled water shall occur within 100 feet of any domestic water supply well.

7-14 RECYCLED WATER PERCOLATION BASIN DESIGN REQUIREMENT

Percolation basins may be used for groundwater recharge within the City of Lathrop. Contact the City Engineer for feasibility. All ground water recharge projects must comply with California Code of Regulations, Title 22.

7-15 RECYCLED WATER PUMPING STATION DESIGN REQUIREMENTS

The following design requirements apply to the design and construction of recycled water pumping stations.

- A.** The designer shall locate pump station structures at least one (1) foot above HGL for 100-year design storm.
- B.** The pumping station shall consist of multiple pumps designed to cover the range of irrigation demands and one standby pump with equal capacity to the largest duty pump.
- C.** Pumps, valves, flow meter, and strainer and electrical equipment shall be installed above grade in a weatherproof enclosure. Pumps shall be controlled both from City's SCADA system and from a local control panel. Pump status (on/off/standby), flow (flow and total flow), and pressure shall be transmitted to the City's SCADA system.
- D.** Pumps shall be vertical centrifugal pumps. Flow and number of pumps to match range of flow demand. All pumps shall be designed with VFD to match motor horsepower (480v). Overall system shall be designed for 45 psi minimum pressure at peak hour flow. Maximum allowable pressure within the system shall be 55 psi.

- E.** Motor control center shall be Square D, Eaton or approved equal with Square D Altivar 61 VFDs or approved equal, Modicon PLC and Ubiquiti Rocket M Radio or approved equal. Designer shall verify compatibility with City SCADA and control system.
- F.** The flow meter shall be a magnetic flow and have a combination sensor and transmitter with relay for directional indication. The flow rate shall be transmitted to the City's SCADA system. The flow meter shall be sized for maximum accuracy over the full range of anticipated flows.
- G.** Air and vacuum relief valve shall be installed with bronze corporation stop or ball valve (min 150 psi rating).
- H.** All piping shall be sized for velocities less than 10 ft/s, including future design considerations.
- I.** Pressure transducers shall be in-line, two wire (0-200 psi).
- J.** Pressure reducing and check valves shall be per ANSI 125, 1.0 psi max drop at rated gpm, epoxy coated.
- K.** Pressure sustaining/reducing/backpressure valve shall be "Y" pattern, ANSI 125, max 1.0 psi max drop at rated gpm, epoxy coated.
- L.** Transducer for level measurement shall be 1-10 psi.
- M.** Gate valve shall be commercial/industrial iron gate valve, solid wedge, resilient seat, ANSI 125.
- N.** Butterfly valve shall be per AWWA C504, Class 125, bonded seat in-body, manual, cylinder, and motor actuator.
- O.** All outside exposed surfaces of all structures shall have Tex-Cote Graffiti-Guard®, 21st Century Coatings Anti-Graffiti, or approved equal applied to full height of structure.

7-16 TESTING AND INSPECTION

Refer and conform to Section 1 of the City's Standards for Inspection Requirements, in addition to the requirements below for recycled water systems.

7-16.1 General Requirements

- A.** Notify the City at least two (2) working days in advance of installation of

irrigation facilities so that the City can inspect the construction.

- B.** In no case shall irrigation lines be backfilled before inspection by the City.
- C.** If the irrigation system is installed prior to plan approval and/or inspection, all or any portion of the system shall be exposed and corrected as directed by the City. Failure to comply will result in termination of service.
- D.** Provide access and cooperate with the City representative, so that the City representative may perform system inspections required by the City. Correct, at no expense to the City, any work that violates the City standards.

7-16.2 Cross Connection Testing and Inspection

- A.** Initially, before activation of recycled water service a thorough cross-connection shutdown test and inspection of both the potable and recycled water irrigation systems on the site shall be conducted under the supervision of an AWWA Certified Cross-Connection Program Specialist employed by the City. Additional cross-connection tests may also be performed whenever determined necessary by the City.
- B.** Cross connection inspections shall include a visual check of the entire system to verify that no cross-connections have been made.
- C.** Any cross-connection or a backflow incident involving the potable drinking water system shall be reported to the City immediately and the recycled water system shut off at the meter. The potable water system should remain on and pressurized. “Not for Drinking” signs must be posted at all potable water fixtures and outlets and may only be removed upon City approval.
- D.** The applicant, owner, or customer shall be responsible for correcting any work which violates the City regulations at their sole expense including any costs associated with repairing and re-testing the backflow device should the backflow device fail to pass the City’s test.

7-16.3 Hydrostatic and Leakage Tests

Hydrostatic and leakage tests shall occur, as a whole or in sections, on the reclaimed water mains between valves.

- A.** The total length of pipe for any single test shall not exceed 5,000 feet.
- B.** The mains shall be tested in accordance with AWWA Standard Specification C600-87, under an average hydrostatic pressure of not less than 150 psi, using a 300 psi gauge, for a minimum of two (2) hours.

- C. All valves shall be tested for secure closure.

7-16.4 Coverage Test

- A. Control overspray and runoff of systems. To ensure the limitation of overspray and runoff is acceptable, an inspection of the completed irrigation system by the City is required.
- B. When the sprinkler system is completed and the planting installed, contact the City and arrange for a coverage test walk through.
- C. The Contractor must be present and have persons capable of making system adjustments during the coverage test.
- D. If modifications to the system are required, other than minor adjustments, the City will provide notification in writing of the changes required. To avoid termination of service, the modifications must be made in a timely manner.
- E. All modifications to the system are the responsibility of the applicant and said applicant shall pay all costs associated with such modifications.

7-16.5 Medians and Parkways

Testing and inspection of median and parkway water systems receiving recycled water will be in accordance with the City's design, review and inspection procedures.

7-16.6 Ponds

Notify the City at least two (2) working days in advance of installation or construction so that the City can inspect the proper installation or construction of the following:

- A. Liner;
- B. Berm; and
- C. Recycled water and any supplemental water inlets.

7-16.7 Pump Stations

Each pump shall be operated at shutoff and near the specified primary selection point to demonstrate proper operation, adequate head and capacity, and proper performance as designed. Pump stations shall work effectively and respond to various controls and alarms. The SCADA system shall be tested for full

functionality. The flow rate shall be measured using a temporarily installed ultrasonic flow meter or by another method approved by the City.

7-17 **SIGNAGE AND IDENTIFICATION PAINTING AND MARKING**

Areas irrigated with recycled water and recycled water facilities and systems shall have signage or identification painting or marking as required below, or as determined by the City Engineer.

Any time caution wording in English or Spanish is stated, the following wording shall be used with the international symbol:

- Caution wording in English: RECYCLED WATER – DO NOT DRINK
- Caution wording in Spanish: AGUA PROCESADA – NO BEBER

A. Recycled Water Piping

1. All piping or piping wrap shall be permanently labeled with caution wording in English and Spanish.
2. The lettering shall be at minimum 1-inch high in black or white color. The lettering shall be repeated continuously on opposite sides (2 sides at minimum) of the pipe or encasement for the full length of the pipe or encasement. Identification tapes and markings shall be placed longitudinally and centered. Tapes shall be at least 3 inches in width and attached to sections of pipe before they are placed in the trench shall have flaps sufficient for continuous coverage. Pipes shall be installed in the trench such that the lettering is facing on the top of the pipe.
3. All buried piping shall be purple Pantone 522; exposed piping, tape and polyethylene vinyl wrap purple shall be purple Pantone 512.
4. All marking and coloring shall be durable enough to be easily recognizable and legible for the design life of the piping.
5. For above ground pipe, the tape shall be applied to the pipe with an adhesive.
6. In addition, all piping shall be continuously and permanently marked with the manufacturer's name or trademark, nominal size, and schedule or class indicating the pressure rating.

B. Potable Water Piping

Potable water piping shall have warning tape at parks where both recycled water for irrigation and potable water for drinking fountains, bathrooms, etc. are used.

1. Warning tape for the potable water piping shall be blue in color with the words "CAUTION: BURIED POTABLE WATER LINE BELOW" imprinted with lettering at minimum 1-inch high and black in color. Imprinting shall be continuous and permanent.
2. Warning tape shall be a minimum of 3 inches wide and shall run continuously for the entire length of all constant pressure main line piping. The tape shall be attached to the top of the pipe with plastic tape banded around the warning tape and the pipe every 5 feet on center.

C. Valve Boxes

1. Valve boxes covers shall be heavy-duty, triangular in shape, and colored purple (Pantone 512).
2. All valve box covers shall in accordance with Standard Detail for Water have the words "RECYCLED WATER" imprinted on them.

D. Equipment

1. Buried fittings, valves, and appurtenances shall be colored purple, Pantone 522. Exposed fittings, valves, pumps, and appurtenances shall be colored purple, Pantone 512.
2. Both aboveground and below grade equipment, such as blow-offs, valves, pumps, and recycled water meters, shall be labeled with recycled water identification tags with caution wording in English and in Spanish.
3. Recycled water identification tags shall be weatherproof plastic, 3" x 4", purple (Pantone 512) in color with caution wording in English and Spanish imprinted on both sides. Imprinting shall be permanent and black in color.
4. All recycled water sprinkler control valves shall be tagged with recycled water identification tags that say " RECYCLED WATER - DO NOT DRINK" and contains the international symbol cautioning against drinking the water.
 - i) One tag shall be attached to each valve using one of the following methods:

- ii) Attached to the valve stem directly or with plastic tie-wrap,
 - iii) Attached to the solenoid wire directly or with plastic tie-wrap, or
 - iv) Attached to the valve cover with valve cover bolt.
5. The interior of all gate post risers shall be painted purple, to indicate a recycled water valve in case the lid is lost.

E. Storage Ponds and Pumping Facilities

1. Permanent signs shall be provided along the fence of storage ponds to designate the nature of the facility and advise against trespassing. Signs shall have caution words in English and Spanish and be posted on each side of the fenced facility. Posting shall be every 300 feet or less.
2. The lettering on the signs shall be at minimum ½-inch in black on purple colored background (Pantone 512). The size of the sign shall be no less than 8½ inches wide by 11 inches high.

F. Irrigated Areas

1. All irrigated areas where recycled water is used shall be posted with signs that are visible to the public.
2. Signs shall have caution words in English and Spanish and include the international warning symbol cautioning against drinking the water as shown in Standard Details for Recycled Water.
3. The lettering on the signs shall be at minimum ½-inch high in black or white on purple colored background (Pantone 512). The size of the sign shall be no less than 8½ inches wide by 11 inches high.
4. For park areas, signs shall be placed where they can be easily seen at all entrances to the park, adjacent to all sensitive areas and recreational areas, or as otherwise determined by the City.
5. For streetscapes (e.g., parkways, medians), place signs at street corners as appropriate to notify passersby. Streetscape signs shall be placed no further than 1,000 feet apart. For medians, signs shall be placed at the beginning and end of each median, and another approximately equidistant from the ends of the median for medians longer than 1,000 feet.

G. Irrigation Emitters and Supply Lines

All emitters and supply lines shall have their exposed surface colored purple to associate them with recycled water use.

H. Curbs

The location of recycled water service lines shall be permanently indicated by embedding the letter “RW” in the curb, directly above the line and shall be in conformance with Section 4-5.3 E 5a & b and Standard Details for Roads.

END OF SECTION

SECTION 8 LANDSCAPE AND PLANTING STANDARDS

8-1 GENERAL

These general requirements provide conditions for all landscape operations in the public right-of-way and on City property including landscaping at the back of sidewalk and the center medians, roundabouts and in public parks. This section applies to all Landscape installation activities.

Landscape planting shall consist of preparing and planting areas as shown on the approved Plans, and as directed by the City Engineer.

All landscape and planting designs shall be designed in accordance with the State of California Model Water Efficient Landscape Ordinance and LMC 17.92.

8-2 CERTIFICATE OF COMPLIANCE

A Certificate of Compliance shall be furnished to the City Engineer with each lot of material delivered to the work and the lot so certified shall be clearly identified in the certificate.

All materials used on the basis of a Certificate of Compliance may be sampled and tested at any time. The fact that material is used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating material in the work in conformance with the Plans and Specifications and any such material not conforming to such requirements is subject to rejection, whether in place or not.

8-3 MEASUREMENT OF QUANTITIES

Measurement of Quantities shall be determined by the City Engineer based on delivery tags presented at time of delivery. The Contractor shall give twenty-four (24) hours' notice of all deliveries, dates and times. Materials delivered when the Engineer is not present, depending on verifiability, at Engineer's discretion, may not be counted.

8-4 MATERIALS

Materials shall conform to these Specifications and the approved plans.

8-5 CONDITIONS

A. Existing Conditions:

1. Prior to work, the Contractor shall be thoroughly familiar with any

surveys and investigative reports directly related to the work to be performed.

2. Contractor shall examine physical conditions at the site, document all conditions differing from those indicated in the contract documents, and inform the City immediately.

B. Environmental Requirements:

1. Contractor shall be aware of, and adhere to, any regulations protecting special plants, wildlife, and natural environmental features present on the project site.
2. Contractor shall be aware of and conform to dirt and dust abatement requirements and water pollution prevention programs.

C. Site Protection:

1. The Contractor shall protect and maintain all existing site improvements, structures, facilities, and utilities from damage, both above and below the ground.
2. Trees, shrubs and other materials which are to remain on the site shall be fully protected by constructing a fence around the items to be protected or other method approved by the City Engineer.
3. Grading around protected trees shall be limited to outside the dripline unless specifically approved by the City of Lathrop. Once grading plans have been approved no grades shall be modified without the approval of the City Engineer.
4. Any tree well graded should be drained to some outfall or swale.
5. No trenching shall occur beneath the drip line of any protected trees unless approved by the City of Lathrop. If approved, grading plans shall bear a statement reading "TRENCHING UNDER THIS TREE IS APPROVED"
6. The following conditions shall apply to ensure preservation of existing trees:
 - a. Each tree or group of trees to be saved shall be fenced by a chain-link fence prior to any grading or movement of heavy equipment or issuance of any permits.

- b. Fencing shall be located one foot outside the drip line of the tree or group of trees.
- c. Signs shall be posted on all sides of said fence stating:

<p>WARNING:</p> <p>THIS FENCE SHALL NOT BE REMOVED</p> <p>OR RELOCATED WITHOUT WRITTEN</p> <p>AUTHORIZATION FROM THE</p> <p>CITY OF LATHROP</p>

7. Parking of vehicles or storage of equipment and materials shall not occur, at any time, under the drip line of trees.

D. Underground Utilities:

1. Contractor shall notify UNDERGROUND SERVICE ALERT at (USA North) at “*811” or (800) 642-2444 at least 48 hours prior to commencing any excavation.
2. Contractor shall relocate or remove existing utilities as shown on the plans or as directed by the City Engineer. Where utilities are marked, careful hand excavation shall be done to determine exact alignment and depth prior to starting excavations within marked areas.

E. Safety:

1. Contractor shall at all times exercise necessary precautions to provide for the protection of the public and employees.
2. Adequate barricades, flashers, fences, signs, and lights shall be installed in all hazardous locations including, but not limited to, open excavations and areas of pedestrian and vehicular traffic. All situations requiring traffic control shall conform to the appropriate Caltrans Traffic Control Manuals and the Caltrans Manual on Uniform Traffic Control Devices.

3. All hazardous materials including, but not limited to, gasoline, solvents, and other similar materials shall be stored in a safe and protected manner, in accordance with City and health regulations.

F. Equipment:

1. Contractor shall provide and maintain all equipment to perform the work.

8-6 SUBMITTALS

- A. Modifications and Revisions:** Contractor shall submit proposed modifications and revisions prior to performing work.

- B. As-Built (Record) Drawings:** Upon final completion of the work, the Contractor shall furnish accurate, up-to-date RECORD drawings that include as-built conditions and any and all changes from the original plans made during the installation of the improvements.

- C. Operation Manuals, Maintenance Instructions and Warranties:** Prior to final acceptance of work, the Contractor shall provide to the City three copies of manufacturers' written operation and maintenance instructions for all equipment installed within the public right-of-way or within areas that the City may be responsible for maintenance and operation.

The Contractor shall provide a signed letter to the City guaranteeing that the irrigation system has been installed free from defects in materials and workmanship and that the work has been completed in accordance with the drawings and specifications. The letter shall state an agreement, by the Contractor, to repair or replace any defects in materials or workmanship that may develop within one year following final acceptance.

- D. Soils Evaluation:** The Contractor shall obtain a soil evaluation of all native or import topsoil for use within the area that work is to be performed. Total number of samples shall be based on accepted standards of the industry. A minimum of four (4) one-quart samples shall be evaluated by a City approved soil testing facility. All samples shall be obtained, tested and with test results submitted to the Engineer for review 14 days prior to beginning work. No material shall be delivered to the site, graded on-site, or otherwise modified until the Engineer approves the material.

- E. Submit a list of soil amendments and fertilizers to be used per the soils tests and a schedule identifying:**

1. When amendments and fertilizers will be on site.

2. How and where they will be stored.
 3. When they will be integrated into planting.
 4. Where empty containers will be kept on site.
- F.** Two (2) weeks prior to planting, Contractor shall submit a list of project plant material to the City for review and approval. This list shall identify:
1. Botanical and common name.
 2. Container size.
 3. Source and location.
 4. Minimum height and spread specifications for each type of material identified on the plant legend.
- G.** Amendment Samples: The Contractor shall provide a one-quart sample of each proposed amendment to a City approved soil testing facility for their testing for conformance to these specifications. No material shall be delivered to the site until the Engineer approves the samples.
- H.** Substitute Plant Material: The Contractor shall submit notice to the Engineer indicating any unavailable plant material and include proposed plant substitutions. No substitute plants shall be ordered or delivered prior to written acceptance by the Engineer.
- I.** Post-Amendment Soils Report: Prior to the beginning of the maintenance period, the Contractor shall obtain a soil evaluation of amended topsoil from the site. A minimum of four (4) one-quart samples shall be evaluated by a City approved soil testing facility. All samples shall be obtained, tested and with test results submitted to the Engineer for review and verification of compliance with pre-amendment soil testing recommendations.

8-7 INSPECTIONS

The Contractor shall specifically request, at least two days in advance, the following reviews prior to progressing with the work:

1. Completion of rough grading
2. Verification of amendment incorporation depths
3. Finish grade

4. Plant material approval
5. Plant layout
6. Substantial completion

8-8 SCHEDULING

Scheduling of start and completion shall be agreed upon in writing between the Contractor and the City.

8-9 SUBSTITUTIONS

Substitutions of any item shall not be permitted without prior written approval of the City Engineer.

8-10 PREPARING PLANTING AREAS

Existing flow lines shall be maintained while preparing planting areas.

Material displaced by the Contractor's operations which interferes with drainage shall be removed and disposed of as directed by the City Engineer.

In planting areas where native topsoil is to be left in place, cross rip to a depth of ten inches (10"). Then incorporate amendments to a homogeneous blended soil depth of six inches (6").

Soil shall be cultivated until the condition of the soil is loose and fine-textured to a depth of six inches (6"). Alternately the top six (6") of soil may consist of quality imported top soil homogeneously blended with required amendments.

The top two inches (2") shall be clear of stones, debris and incompatible foreign matter.

Rock and other debris, larger than one inch (1") in diameter, which is brought to the surface during soil preparation, shall be properly disposed of off the project site by the Contractor.

Finish grade of all planting areas shall be reviewed and approved by the Engineer before proceeding with planting.

After 14 days, the area shall be allowed to dry to a condition that any spray equipment will not damage the existing grades.

Weeds shall be sprayed with an approved, post-emergent herbicide, which controls both broadleaf plants and grasses, but which will not contaminate the soil. Substances shall be approved by the City Engineer prior to use.

The use of rubber-tired equipment will be permitted for cultivating operations provided that any unacceptable compaction caused by the equipment used is completely corrected, to the satisfaction of the City Engineer.

Soil in lawn areas adjacent to curbs or paved areas shall be graded so that after settlement, the soil shall be no more than one-half inch (1/2") below adjacent paving.

Plant pits shall be excavated and prepared in accordance with the standard details. Backfill material for the sides of the plant pits shall be a mixture of soil amendment and soil. The proportion of material per plant pit and the quantity of soil amendment shall be as determined by soils analysis, and sufficiently consolidated or surcharged so that after settlement, the backfill material in the plant pit will be even with finish grade. The materials shall be thoroughly mixed to the bottom of the plant pit so that they are evenly distributed and without clods or lumps.

8-10.1 Soil Amendment

Soil amendments shall be the following types, unless otherwise indicated and approved on the Plans.

- A. Organic Amendment shall be composted bark composed of ninety-five (95%) of the material passing through a one-fourth inch (1/4") screen, fifty percent (50%) through a one-eighth inch (1/8") screen. Material shall be stabilized with Nitrogen (1/2 lb. actual nitrogen per cubic yard) and shall not contain more than 5,000 ppm soluble salt. The material shall weigh a minimum of 450 pounds per cubic yard by dry weight. Identifiable wood pieces are acceptable but a balance of material should be soil-like in appearance without recognizable grass or leaves.
- B. No planting shall be allowed until all soil amendment delivery tags are received and quantities used are approved by the City Engineer.

8-10.2 Commercial Fertilizer

Fertilizer composition and quantity shall be determined from soils analysis results.

Commercial fertilizer shall be uniformly sized, in a homogenous pellet form and shall be guaranteed to comply with the chemical analysis specified in the Commercial fertilizer, and shall be noted and approved on the plans.

Before applying any fertilizer, the Contractor shall provide the following submittals to the City Engineer for approval.

1. Written description of the material to be used.
2. Rate of application.
3. Method of application.
4. Name of applicator.
5. Diagram of area to which material is to be applied.

8-11 PLANTING - GENERAL

Plantings shall be in accordance with the following provisions and approved by the City Engineer:

- A. Landscaping shall comply with the State Model Water Efficient Landscape Ordinance (MWELo).
- B. Plants shall be the variety and sizes shown on the Plans and shall conform to the requirements of these specifications.

Minimum quality of all plant material shall conform to prevailing published specifications of the California Association of Nurserymen and the American Association of Nurserymen's "American Standard for Nursery Stock", and the California Department of Forestry and Fire Protection "Specification Guidelines for Container-Grown Landscape Trees" unless otherwise indicated or approved by the Engineer.

- C. No planting shall be done in any areas until the area concerned has been prepared in accordance with these Specifications and the Special Provisions and presents a neat and uniform appearance satisfactory to the City Engineer.
- D. Planting shall not be allowed in any area which in the opinion of the City Engineer is too wet or dry or in any other way unacceptable for planting.
- E. No more plants shall be placed than can be completed and watered on that day.
- F. Plants shall be set in the backfill material in flat bottomed holes to such depth that after the soil has settled the top of the plant ball shall be one inch (1") above the bottom of the basin or even with the surrounding soil where there is no basin. Plants shall be planted in such a manner that the roots will

not be restricted or distorted. Soil shall not be compacted around the roots or ball of the plant during or after planting operations.

- G.** Any plants which have settled deeper or stand higher than specified in the above paragraph shall be adjusted to required level or replaced at Contractor's option.
- H.** Plants shall be spaced as indicated in the Contract Documents. Plants in adjacent rows shall be staggered. Groundcover plants shall not be planted closer than three feet (3') to trees or shrubs nor closer than eighteen inches (18") to curbs, paved areas and fences, unless otherwise shown on the Plans.
- I.** Planting areas that have been compacted for any reason, either before or after planting, shall be re-cultivated by the Contractor, at Contractor's expense.
- J.** Trees, shrubs and vines in ground-cover areas shall be planted before groundcover plants or cuttings are planted.
- K.** At the time the plants are planted, stakes shall be placed at certain plants and the plants shall be tied thereto. The plants to be staked and the size of stake and number of ties to be installed shall be as shown on the Plans or specified in the Special Provisions. Stakes shall be placed against, but not through, the plant ball and shall be placed 90 degrees from the prevailing wind.
- L.** Soil shall be watered so that the soil is moist, not soggy, or dried out.
- M.** From the time plants are planted until the beginning of the plant establishment period, plants shall be watered, trash and debris shall be removed daily, weeds shall be controlled and replacements shall be made.
- N.** At the time of planting, commercial fertilizer shall be applied to all trees, shrubs, vines, groundwater areas and lawn areas as specified in the Contract Documents

Upon review, the City reserves the right to conduct a site investigation of the proposed plant materials. Contractor shall demonstrate to the City Representative that all plant material has been located and reserved for the project.

All plants shall comply with Federal and State laws requiring inspection for plant diseases and infestations. Any inspection certificates required by law shall accompany each shipment of plants and certificates shall be delivered to the Engineer.

The Contractor shall obtain clearance from the County Agriculture Commissioner as required by law before planting plants delivered from outside the County. Evidence that such clearance has been obtained shall be filed with the City Engineer.

All plants furnished by the Contractor shall be true to type or name as shown on the Plans and shall be tagged in accordance with the standard practice recommended by the American Association of Nurserymen.

Contractor furnished plants shall be healthy, shapely and well rooted. Roots shall show no evidence of having been restricted or deformed. Plants shall be well grown, free from insects, disease or mechanical injury. No plants shall be transplanted to any planting area that is not thoroughly wet throughout the ball of earth surrounding the roots.

Plants may be inspected by the Engineer prior to planting. Any plants rejected shall be removed from the site and replaced by the Contractor, at Contractor's expense.

8-11.1 Planting – Shrubs, Vines and Groundcover

Shrub, vine and groundcover planting shall be in accordance with the following provisions and approved by the City Engineer:

- A.** Where vines are to be planted against walls or fences, the plants shall be as close as practicable to the wall or fence as shown in the plans.
- B.** Where shrubs are shown on the Plans to be planted in groups, the outer rows shall be parallel to the nearest pavement or fence.
- C.** Any adjustment in the number of plants shall be made between the outer rows.
- D.** Ground cover plants in areas equipped with an irrigation system shall be planted in blocks which conform to the design of the irrigation system. The area covered by one unit of the irrigation system shall be as completely planted as possible, and then watered. Not more than one (1) hour shall elapse from the time any groundcover is planted until it has been watered, unless otherwise specified in the Contract Documents or authorized by the City Engineer.
- E.** Groundcover plants shall be planted in moist soil and in neat, straight rows parallel to the nearest pavement, curb or fence, unless otherwise previously approved by the City Engineer in a planting plan.

8-11.2 Planting - Trees

Tree plantings shall be in accordance with the following provisions and approved by the City Engineer:

- A.** Trees shall have soil removed down to the buttress roots. Roots shall be teased out to get correct spread and direction for correct growth of tree with minimal damage to the existing root system. Plants shall be removed from the containers in such a manner that the ball of earth surrounding the roots remains intact, and they shall be planted and watered as hereinafter specified immediately after removal from the containers.
- B.** After planting, trunk flares (root crown) of trees shall be evident and free of any container soil and/ or planting backfill. The root flare shall be slightly above the surface of the surrounding soil at all times.
- C.** When planting on a sloped site, the top-most root in the root ball shall be even with the grade on the uphill side of the tree.
- D.** Tree stock shall be protected from excessive vibration, should not be thrown or bounced off mobile equipment. Trees shall not be dragged, lifted or pulled by the trunk or foliage in a manner that will loosen the root ball.
- E.** Trees shall exhibit no circling root conditions or evidence of untreated root bound container stock.
- F.** Trees shall be planted in an upright position.
- G.** Tree planting pits shall be backfilled to avoid large air pockets or voids within the backfill soil profile.
- H.** All synthetic materials (i.e. string, rope, plastic, etc.) shall be removed from the tree trunk and root ball prior to planting and shall not be evident within the backfill soil mix.
- I.** Any support trunk staking supplied with the container tree shall be removed prior to planting.
- J.** Trees located in parkway strips shall be provided with a 5-foot bark mulch area around their trunk.
- K.** Tree Stakes for all trees shall be Reddy Stakes (9-foot size) as available from Horizon.
- L.** Trees planted in grass shall be provided with ArborGard Tree Trunk Protectors or other as approved by the City Engineer.

- M.** Root Barriers shall be polyethylene or materials with similar characteristics specifically manufactured for the purpose of redirecting root growth away from sidewalk or paved areas. Barriers shall be assembled and interlocked together to form one continuous barrier at the locations and depths as shown on the plans.

8-12 **PLANT ESTABLISHMENT**

Plant establishment work shall consist of caring for the project landscape planting.

Plant establishment period shall continue through final acceptance of the project, and plants shall thrive showing proper growth characteristics through the warranty period.

The Contractor shall fill trench settlement, adjust sprinkler heads, water plants, replace unacceptable plants and lawn areas, and perform weed, rodent and other pest control work to the satisfaction of the City Engineer.

Lawns first cut shall be mowed when grass is no less than three inches (3") high and shall be cut to a height of no less than one and one-half inches (1-1/2").

Thereafter, lawn shall be mowed as often as necessary to maintain a maximum height of one and one-half inches (1-1/2").

Weed control, shall be performed as often as required to prohibit interference with plantings and to maintain the project in a neat and uniform condition to the satisfaction of the City Engineer.

At the time of final acceptance of the work, all planted areas shall be weed free and neatly mowed, as applicable, and shall receive a second application of fertilizer as determined by the City Engineer.

Surplus earth, papers, trash and debris, in any planted areas shall be removed and disposed of. The planted areas shall present a neat and clean condition at all times.

8-13 **WEED CONTROL**

Bermuda grass and other weeds in the areas to be planted with trees, shrubbery and groundcover shall be completely killed and removed. After planting, above areas shall be treated with pre-emergent such as "Surfland", or approved equal.

Before applying any chemicals, the Contractor shall provide the following information and obtain written approval of the materials to be used from the City Engineer:

1. Material Safety Data Sheets
2. Rate of application
3. Method of application
4. Name of applicator
5. Diagram of area to which material is to be applied

If special permits are required for the materials to be used, they shall be obtained from the County Agriculture Commissioner or appropriate authority, and submitted with the request for the use of the materials.

8-14 **WATERING**

Water from facilities within the limits of the project may be obtained as noted in the development agreement.

Water conservation principles are strongly recommended. Watering shall be done between the hours of 10:00 p.m. and 6:00 a.m. whenever possible.

All plants shall be watered immediately after planting. Water shall be applied in a moderated rate until the backfill soil around and below the roots or ball of earth around the roots of each plant is thoroughly saturated.

Following planting, provide a minimum of weekly watering during the dry season for all trees.

Precautions shall be taken to prevent water from wetting vehicles, pedestrians and pavement. Any erosion or slippage of the soil caused by watering shall be repaired by the Contractor, at Contractor's expense.

Compliance with the provisions in this section shall not relieve the Contractor of the responsibility for the replacement of plants. Any additional watering measure required to maintain the plants in growing condition shall be furnished by the Contractor, at Contractor's expense.

8-15 **START OF MAINTENANCE PERIOD INSPECTION**

After all planting work is completed the Contractor shall schedule the pre-final inspection with the City Engineer.

8-15.1 Pre-final Inspection

In preparation for entering the maintenance period, the Engineer, Landscape Architect and Contractor will conduct a pre-final inspection. The City Parks Superintendent and the maintenance personnel who will be responsible for the project will be present to acquaint them with the operational requirements of the project and any submitted O&M manuals or operating instructions. At this time, all systems shall be tested and proper operation verified.

8-15.2 Replacement

All plants or lawn areas that show signs of failure to thrive anytime or which are injured or damaged as to render them unsuitable for the purpose intended as determined by the City Engineer shall be removed and replaced. The City Engineer may inspect the work weekly or at any interval of time at City discretion and will mark or otherwise indicate all plants or lawn areas to be replaced. The Contractor shall complete replacement of unsuitable plants or lawn areas within one week of notification.

Replacement plants shall be furnished and planted by the Contractor, at Contractor's expense. The City Engineer may agree to the substitution of alternative species of plants to be used as replacements.

Any damage to the finish grading prior to final acceptance caused by re-planting operations and/or vandalism shall be repaired and re-planted by the Contractor, at Contractor's expense. Damage caused by premature or heavy use of facilities before final acceptance will be determined by the City Engineer.

Lawn damages shall be repaired before final inspection but will not automatically be considered cause for extending the maintenance period.

Lawn or plant failure caused by improper maintenance practices and/or weather shall be removed and re-planted.

8-15.3 Maintenance and Warranty Period

The Maintenance period shall begin immediately after the (60) day plant walk of public improvements.

All landscaping shall be maintained for a minimum period of ninety (90) days after pre-final inspection/substantial completion, unless otherwise indicated by the City Engineer.

The warranty period for the landscaping portions of the work (trees, shrubs, plants, grass, irrigation system, etc.) will begin after the installation of all landscape items are complete in accordance with the Plans and Specifications. Unacceptable

landscape items must be replaced and final inspection performed by the City Engineer before final acceptance is granted.

Contractor shall be responsible for defective materials and faulty workmanship at all stages of the work in progress. Upon relinquishing care, custody, and control of the improvements, the Contractor shall be responsible for defective materials and faulty workmanship for one year for all plant materials (including trees) and all other work.

Any damages to site improvements and facilities under the Contractor's control shall be corrected prior to acceptance of said improvements.

8-15.4 Final Inspection

At the end of the maintenance period a final inspection will be held. If all items listed on the punch list are corrected and no other problems have developed, the landscape portion of the project will be accepted and the Contractor will be relieved of responsibility for the work, except for maintenance, warranties or guarantees. The Contractor shall schedule the final inspection with the City Engineer.

END OF SECTION

SECTION 9 IRRIGATION SYSTEM STANDARDS

9-1 GENERAL

Irrigation system shall include all appurtenances, incidentals and accessories required for proper installation and operation of the system.

All irrigation systems shall be designed in accordance with the State of California Model Water Efficient Landscape Ordinance and LMC 17.92.

9-2 MANUFACTURER'S WARRANTIES

Manufacturer's warranties, guarantees, instruction sheets and parts lists furnished with articles or material incorporated in the work, shall be delivered to the City Engineer prior to acceptance of the product.

9-3 GUARANTEE

The sprinkler system shall be guaranteed for a period of one (1) year from date of project acceptance. Should any trouble develop within the time specified above due to faulty workmanship or materials, the problem shall be corrected by the Contractor, without expense to the City.

Any settling of backfilled trenches during the one (1) year period after acceptance shall be repaired by the Contractor, at no expense to the City, including the restoration of all damaged property.

9-4 RECORD DRAWINGS

The Contractor shall furnish the Engineer with "As-Built" Record drawings showing any changed or differing site conditions, locations and depths of pipes and valves, etc. The irrigation system will not be accepted until "As-Built" Record drawings are furnished and accepted by the City.

9-5 WATER TAPS ON CITY MAINS

All taps into existing City mains or active service lines shall be "hot taps" made by approved personnel/Contractor at Contractor expense. No taps will be made until tap fees have been paid to the City (refer to the City's Comprehensive Fee Schedule).

Contractor shall provide traffic controls, to the City's satisfaction, when a tap is occurring in the road right-of-way.

The Contractor shall excavate and fully expose the water main to be tapped and the Contractor will provide all material approved via submittals necessary to perform the water tap. The Contractor shall be responsible for trench shields (as required), backfill compaction, final grading, and pavement replacement (if applicable) over the water main.

The Contractor shall make the necessary arrangements with the City to have City crews available to make all hot taps into the city systems.

9-6 CONNECTIONS TO EXISTING LANDSCAPE MAINS

Connections to existing park landscaping water mains will be witnessed by the City. The contractor, with proper license, shall perform excavation, expose the main, and provide and install necessary trench safety.

The Contractor shall pay all costs associated with making taps to an existing water line.

City crews will make necessary shutdowns of existing facilities as required.

9-7 SALVAGE

Unless otherwise specified, all salvageable material and equipment removed from the present installations which are not to be reinstalled shall be delivered in good and clean condition to the Parks and Recreation Department at the City Municipal Corporation Yard.

9-8 CONDUIT

Conduits shall be either mild steel, rigid, hot dipped galvanized or Schedule 40 polyvinyl chloride (PVC). The same type of conduit shall be used for the entire system.

- A. Requirements for Mild Steel, Rigid Conduit: The rigid steel conduit shall be thoroughly cleaned and all burrs removed. The use of thin-wall conduit is specifically prohibited for underground installation.

Exterior and interior surfaces of all conduit and fittings shall be uniformly and adequately zinc coated by the hot-dipped galvanizing process. The interior and exterior of a six inch (6") sample cut from the center of a standard length of conduit when tested shall not show a fixed deposit of copper after four, one-minute immersions in the standard copper sulfate solution.

The interior of the conduit shall have a continuous coating of lacquer or enamel. Each length shall bear the label of Underwriters' Laboratories, Inc. Installation shall conform to appropriate articles of the Code.

Rigid steel conduits shall be not less than two inches (2") in diameter. Contractors, at their own expense and discretion, may be allowed to use larger size conduit, upon request. Where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. No reducing couplings shall be permitted in any run. All conduit bends, except factory bends, shall have a radius of not less than six (6) times the inside diameter of the conduit. Where factory bends are not used, conduit shall be bent, with approved hydraulic bender, without crimping or flattening, using the longest radius practicable. All conduit ends shall be sealed with a slip on cap until wiring is started. When caps are removed, conduit ends shall be provided with approved conduit bushings.

Conduit stubs, caps, exposed threads and all standard screw joints shall be painted with zinc rich paint or an equal rust preventative paint.

All mild steel, rigid conduits, where exposed to a corrosive environment, must be OCAI or approved equal. All conduit openings mild steel, rigid and PVC whether used or spare must be identified and sealed with duct seal.

- B.** Requirements for Schedule 40 Polyvinyl Chloride Conduit: Polyvinyl Chloride conduit (PVC) shall be ninety degrees (90°) C rated and listed by Underwriters' Laboratories. Conduit shall conform to NEMA Standards and be in conformance with Article 347 of the California Electrical Code. Conduit, fittings and cement shall be produced by the same manufacturer, who shall have at least five (5) years' experience manufacturing the product. Material shall have a minimum tensile strength of 7,000 psi at 73.4°F; flexural strength of at least 11,000 psi and a minimum compressive strength of 8,600 psi. All joints shall be solvent welded in accordance with the manufacturer's recommendations.

All PVC conduits shall be not less than two inches (2") in diameter. Contractors, at their own expense and discretion, may be allowed to use larger size conduit, upon request. Where larger size conduit is used, it shall be for the entire length of the run. All conduit ends shall be sealed with a slip on cap until wiring is started. The slip on cap shall have a slot large enough for a pull rope. Unless otherwise specified, all PVC conduits shall contain one No. 10 green ground conductor.

- C.** Conduit Installation: The installation of conduit in lawn areas shall be by approved boring method or by trenching. If trenching is used, Contractor shall first remove the sod prior to trenching. The removal of sod over jack

holes or over trenches shall be done by a sod cutting machine. Removal of sod by other means shall not be accepted. Each strip of sod removed shall be rolled into a neat roll without damage. All sod removed shall be replaced within forty-eight (48) hours. Conduits in existing paved streets shall be installed by approved jacking, drilling or trenching methods.

Minimum cover for conduits is twenty-four inches (24") to finish grade.

Conduit runs to be located under street pavement shall be installed within a minimum of twelve inches (12") and a maximum of eighteen inches (18") from and parallel to the lip of gutter, by using the "Trenching Installation of Conduit in Paved Streets" method (see sub-section D below). Installation of additional conduits at street intersections may be required, at the discretion of the City Engineer, to support known and potential future telecom requirements. All pull boxes shall be located behind sidewalks or as shown on the Plans.

When a conduit is shown on the Plans as lying in a straight line parallel to the curb line, sidewalk, or pavement edge, it shall not deviate more than six inches (6") to either side of that parallel line.

In order to verify that conduit is laid to the correct depth and in as straight a line as possible, the Contractor shall trace the route and mark the horizontal and vertical location of the conduit at regular intervals. For open trench installations, leave conduit exposed at regular intervals not to exceed seventy-five feet (75'). Backfill trenches after city inspection and approval.

The bending of PVC conduit shall be by a hot box bender.

Before any wire is pulled in the conduit system, all conduits shall be swabbed out to remove any foreign material that is in the conduit. The removal of foreign material from the conduit with compressed air is acceptable. A pull rope and one bare copper conductor shall be installed in all empty conduits.

Conduit entering controller or service cabinets shall be sealed to prevent the entrance of gases by the use of paraffin or other sealing compound approved by the City Engineer.

Five inch (5") conduit nipples shall be attached by use of a coupling to any conduit run which terminates inside signal standards. Top of nipple shall be two inches (2") above the finished grade of the signal standard foundation.

- D.** Trenching Installation of Conduit in Paved Streets: Conduit shall be placed under existing pavement in a trench approximately two inches (2") wider than the outside diameter of the conduit to be installed. Trench shall not exceed six inches (6") in width. Place conduit a minimum of six inches (6") below the top of the aggregate base or subgrade (if no AB) or twenty-four inches (24") below finish pavement grade, whichever is deeper.

All pavement to be removed shall be cut full-depth with a diamond blade saw or with a rock cutting excavator specifically designed for this purpose. Cuts shall be neat and true with no shatter outside the removal area.

The trenching machine shall be shielded to prevent loose material from being thrown away from the machine. Loose material deposited on the pavement behind the cutting machine shall be removed from the pavement immediately and the pavement cleared to allow the passage of traffic. Only those traffic lanes occupied by the cutting machine and the cleanup operation shall be closed and they shall be opened as soon as the work has moved sufficiently to clear them.

The conduit shall be placed in the bottom of the trench and the trench shall be backfilled with commercial quality concrete containing not less than 590 pounds of cementitious material per cubic yard to 0.15 foot below the pavement surface. The concrete shall be tamped or vibrated to provide a dense material free from excessive voids and rock pockets.

The top 0.15 foot shall be backfilled with HMA. Apply tack coat to the edges of the existing asphalt pavement immediately prior to paving.

Spreading and compacting of HMA shall be performed by any method which will produce a uniformly dense, smooth finish surface.

Excavation, installation of conduit and concrete backfill shall be completed within the same working day. HMA placement shall be completed within twenty-four (24) hours after excavation off trench. Apply seal coat to new pavement overlapping existing pavement by two to three inches.

9-9 **BACKFLOW PROTECTION ASSEMBLIES**

Backflow prevention assemblies shall conform to Section 4, Engineering Design Standards.

Original backflow test results are to be provided to the City's Engineering Department immediately following installation.

9-10 IRRIGATION CONTROL VALVES AND VALVE BOXES

Irrigation control valves and valve boxes shall be of the type shown on the Plans and shall conform to the Standard Specifications or as indicated in this section.

Installation shall be in the location indicated on the Plans and shall conform to the Standard Details of these Specifications, unless otherwise approved by the City Engineer.

Valves shown in-groups shall be in individual valve boxes, set in an orderly manner to provide easy access and accessibility to each valve.

Valve boxes shall be installed in accordance with the Standard Details or as shown on the approved plans.

9-11 VALVE MANIFOLDS

Valve manifolds shall be constructed of Polyvinyl Chloride (PVC) Schedule 80 nipples and fittings.

9-12 SWING JOINT ASSEMBLIES

A. For rotors, risers and elbows shall be Schedule 80 PVC. The horizontal nipple shall be Schedule 80. Optionally, rotor swing joints may be pre-made assemblies as manufactured by Rainbird, Hunter or other as approved by the City Engineer.

B. For spray heads, all Swing joint shall be pre-made assemblies as made by Rainbird, Hunter or other as approved by the City Engineer.

9-13 SPRINKLERS

Sprinklers (spray heads and rotors and bubblers) shall be as listed below and shall conform to the drawings shown in the Standard Details, unless otherwise shown and approved on the plans.

A. Spray Heads: shall be Rain Bird 1800 MPR series with check valve with 6" risers where located in turf areas and 12" risers where located in shrub areas.

B. Rotor Heads: shall be Hunter I-20, 25, 35 or 40 series with stainless steel risers and check valves.

C. Tree Bubblers: shall be Rain Bird RWS (Root Watering System) with 1300 or 1400 series bubbler, or approved equal. Two bubblers shall be provided per tree.

- D.** Shrub Bubblers: shall be Rain Bird 1300 or 1400 series bubblers. One bubbler shall be provided per shrub.

Installation shall conform to the drawings shown in the Standard Details of these Specifications, unless otherwise shown and approved on the plans.

9-14 TRENCHES

Trenches shall be straight with vertical sides and smooth bottoms, with a consistent and even laying grade and depth that follows the contour of the surface.

Provide a minimum twenty-four inches (24") of cover for all pressure lines three-inches (3") in diameter and larger and eighteen inches (18") of cover for all pressure lines two-inches (2") in diameter and smaller.

Provide minimum twelve inches (12") of cover for all lateral lines.

Provide a minimum eighteen inches (18") cover for all control wiring. If in the same trench as an irrigation line, tape bundled wires to the water main at ten-foot intervals.

Provide a minimum twenty-four inches (24") of cover for all sleeves crossing pavement and drives, and extend a minimum of twelve-inches (12") past edge of concrete, asphalt or other finish surface ways into the planting area.

All trenches shall be wide enough to permit easy access for installing pipe, wire, etc. and allow enough width for snaking of PVC pipe, to allow for expansion and contraction. Trench width shall be a minimum of 2-1/2 times the size of the pipe.

Daily trench excavation shall be limited by the amount of pipe laying that can be completed that day or as is permitted by the City Engineer. Excavated material shall be stored in a manner that will not endanger pedestrians, the work and will avoid obstructing the traveled right-of-way, sidewalks and driveways. Open trenches and mounds of dirt and debris will be so marked and lighted as to provide safety to pedestrians and vehicles.

Any open excavations along a sidewalk or other type of public travel way shall be plated or covered and barricaded as necessary to prevent access to the area.

Trenches shall be of sufficient width to permit snaking in of all plastic piping in bottom of trench not connected by ring or gasket joint pipe. Pipe connected with ring or gasket joint pipe need not be snaked.

9-15 INSTALLATION OF IRRIGATION PIPE

Plastic pipe, including fittings, shall be installed according to the Manufacturer's directions and as directed by the Engineer.

Concrete thrust blocking shall be Portland Cement Concrete for minor concrete (550lbs) 6 sack and shall conform to Section 90 of the latest Caltrans Standard Specifications.

The quantity of concrete used shall be sufficient to provide adequate monolithic bracing against undisturbed soil.

Installation of irrigation pipe shall be as shown on the Plans and in accordance with these Specifications.

In all situations where an irrigation pipe is to be installed under concrete, asphalt pavement or any type of pedestrian or vehicle-traveled finish surface, an irrigation sleeve shall be installed. The sleeve shall be Schedule 40 PVC. The sleeve shall be 2.5 times the outside diameter of the proposed irrigation pipe to be installed.

Installation shall be in the location indicated on the plans and shall conform to the drawings in the Standard Details of these Specifications, unless shown and approved otherwise on the plans.

Plastic irrigation pipe shall be placed in trenches on level, undisturbed or well compacted earth and shall be snaked from side to side in the trench at intervals of approximately fifty feet (50'). Pipe shall be held down between joints with minimal mounds of earth to adequately prevent movement.

Foreign material shall be prevented from entering the irrigation system during installation. Immediately prior to assembling all pipes, valves and fittings, all valves shall be plugged or capped pending the attachment of additional pipe or fittings. All lines shall be thoroughly flushed out prior to attachment of terminal fittings.

Pipe shall be cut with a fine tooth hacksaw and all burrs removed. The outside surface of the pipe and the inside surface of the fittings shall be wiped with a clean cloth to remove all dirt and moisture before the cement solution is applied. The cement solutions shall be applied to the pipe and fitting socket with a brush having a width approximately three-quarters (3/4) of the depth of the socket. The cement solution shall be applied freely with a light wiping acting to spread the cement uniformly over the surface. The pipe surfaces or fitting socket shall not be rubbed with the brush any more than is necessary to spread the cement. If the cement thickens before parts are connected, the coated fittings shall be discarded. Solvent weld connections on the supply side of valves shall first be cleaned with Weld-on

Solvent No. P-70 or equal. Cement solution shall be Weld-on Solvent No. 2711, or approved equal.

Immediately after the cement has been applied to the surface to be joined, the pipe shall be inserted into the fitting with a twisting motion to the full depth on the fitting socket. Immediately after joining is completed, any excess cement shall be thoroughly wiped from the pipe and fitting. The jointed members shall be allowed to cure for at least five (5) minutes before they are handled. An additional fitting or pipe section may be added to the completed joint within three (3) minutes if care is exercised in handling so that strain is not placed on the previous joint.

The male pipe threads of all threaded connections on PVC plastic pipe shall be coated with a joint compound suitable for use with plastic pipe.

Contractor shall install #10 bare copper tracer wire, taped using PVC tape, to the mainline per the Standard Detail W-36.

9-16 TESTING OF IRRIGATION SYSTEM

After laying and before backfill and compaction, irrigation mains and laterals shall be tested for leakage.

Once heads are placed and adjusted by Contractor, layout of sprinklers shall be tested for head to head coverage.

Authorized City personnel or Landscape Architect shall monitor and record all pressure testing and verify sprinkler coverage.

- A. Pressure Test for Irrigation Main: Mains shall be tested and proven watertight under hydrostatic pressure at 125 lbs per square inch.

Sustain pressure in lines for at least two (2) hours without pressure drop. If pressure drop occurs within two (2) hours, identify and replace deficient area and repeat test until such time as no pressure drop occurs.

The Contractor shall provide the necessary pump and other testing equipment required for this test. The test gauge shall be a sealed oil filled gauge.

- B. Pressure Test for Irrigation Laterals: Laterals shall be tested as specified above, except that the test period shall be a minimum of thirty (30) minutes. The pipe shall be plugged or capped where sprinklers are to be installed while making this test.
- C. Sprinkler Coverage Test: The risers for sprinklers on slopes shall be set approximately perpendicular to the slope. Each series of sprinklers shall be

installed and test operated. Nozzles of all sprinklers and bubblers shall be adjusted for proper rate of flow and coverage. Sprinklers or bubblers shall be relocated as required to produce uniform coverage.

9-17 **BACKFILL OF IRRIGATION PIPELINES**

All lumber, rubbish, and rocks shall be removed from trenches and backfill material. Ensure that the pipe will have a firm, uniform bearing for the entire length of each pipeline, to prevent uneven settlement.

In rocky areas, the pipe shall be laid on a minimum of four inches (4") of sand and covered with four inches (4") of sand to prevent rock damage to pipe.

Trenches shall not be backfilled until all required pressure tests are performed, and then carefully backfilled after pipe and wire have been installed. Excavated materials approved for backfilling, consist of earth, loam, sandy clay, and sand, free from large clods or stones. All backfill shall be compacted by mechanical compaction method to the same relative compaction as the surrounding soil. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill shall conform to adjacent grades without dips, sunken areas, humps, or other surface irregularities.

A fine granular material backfill shall be initially placed on all lines. No foreign matter larger than one-half inch (1/2") in size shall be permitted in the initial backfill.

If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the City.

The top six inches (6") of backfill in planting areas shall consist of select excavated material, free of rocks, debris, vegetative material, and other unsuitable material.

Backfill in street sections shall be per City Standards.

Special backfill requirements may be set forth and noted on the plans as approved by the City Engineer.

9-18 **RE-PAVING**

Re-paving over trenches shall be as specified in these Design and Construction Standards, unless otherwise shown and approved on the plans.

9-19 PLASTIC IRRIGATION PIPE

Plastic pipe for irrigation systems shall be polyvinyl chloride (PVC) plastic pipe extruded from one hundred percent (100%) virgin material and shall conform to ASTM Designation D2241.

All pipes that carry recycled water shall be per Section 7, Recycled Water Standards, of these Standards.

Plastic pipe on the supply side of the irrigation side of the irrigation control valve shall be one or more of the following types:

- A. 1-1/2" or smaller shall be Schedule 40, PVC solvent weld pipe.
- B. 2 - 3" shall be PVC, Class 315 solvent weld pipe.
- C. 4" and larger shall be Class 200, PVC Gasket Joint.

Plastic pipe on the discharge side of the irrigation control valve shall be Schedule 40, PVC Class 200 solvent weld pipe.

9-20 PLASTIC IRRIGATION PIPE FITTINGS

Fittings for PVC plastic pipe shall be rigid polyvinyl chloride, Schedule 80 high impact fittings and shall be solvent weld type or threaded as shown in the plans and details. Plastic fittings shall have a higher bursting pressure rating than the adjoined pipe.

All joints utilizing ring type fittings and pipe shall be sealed with rubber rings. Fittings shall be of the joint design as recommended by the manufacturer. Ring type plastic pipe and fittings shall be assembled with a non-toxic lubricant as recommended by the manufacturer.

9-21 ELECTRIC AUTOMATIC CONTROLLER

Contractor shall program a base watering schedule into the irrigation controller that accommodates the City watering window.

The controller shall be capable of being operated manually at any time. A manual "single station" operation for programmed time or new time setting shall be possible without affecting the original program.

Controller shall have a factory preset back-up program for standby operation in the event of a program loss and a battery back-up circuit to maintain power during power loss.

The controller shall be as manufactured by Calsense, or approved equal.

Electric Controller Enclosure Cabinet shall be fabricated from stainless steel as manufactured by Calsense, or approved equal.

Irrigation controllers shall be installed by a licensed electrician.

9-22 **ELECTRIC CONTROL WIRES**

Conductors shall be buried directly in the ground a minimum of eighteen inches (18") below the surface and shall follow irrigation supply lines whenever possible. Where conductors pass under paved areas, conductors shall be installed in conduit.

Conductors shall be run continuous without splices from controller enclosure to the valve boxes. At valve boxes, splices shall be clamped and sealed with waterproof connectors.

At least one foot (1') of slack shall be left in each conductor at each splice.

Conductors from controllers to Valves shall be wrapped together with electrical tape at ten-foot (10') intervals.

Extend ends of any conduit and conductors one-foot (1') minimum from under any concrete, asphalt or other surface item.

Contractor shall provide (2) two spare yellow or blue wires throughout the entire system.

9-23 **IRRIGATION CONTROL WIRES**

Irrigation Control Conductors shall be underground feeder type (U.F.) with 4/64" minimum thickness of TW grade polyvinyl chloride insulation.

Control conductors shall be No. 14 AWG. Insulation shall be any color except white.

Neutral conductors shall be No. 12 AWG. Insulation shall be white.

9-24 **ELECTRIC REMOTE CONTROL VALVES - SIZES 3/4" TO 2"**

Electric remote control valves shall have a straight or angle pattern. Valves shall be normally closed and shall be the same size as the pipeline, which they control, unless otherwise indicated on the plans and approved by the Engineer.

Electric remote control valves shall be capable of withstanding a working pressure of one hundred pounds per square inch (100 psi).

Valves shall be completely serviceable from the top without removing the valve body from the system and shall have a wheel or nut type manual adjustment feature to regulate flow from fully open to closed. The adjustment shall remain in set position when the valve is operated manually or automatically. The adjustment feature shall regulate automatic closing time to not less than four (4) seconds. Each valve solenoid shall be designed for operation on a 24-volt 60-cycle AC circuit at a 3.1-watt maximum.

9-25 **MANUAL CONTROL VALVES**

Manual control valves shall be straight or angle pattern globe valves of brass or bronze construction with replacement compression discs and shall be of the same size as the pipeline which said valve serves, unless otherwise shown on the Plans. Control valves shall be capable of withstanding a working pressure of two hundred pounds per square inch (200 psi).

9-26 **IRRIGATION VALVE BOXES**

Irrigation valve boxes shall be one of the following types; as indicated on the Plans or in the Special Provisions, or directed by the Engineer:

- A. Portland Cement Concrete boxes with a one-piece concrete or cast iron cover, rated for an H₂O traffic loading shall be as manufactured by Christy, or approved equal.
- B. Plastic boxes conforming to ASTM Designation D638, tensile strength 3400 psi and impact strength of 1.5 pounds per inch shall be as manufactured by Carson Box, or approved equal.

Valve box extensions shall be of the same type as the valve box. All covers shall be lockable and be legibly marked with the valve ID.

9-27 **QUICK COUPLING VALVES**

Quick coupling valves shall be of one (1) piece brass or bronze construction, single slot type with one inch (1") threaded pipe connection and one and one-quarter inch (1-1/4") key connection guaranteed to withstand normal working pressure of one hundred and fifty-pounds per square inch (150 psi) without leakage. Quick couplers shall be installed with swing joint assembly and shall be installed a minimum of one foot (1') from curbs and walks where applicable. Refer to "Testing of Irrigation System," B.17, of this section.

9-28 **BOOSTER PUMPS**

Booster pumps for use shall be by Custom Pump and Power or approved equal.

9-29 RECORD DRAWINGS AND IRRIGATION STATION CHART

Contractor shall regularly update drawings of the irrigation system and mark any changes made to the system during construction. Below ground features shall be indicated with measurements from at least two surface features. All changes to below ground features shall be recorded before trenches are backfilled. A completed record set shall be submitted to the City upon completion of the project.

In addition to the record drawings the contractor shall provide the City with an 11x 17 laminated color coded irrigation station chart.

END OF SECTION

SECTION 10 PARK IMPROVEMENTS STANDARDS

10-1 GENERAL

These general requirements provide conditions for City park improvements including site furnishings, play equipment, and water play/ splash play equipment.

Park improvements shall consist of supplying and installing park hardscape and furnishings as shown on the approved Plans, and as directed by the City Engineer.

10-2 MANUFACTURER'S WARRANTIES

Manufacturer's warranties, guarantees, instruction sheets and parts lists furnished with articles or material incorporated in the work, shall be delivered to the City Engineer prior to acceptance of the product.

10-3 GUARANTEES

All park improvements shall be guaranteed for a period of, at least, one (1) year from date of project acceptance. Any additional guarantee period, as provided under manufacturer's warranties, shall be honored by the Contractor. Should any trouble develop within the time specified above due to faulty workmanship or materials, the problem shall be corrected by the Contractor, without expense to the City.

10-4 MEASUREMENT OF QUANTITIES

Measurement of Quantities shall be determined by the City Engineer based on delivery tags presented at time of delivery. The Contractor shall give twenty-four (24) hours' notice of all deliveries, dates and times. Materials delivered when the City Engineer is not present, depending on verifiability, at City Engineer's discretion, may not be counted.

10-5 CONDITIONS

A. Existing Conditions:

1. Prior to work, the Contractor shall be thoroughly familiar with any surveys and investigative reports directly related to the work to be performed.
2. Contractor shall examine physical conditions at the site, document all conditions differing from those indicated in the contract documents, and inform the City immediately.

B. Site Protection:

1. Trees, shrubs and other materials which are to remain on the site shall be fully protected by constructing a fence around the items to be protected or other method approved by the City Engineer.
2. Refer to Section 8.5-C, Landscape and Planting, of these Standards for additional tree protection requirements.

C. Underground Utilities:

1. Contractor shall notify UNDERGROUND SERVICE ALERT (USA North) at “811” or (800) 227-2600 at least 48 hours prior to commencing any excavation.
2. Contractor shall relocate or remove existing utilities as shown on the plans or as directed by the City Engineer. Where utilities are marked, careful hand excavation shall be done to determine exact alignment and depth prior to starting excavations within marked areas.

D. Safety:

1. Contractor shall at all times exercise necessary precautions to provide for the protection of the public and employees.
2. Adequate barricades, flashers, fences, signs, and markers or lights shall be installed in all hazardous locations including, but not limited to, open excavations and areas of pedestrian and vehicular traffic. All situations requiring traffic control shall conform to the appropriate Caltrans Traffic Control Manuals and the Caltrans Manual of Uniform Traffic Control Devices.
3. All hazardous materials including, but not limited to, gasoline, solvents, and other similar materials shall be stored in a safe and protected manner, in accordance with City and health regulations.

E. Equipment:

1. Contractor shall provide and maintain all equipment to perform the work.

10-6 SUBMITTALS

- A. Modifications and Revisions:** Contractor shall submit proposed modifications and revisions prior to performing work.

- B. As-Built (Record) Drawings: Upon final completion of the work, the Contractor shall furnish accurate, up-to-date RECORD drawings that include as-built conditions and any and all changes from the original plans made during the installation of the improvements.
- C. Operation Manuals, Maintenance Instructions and Warranties: Prior to final acceptance of work, the Contractor shall provide to the City three copies of manufacturers' written operation and maintenance instructions for all equipment installed within the public right-of-way or within areas that the City may be responsible for maintenance and operation.
- D. Catalog Cuts: The Contractor shall submit catalog cuts for each pre-manufactured items.
- E. Shop Drawings: The Contractor shall submit shop drawings for all custom, modified, or shop fabricated item and where required elsewhere on the approved Plans or in these specifications.
- F. Finish samples: The contractor shall supply the City Engineer with samples of all colors and finishes for approval prior to ordering the item.
- G. Playground Safety Inspection certification as described below.

10-7 SUBSTITUTIONS

Substitutions of any item shall not be permitted without prior written approval of the City Engineer. Contractor shall provide all product data, cut sheets, and shop drawings necessary to demonstrate the suitability of a proposed substitution.

10-8 WARRANTY

- A. Contractor shall be responsible for defective materials and faulty workmanship at all stages of the work in progress. Upon relinquishing care, custody, and control of the improvements, the Contractor shall be responsible for defective materials and faulty workmanship for a minimum period of, at least, one year for all park improvements and all other work.
- B. Any damages to site improvements and facilities under the Contractor's control shall be corrected prior to acceptance of said improvements.

10-9 MATERIALS

Materials shall conform to these Specifications and the approved plans.

10-10 LAYOUT

Prior to commencing installation of park improvements, Contractor shall stake layout of the improvements, including use zones of all play equipment, and request review by the City Engineer to determine if any adjustments to the layout shown on the drawings is necessary.

10-11 SITE FURNISHINGS

- A.** Benches: shall include a back, arm rests, and be a minimum six feet in length with a baked-on polyester powder-coat finish as manufactured by DuMor, Inc., Wabash Valley or approved equal.
- B.** Picnic Tables: shall have a baked-on polyester powder-coat or plastisol coated finish as manufactured by DuMor, Inc., Wabash Valley or approved equal.
- C.** All picnic tables shall provide at least one space compliant with current Americans with Disabilities Act Accessibility Guidelines (ADAAG) and California Title 24 requirements for wheelchair access and seating.
 - 1. Accessible Picnic Tables – All picnic tables shall meet accessibility Guidelines for Outdoor Developed Areas, states that in newly constructed picnic facilities that contain two or fewer picnic tables, each picnic table shall be accessible. Where picnic facilities contain more than two picnic tables, at least 20 percent but not less than two of the picnic tables shall be accessible. Where picnic tables are altered or added, the requirements shall apply only to the picnic tables that are altered or added until the number of accessible picnic tables complies with the minimum number required for new construction. For example, if you have only two picnic tables within a picnic facility, both picnic tables must be accessible; if you have four picnic tables within a picnic facility, two must be accessible, and if you have 24 units within a picnic facility, five must be accessible.
- D.** Trash Receptacles/Recycling Receptacles:
 - 1. 32-gallon nominal capacity with liner for ease of collecting and emptying collected materials
 - 2. Top or cover designed to keep out rain and other weather elements
 - 3. Black or other color for trash and blue color for recycling
 - 4. Trash and recycling containers to be located in pairs

5. The overall “recycling message” should be highly visible:
 - a. Must display the recycling “chasing arrow” symbol at least 10 inches in diameter on two sides of the container.
 - b. Must include “Recyclables Only” and “No Food Waste” labels in lettering at least 2 inches high on two sides of the container and legible from a 10-yard distance.
 - c. Signage must have graffiti-resistant coating.
 6. Baked-on finish, such as, fusion epoxy powder coated finish or plastisol coated finish (DuMor, Inc., Wabash Valley) or approved equal.
 7. Match existing container style in historic or downtown districts or other areas as designated by the City Engineer.
- E.** Drinking Fountains: shall be ADA compliant hi-lo fountains (2 fountains and basins in combination) Model #440 including optional pet fountain as manufactured by Most Dependable Fountains or approved equal.
- F.** Bike Racks: shall be Model #125 and #130, manufactured by DuMor Inc., or approved equal. Number of loops (bike parking spaces) to be defined on the plans. A minimum of 2 loops shall be provided for any installation.
- G.** Barbecue (Single): shall be steel, embedment mounted, #21/22 series, by DuMor Inc. or model # 200-X by Little Tikes or approved equal.
- H.** Barbecue (Group): shall be steel, embedment mounted, #24 series, by DuMor or model # 210-X by Little Tikes or approved equal.
- I.** Dog Waste Disposal Station: shall be green aluminum model #1003-L by Dogipot or approved equal.
- J.** Park Sign: shall be by Outdoor Creations or approved equal. Sign to include City logo and park name. Colors to be approved by City Engineer.
- K.** Basketball Goals: shall be manufactured by BSN Sports, Tomark Sports, Douglas or approved equal.
- L.** Soccer Goals: shall be permanent or semi-permanent (removable) with the ability to anchor into natural turf or synthetic turf as manufactured by BSN Sports, Tomark Sports, Douglas or approved equal. Powder coat color shall be white.

All site furnishings shall be installed in accordance with manufacturer's instructions.

10-12 PLAY EQUIPMENT

All materials and methods shall, at a minimum, conform to the latest version of California Code of Regulations: Title 22 – Social Security, Division 4 – Environmental Health, Chapter 22 – Safety Regulations for Playgrounds.

In addition, all materials and methods must meet the following standards:

- A. Consumer Product Safety Commission “Handbook for Public Playground Safety”, current version
- B. ASTM F1487 “Standard Consumer Safety Performance Specifications for Playground Equipment for Public Use”, current version
- C. ASTM F-1292 “Specifications for Impact Attenuation of Surface Systems Under and Around Playground Equipment”, current version
- D. CFR Part 1191 “Americans with Disabilities Act Disability Guidelines for buildings and Facilities”, Section 15.6 “Play Areas”, current version

All components of play equipment shall be certified by the International Play Equipment Manufacturers Association (IPEMA). Contractor shall provide Certificate of Compliance with IPEMA to City Engineer prior to purchase of items.

Prior to purchase of equipment, Contractor shall submit for approval a plan view of play equipment at an appropriate, legible scale indicating overall dimensions with all components labeled and all deck heights indicated. Additionally, Contractor shall submit for approval a complete list of components including a description of component, quantity, finish and color.

- E. Play Equipment Manufacturers: Approved play equipment manufacturers include:
 - 1. Miracle Recreation Equipment
 - 2. Landscape Structures
 - 3. Play World Systems,
 - 4. or equivalent

Contractor shall assemble and install playground equipment in compliance with the written instructions of the manufacturer. Equipment shall be installed by or under

the direct supervision of an individual who is authorized by the manufacturer to assemble and install the equipment.

Prior to its first use, the playground equipment shall be inspected by a Certified Playground Safety Inspector who shall certify in writing that the equipment, insofar as it can be seen without disassembly or excavation of the surfacing, is in compliance with ASTM F-1487-98 and CPSC Handbook Publication number 325.

- F. Play Area Surfacing: Play area surfacing shall be a dual layer poured-in-place system with a wearing layer upper membrane and an underlying impact attenuation cushion layer. The finished surface shall be porous and capable of being installed at varying thickness to comply with Critical Fall Height requirements of playground equipment. Play area surfacing shall be SpectraPour by Spectraturf Global Surfacing Systems or approved equal.
- G. Water Play/Splash Play Equipment: shall be recirculation system with all components and operating system provided from the same manufacturer cover under a single warranty. Equipment shall be Splashpad equipment from Vortex Aquatic Structures International Inc. or approved equal.

10-13 CONCRETE FOOTINGS

All concrete footings for site furnishings and play equipment shall be Class 2 concrete with a $\frac{3}{4}$ " minimum size aggregate, 6 sack minimum and provide 3000 psi strength at 28 days, unless otherwise approved by the City Engineer. Footings shall be in accordance with Section 90 of the latest Caltrans Standard Specifications. Add 1 lb. lamp black per cubic yard.

Footings shall be installed below finish surface. In paved areas paved surface shall be installed over footing to provide clean finished surface.

10-14 PARK WATER SYSTEMS

Park water system design shall conform to the applicable portions of Section 4, Water System Standards and Section 9, Irrigation System Standards, of these Standards, except as follows:

A. Plastic Potable Pipe

Plastic pipe for potable water systems within City parks and recreation areas and where designated on the Plans, shall be polyvinyl chloride (PVC) plastic pipe extruded from one hundred percent (100%) virgin material conforming to ASTM Designation D2241, or shall conform to Section 4, Water System Standards, for public water systems, and shall be used as noted below.

B. Pipe less than two inches (2") diameter shall be PVC water service per Section 4. Water Services, or, pipe less than four inches (4") diameter shall be Schedule 40 PVC with solvent welded joints.

1. Pipe four inches (4") diameter and larger shall be PVC (C900) water main per Sections 4.

C. STERILIZING POTABLE WATER LINES

Sterilization and testing of water lines for potable purposes shall conform to Section 4 Water System Standards.

D. Installation of Potable Pipe

Installation of potable pipe shall conform to the requirements for installation of public water systems as provided in Section 4, Water System Standards.

10-15 **PARK IRRIGATION SYSTEMS**

Park irrigation system design shall conform to the applicable portions of Section 9, Irrigation System Standards, of these Standards, except as follows:

A. ELECTRIC AUTOMATIC CONTROLLER

Automatic controllers for use on City parks shall be central control ready Calsense controller or approved equal with hydrometer in UL rated stainless steel enclosure.

B. BOOSTER PUMPS

Booster pumps for use on City parks shall be by Custom Pump and Power or approved equal.

C. Enclosures

All above grade enclosures, including controller boxes, booster pump enclosures and electric service panels shall be either anodized aluminum or stainless steel. Enclosures shall be finished (powder coated) as required.

10-16 **PARK SANITARY SEWERS**

Park sanitary sewer design shall conform to the applicable provisions of Section 5, Sewer System Standards, of these Standards.

10-17 PARK STORM DRAINAGE

Park storm drainage design shall conform to the applicable provisions of Section 3, Storm Drainage Standards, of these Standards.

10-18 PARK ELECTRICAL AND LIGHTING

Park electrical and lighting design shall conform with the applicable portions of Section 6, Roadway Standards, of these Standards, except as follows:

A. Light Fixtures:

Park light fixtures are not required to match City standard street light fixtures.

Park light poles shall be aluminum with a textured powder coat finish

All light fixture luminaires shall be 120 volts, IP66 rated and dark sky compliant. All safety and area lighting fixtures shall be LED.

All non-electrical hardware shall be stainless steel.

Light fixture globes shall be composed of acrylic material.

Manufacturer warranty for all lighting fixtures and poles shall be:

- B. LED Fixtures:** 8 years from date of acceptance.
- C. Material and Workmanship:** two (2) years from date of acceptance.
- D. Paint/Coating:** five (5) years against corrosion, peeling and fading of more than 20% of original gloss.

10-19 ENCLOSURES

All above grade enclosures, including controller boxes, booster pump enclosures and electric service panels shall be either anodized aluminum or stainless steel. Enclosures shall be finished (powder coated or painted) as required.

10-20 CLEANING

Contractor shall thoroughly clean all areas where work has occurred. Excess material, debris and rubbish shall be removed from the site.

Contractor shall take all precautions to protect completed work. Immediately repair or replaced any areas or improvements damaged during construction operations.

END OF SECTION

SECTION 11 TREE PRUNING STANDARDS

11-1 GENERAL

These general requirements provide conditions for the basic standards for tree pruning in the City of Lathrop. These standards apply to all those working on all trees located on public property and in the public right-of-way, including City of Lathrop employees and managers, private contractors, property owners, and residents.

11-2 STANDARDS

Unless otherwise shown or specified all materials and methods shall conform to the appropriate current edition of:

- A. American National Standards Institute (ANSI) A300 Pruning Standards
- B. ANSI Z133.1 Safety Standards
- C. ISA Best Management Practices: Tree Pruning

City arborists, managers, related personnel and contractors should obtain copies of the above publications and apply the standards and guidelines when engaged in pruning operations in Lathrop. Copies of these documents can be obtained from the International Society of Arboriculture (see Resources). Occupational health and safety standards in the workplace shall be observed at all times.

For street trees, Chapter 12.16 Trees, of the City of Lathrop Municipal Code establishes responsibility regarding planting, maintenance (including pruning), and removal.

11-3 QUALITY CONTROL

Trees must be maintained to an industry standard for shape and health. Trees shall be trimmed according to the International Society of Arboriculture standards. Trees shall be trimmed to maintain safe pedestrian traffic and vehicle traffic. These clearances are 7 feet above the sidewalk and 12 feet above the roadway. Refer to City Standard Detail R-66 for vehicle sight distance requirements.

11-4 PRUNING PLANS

For commercial contractors, a written plan of work shall be prepared that clearly identifies the tree species, location, need for pruning and the scope of pruning. A checklist format can be used. Where multiple reasons for pruning exist, they should be prioritized from highest to lowest. A separate plan is needed for each tree. For groups of trees of the same species with similar pruning needs, one plan will suffice.

For all city departments and agencies, work plans shall be developed either for individual trees or for groups of trees, such as trees along streets, in parks, or on the grounds of public buildings. Plans shall include species, location, need for pruning and the scope of pruning. Pruning plans shall be specific for the species to be pruned.

Work plans shall be available at work sites during pruning operations.

A. Pruning Cuts

Pruning is a wounding process that causes some level of injury to trees. It is important to make pruning cuts that minimize injury or the potential for injury. For instance, cuts should be made on branches in a manner that ensures rapid and complete wound closure, thus reducing the potential for decay. Information on appropriate branch removal practices and the size and location of cuts is found in ANSI A300 Part 1 (Pruning) and Best Management Practices: Tree Pruning (see References).

Note that flush cuts increase the potential for decay and reduce the formation of callus tissue above and below the wound (wound wood). In some cases, flush cuts can stimulate vigorous but incomplete callus development. Conversely, leaving branch stubs prevents wound closure and increases the potential for decay. These types of pruning cuts should be avoided.

11-5 PRUNING PRACTICES

A. Pruning Cuts: All pruning cuts shall conform to ANSI A300 standards (Part 1: Pruning). Do not make flush cuts or leave branch stubs.

B. Amount of Pruning: Not more than 25% of the crown shall be removed within an annual growing season. The percentage of foliage removed shall be adjusted according to age, health, and species considerations. Stressed trees are less tolerant of pruning and leaf area removal should be minimal. In cases where more than 25% of the crown needs to be removed, such as to reduce the potential for structural failure, a qualified arborist shall make an assessment of the amount of pruning needed to abate the hazard. When

possible, such pruning should be scheduled over a two- or three-year period. Pruning should be minimal on species prone to water sprout development. For such species, pruning during the summer months may reduce the potential for water sprout development (see Standard 4). For species susceptible to sunburn injury, pruning shall not expose bark tissue of the trunk and scaffold branches to sunlight levels that lead to injury.

- C. Pruning Schedule: Generally, pruning can be done throughout the year. For some trees, however, certain periods or seasons need to be avoided. For species susceptible to particular insect or disease problems, avoid pruning at times of the year when the problem will be exacerbated (e.g., do not prune pines during the spring and summer months in order to minimize the potential for bark beetle infestations). For trees with a notable flowering trait, avoid pruning prior to or during flowering periods (unless flowers cause allergic reactions). Pruning to remove dead, diseased, or broken branches can be done at any time of year. Pruning during the summer months can be used as a strategy to reduce water sprout development in certain species.

For deciduous species, do not prune during bud swell, bud break, or leaf expansion in the spring. Do not prune during times of the year that may initiate or exacerbate a pest problem (e.g., do not prune elms during the summer months to avoid Dutch elm disease infection and transmission).

Broadleaf-evergreen species (such as Eucalyptus spp., Acacia spp., and Myoporum spp.) can be pruned throughout the year. Avoid pruning during periods that stimulate substantial water sprout development. For species prone to foliar diseases, avoid pruning at times when disease-susceptible new growth can be stimulated by pruning.

For conifers, pruning during the winter months (November through February) is generally recommended. Do not prune during periods of needle formation and enlargement. For species susceptible to bark beetle infestations (e.g., Pinus spp.), do not prune when beetles are active (typically March through October in Lathrop).

- D. Wound Treatment: Pruning wound treatments (dressings and paints) shall not be used.
- E. Equipment: Pruning equipment shall be sharp and sized appropriately for the pruning cut. Avoid the use of any pruning and climbing equipment that may cause damage to bark tissue. Spikes (climbing spurs) shall not be used for climbing trees unless the tree is being removed, or when limbs are more than throw-line distance apart and there is no other means of climbing the tree. Pruning tools shall be treated with a disinfectant (such as Lysol) when

pruning trees infected with a pathogen that may be transmitted (on tools) from one tree to another of the same species, such as elms (*Ulmus* spp.). Disinfectants should be used before and after pruning individual trees.

11-5.2 Pruning Mature Trees

- A. Pruning Types: In Lathrop, all those engaged in tree pruning operations shall be familiar with each of the pruning types. Selection of the pruning type(s) shall be based on pruning objectives (see Standard 1). Refer to publications cited in Section C1 for descriptions of pruning types. Clearance pruning that does not comply with Standards 3 and 4 shall be conducted only under the supervision of a qualified arborist (see footnote 1).
- B. Head Cuts: Heading cuts shall not be used when pruning mature trees, except in very limited cases. Whenever possible, use reduction cuts to reduce height and branch removal cuts (thinning cuts) to reduce branch end weights. When reduction and branch removal cuts are not possible (such as when interior lateral branches are not present) and tree hazard potential is high, then heading cuts may be needed, but their use should be minimized. The practice of pollarding shall be limited in application to London plane tree (*Platanus x acerifolia*) and elm (*Ulmus* spp.), and only when initiated on young trees (i.e., not after they reach a juvenile or mature stage).
- C. Stressed Trees: For old, unhealthy, and stressed trees, pruning should be limited to the removal of dead branches and structural defects. Removal of live branches should be avoided or minimized.
- D. Utility Pruning: Utility pruning requires extensive training in safe work practices and specialized pruning techniques. Prior to pruning trees for line clearance, all workers shall have documented training that meets utility and tree industry standards. Pruning practices shall follow guidelines described in ANSI A300 Pruning Standards (see References). A plan of work that incorporates these practices shall be developed prior to pruning.

11-5.3 Pruning Young and Juvenile Trees

Trees should be structurally pruned when they are young. Follow guidelines in: Training Young Trees for Structure and Form (see References).

Young trees will need follow-up pruning, preferably three times in the first five years, and then periodically as they develop through the juvenile phase into maturity.

11-5.4 Palm Pruning

Palm pruning should be limited to the removal of dead, broken, and strongly chlorotic fronds. Live, healthy fronds should not be removed. Fronds should be severed close to the petiole base without damaging living trunk tissue. Palm fruit, flowers, and loose petiole bases should be removed if deemed to be a safety risk. A disinfectant (such as Clorox or rubbing alcohol) shall be used on pruning tools before and after pruning individual trees. Climbing spikes or spurs shall not be used to climb palms for pruning.

11-5.5 Root Pruning

Root pruning should be considered only when other options for correcting a conflict between roots and infrastructure are deemed not practical. For trees requiring root pruning, a tree assessment shall be conducted and a root-pruning plan shall be developed by a qualified arborist (see footnote 1). Avoid root pruning during times of the year when wind loads on trees are greatest, such as during the winter months. Crown pruning prior to or following root pruning shall be done only in cases where the potential for structural failure may increase substantially because of root pruning.

END OF SECTION

APPENDIX A

Improvement Plan Review Checklist

CITY OF LATHROP IMPROVEMENT PLAN REVIEW CHECKLIST

TRACT NAME: _____ DEVELOPMENT NO. _____

Engineering Firm: _____

Contact Person: _____

Telephone Number: (_____) _____

Assessor's Parcel No.: _____

Tentative Map Expiration Date: _____

() First Check () Recheck

- _____ 3 Sets of Grading and Improvement Plans
- _____ 2 Sets of Hydrology Map and Calcs
- _____ 3 Copies of Engineer's Estimate
- _____ 2 Copies of Soil Report
- _____ 2 Sets of Sewer Map and Calcs
- _____ 1 Copy of Approved Tentative Map
- _____ 1 Copy of Final Conditions of Approval (Resolution)
- _____ 3 Sets of Final Map Package
- _____ 3 Sets of Landscaping and Irrigation Plans
- _____ 3 Sets of Signing and Striping Plans
- _____ 3 Copies of Wall Calculations
- _____ 3 Copies of Trench Calculations
- _____ 1 Set of AutoCAD Drawing files (3½" 1.44 Mb floppy disks on final submittal)
- _____ 2 Scanned Files of Final Plans on CD (.GIF, .JPG or .TIF format on final submittal)

Preliminary Engineer's Estimate	\$	_____
Preliminary Plan Review Fee	\$	_____
Final Bond Estimate	\$	_____
Final Plan Review and Inspection Fee	\$	_____
Plan Storage Fee (on final submittal)	\$	_____

I. GENERAL

- _____ 1. Plans on 22" X 34" plan sheets.
- _____ 2. North arrow and scale on each sheet. North up and/or left.
- _____ 3. Titles and numbers on all sheets and match index.
- _____ 4. Conformance to Tentative Map and Conditions of Approval, especially street and R/W widths, grading, drainage, sewerage, water lines, number and size of lots, etc.
- _____ 5. Plans are prepared in AutoCAD and Layers conform to City Standard Layer.

II. TITLE SHEET

- _____ 1. Name of Subdivision or project
- _____ 2. Subdivision Number and Assessor's Parcel Number (APN)
- _____ 3. Vicinity Map with north arrow (north up and/or to the left).
- _____ 4. Sheet Index.
- _____ 5. City Engineer's Signature Block.
- _____ 6. Consultant Signature Block and Geotechnical Engineer's Signature on Grading Plan.
- _____ 7. Standard Notes per Section 2-3.2 of the Standards. (may be on Sheet 2)
- _____ 8. Other required signature blocks.

III. SHEET TWO (AND THREE IF REQUIRED)

- _____ 1. Map showing all streets, utilities, structures, etc. and show improvement plan sheet layout. (1" = 100' minimum scale)
- _____ 2. Drafting symbol legend per Section 2.
- _____ 3. Street sections and pavement schedule shown.
 - _____ a. Structural sections shown and agree with City Standards.
 - _____ b. Curb shown.
 - _____ c. Right-of-way and street widths shown.
 - _____ d. Cross-slope shown-note relative difference to T/C.
 - _____ e. Sidewalk shown.
 - _____ f. Pedestrian paths shown.
 - _____ g. Drainage channels and pipes shown.

- _____ 4. Temporary and permanent bench marks and descriptions
- _____ 5. List of Abbreviations.
- _____ 6. Pavement Chart (R value, TI, AC, AB, AS and street name) (see example layout in Section 2-3.1 (F) (10))

IV. DEMOLITION AND ABANDONMENT PLAN

- _____ 1. Show existing buildings and structures.
- _____ 2. Existing septic tanks and leach fields shown.
- _____ 3. Existing wells shown.
- _____ 4. Show trees to be removed and tag/label trees to be saved.

V. GRADING PLANS

- _____ 1. Existing elevation or contours shown and extend 50' beyond boundary.
- _____ 2. Proposed pad grades and correct relationship to TC grades.
- _____ 3. TC elevations at property line extensions.
- _____ 4. TC at grade breaks and curb returns shown.
- _____ 5. TC at storm drain inlets shown.
- _____ 6. Storm drain lines and structures shown.
- _____ 7. Street slopes at centerlines shown. (0.5% minimum)
- _____ 8. Lot numbers shown.
- _____ 9. Retaining walls, fences, and sound walls shown.
- _____ 10. Plan view of typical lot drainage. Minimum slope of lots 1%.
- _____ 11. Section of typical lot to show property line/slope relations.
- _____ 12. Show grading required for off-site drainage.
- _____ 13. Grading shown between back-of-curb or sidewalk and original ground at right-of-way line.
- _____ 14. Grading conforms to adjacent properties are shown correctly and there is no adverse effect on future development.
- _____ 15. Check no drainage across lot lines and lots to drain to streets.
- _____ 16. Maximum slopes 2:1 or per Soils Report.
- _____ 17. All pads above high water when storm drains plug. (Surface flows)
- _____ 18. Elevations at rear of lots shown.
- _____ 19. Driveway slopes per standard

_____ 20. Grading permit per UBC Ch. 33

VI. STREETS

A. Plan Views

- _____ 1. Wheelchair ramps shown per Standard Details R-10A and R-10B and in compliance with ADA guidelines.
- _____ 2. Radius of curvature, central angle, and length shown on all street curves.
- _____ 3. Curb curve data given - central angle, length, and radius (See Section 6-5.4)
- _____ 4. Scale 1" = 40' or 1" = 20'.
- _____ 5. Cul-de-sac radius (see Standard Detail R-18)
- _____ 6. Property corner cutoffs used when wheelchair ramps installed, otherwise concentric with curb. (see Section 6-4.4G)
- _____ 7. R/W and street width dimensions shown.
- _____ 8. Centerline stationing at 100' and at BC and EC of curves.
- _____ 9. Lot/parcel lines and numbers/letters shown.
- _____ 10. Cul-de-sac cross slopes from high point to gutter lip (See Standard Detail R-18).
- _____ 11. Valley gutters (at cul-de-sac entry only) - show flow lines at center of street.
- _____ 12. Stationing on all drainage structures shown.
- _____ 13. T/C elevation given at all drain structures.
- _____ 14. Drainage easements shown and dimensioned.
- _____ 15. Location of proposed and existing underground pipes and utilities shown.
- _____ 16. Location of fire hydrants.
- _____ 17. Street monuments shown.
- _____ 18. Bench Mark locations shown
- _____ 19. Pedestrian Paths shown. Basic grades shown.
- _____ 20. Street names shown.
- _____ 21. Stations and elevations street intersections shown.
- _____ 22. All notes and symbols standard and conforming to legend.

- _____ 23. All existing utility poles, manholes, valves, signs, mail boxes, trees, etc. shown. Indicate those to be removed, relocated or adjusted to grade.
- _____ 24. Continuations and cross streets properly referenced (Match line–See sheet #)
- _____ 25. Project limits and City limits shown.
- _____ 26. Standard knuckle and cul-de-sacs used.
- _____ 27. Street signs, traffic signs and barricades shown in proper locations.
- _____ 28. Station centerline of driveways and width shown (4' minimum of full height vertical curb between driveway transitions and 2' minimum to property line).
- _____ 29. Minimum sight distance at intersections and curves observed.

B. Profiles

- _____ 1. Vertical curves designed for proper speeds per Highway Design Manual.
- _____ 2. Minimum vertical curve lengths observed.
- _____ 3. Vertical scale 1" =2'.
- _____ 4. Vertical Curve used for grade breaks greater than 1% on local streets, 0.5% in collectors or higher.
- _____ 5. In cul-de-sacs, show profiles at centerline and TC profile through the radius point top of curb at end of cul-de-sac (dashed line).
- _____ 6. 2% maximum grade observed across intersections.
- _____ 7. 0.5% minimum grade observed on all streets at curb.
- _____ 8. All underground pipes and utilities shown; storm drain, water and sewers.
- _____ 9. Fire hydrants are located at high points in water mains.
- _____ 10. Existing ground on centerline shown.
- _____ 11. Finished grade profile for top of curb shown.
- _____ 12. Centerline profiles of intersecting streets shown on their point of intersection with slopes called out.
- _____ 13. Off-tract profile to catch point shown where road is constructed to subdivision boundary. (min. 50' beyond tract boundary)
- _____ 14. Centerline stations and elevations shown at all BVC, EVC, PIVC, grade breaks, low points and high points and TC or rim elevation at all drainage structures.
- _____ 15. All slopes in profile shown.

- _____ 16. Show all utility crossings with outside diameter (O.D.) clearances indicated.
- _____ 17. Manhole and drop inlet invert and flow line elevations shown.
- _____ 18. Elevation at high and low points of water mains shown.
- _____ 19. Top of Curb profile bulbs and/or returns shown
- _____ 20. Profile of through street holds across intersection.

VII. SANITARY SEWERS

- _____ 1. System in agreement with tentative map and master plan.
- _____ 2. Design conforms to City Design and Construction Standards.
- _____ 3. Size of line shown. (8" min.)
- _____ 4. Adequate cover. (3' min to finished grade) ductile pipe or engineered alternatives if shallower.
- _____ 5. Clearance with water main. (min 1' O.D. to O.D.)
- _____ 6. Size, slope, length between structures, and type of pipe.
- _____ 7. Show connection to existing facilities with existing invert. Manhole installed when tying to existing lines.
- _____ 8. Extension pipe lines to subdivision boundary for future use.
- _____ 9. Sewer line to be located per Standard Details R-35 thru 37.
- _____ 10. Curves allowed within 80% of recommendation of pipe manufacturer. Show curve data or offsets if concentric with centerline.
- _____ 11. On all curves where short pipe lengths are used indicate clearly on plans.
- _____ 12. Top of manhole elevations shown.
- _____ 13. Stations given for manholes.
- _____ 14. Sizes of existing lines shown.
- _____ 15. Pipe types allowed. (D.I. if cover requires it).
- _____ 16. 350' maximum distance manhole on mains smaller than 24", 400' maximum distance manhole to manhole on mains 24" and larger and 250' manhole to flushing.
- _____ 17. Minimum 2 fps velocity.
- _____ 18. 0.2' drop through manhole with change of direction.
- _____ 19. Bolted manhole covers for any off street manholes or when manhole is deeper than 10'.

- _____ 20. In unimproved areas, manholes extended 1' above ground.
- _____ 21. Sanitary calculations.
- _____ 22. Laterals shown in plan and 11' center to center from water services and 3' below water if crossing. (Follow health department diagram.)
- _____ 23. Special approval areas shall be noted in profile (less than minimum cover and clearances).
- _____ 24. Spacing between opposing laterals observed.
- _____ 25. Manhole types per City Standard Details.

VIII. DRAINAGE

A. Hydrology-Hydraulics

- _____ 1. Calculations per City Design and Construction Standards and based on 10-year 48-hour storm with minimum velocity of 2 fps and max. per Table 3-4.
- _____ 2. Calculations shall include: HGL, FL, EL, Q, A, S, V, freeboard at structures, structure losses, and tail water assumptions and legend of abbreviations.
- _____ 3. Adequacy of in-tract and off-tract drainage system verified.
- _____ 4. All starting water surface and tributary area calculations adequately verified.
- _____ 5. Drainage map showing street system, existing and proposed drainage system, slope arrows, tributary sub-areas in acres, peak flow in all pipes (1" = 100' preferred).
- _____ 6. All pipe and structures in tributary areas labeled to correspond with calculations.

B. Easements

- _____ 1. Off-tract drainage improvements (plan and profile) and accompanying easements shown. Off-tract offers of dedication for drainage easement submitted for review. (Plat and description)
- _____ 2. Off-tract work to be done but no easement requirements. Right of entry submitted for review.
- _____ 3. Easement widths indicated.
- _____ 4. Easements across lots not permitted.

C. Structures

- _____ 1. Max. Diameter pipes through drainage structures observed.
Standard inlet - 24"
Manhole Base - > 24"
- _____ 2. 1.00' minimum HGL to top of grate. (10-year storm)
- _____ 3. Special structure calculations provided.

D. Pipes

- _____ 1. Closed conduit minimum slope of 0.005 observed.
- _____ 2. Size, slope, length between structures, type and class or thickness of pipe shown in profiles. (15" minimum).
- _____ 3. RCP is only allowed pipe type with a minimum of CL III (See Section 3-6.3 A)
- _____ 4. Trunk lines 1.25' behind top sidewalk.
- _____ 5. On all curves where non-standard pipes are to use, indicate clearly on the plans.
- _____ 6. Outlet protection provided.
- _____ 7. 3' minimum cover over pipe to finished grade observed (provided manufacturer specs does not require more) unless special design and calcs submitted.
- _____ 8. Curve radii allowed to within 80% of pipe manufacturers recommendation
- _____ 9. All curve data at centerline of pipe shown unless concentric with street where offsets allowed.
- _____ 10. Elevations, slopes and distances all mathematically correct.
- _____ 11. Match hydraulic/hydrology calculations.
- _____ 12. Lines in proper location per standards
- _____ 13. At changes in pipe size, match soffits.

E. Temporary Storm Drain Retention Basins

- _____ 1. Runoff and volume calculations per City Design and Construction Standards.
- _____ 2. Groundwater level shown on basin section.
- _____ 3. Basin bottom 2' above water table

- _____ 4. Outfall protection using riprap required and safety grate on pipe.
- _____ 5. Chain link fence with slats around basin required.
- _____ 6. Off-tract basins require an access road around the basin.
- _____ 7. Easements

F. Channels

- _____ 1. Maximum velocity in earth channel verified by soils report (min. 2 fps)
- _____ 2. Channel side slopes as specified by soils report
- _____ 3. Channel design per design standards

IX. WATER LINES

- _____ 1. System in agreement with Tentative Map.
- _____ 2. Design conforms to City Design and Construction Standards.
- _____ 3. Size - 8" min. Except cul-de-sacs without hydrants where 6" is allowed.
- _____ 4. Valves (min 3 at cross and 2 at tee)
- _____ 5. Hydrants - locations as shown on approved Tentative Map.
- _____ 6. Cover - 3' min. to finished grade.
- _____ 7. Proper separation from sewer lines. (See Section VII. 22. of this checklist)
- _____ 8. Location - per City Standard Details.
- _____ 9. Lines kept in streets - easements not allowed.
- _____ 10. Crossings with sewer mains or laterals meet health standards
- _____ 11. Length, size and class of pipe shown in profile.
- _____ 12. Length shown as distance between crosses or tees.
- _____ 13. Invert elevations shown at grade breaks, high and low points.
- _____ 14. Sizes of all existing lines shown.
- _____ 15. Top of curb at hydrant locations.
- _____ 16. Curves allowed to within 80% of pipe manufacturer's recommendation. Curve data shown unless concentric with street improvements where offsets are acceptable.
- _____ 17. Air and vacuum valves at high points and elevated cul-de-sacs if difference in elevation greater than ½ pipe diameter.
- _____ 18. Connection to existing facilities.
- _____ 19. At points of future extension install temporary blow off with valve.

- _____ 20. Lines extended to tract boundaries and along frontage.
- _____ 21. House services shown in plan and stationed or dimensioned from the centerline of driveway.
- _____ 22. If home is larger than 4,000 square feet, the water service line has been sized for fire sprinklers and fire sprinklers are provided.
- _____ 22. Fire hydrant maximum spacing – 500’ residential and 300’ other. Hose lay lengths 250’ residential and 150’ other. Cul-de-sacs within 200’ of radius points.
- _____ 23. Place valves and blow-offs behind sidewalk.

X. STREET LIGHTING

- _____ 1. Shown on 100-scale plan.
- _____ 2. Cul-de-sacs - _____ watt at end of 100 foot deep or deeper.
- _____ 3. Residential streets – evenly spaced at _____ feet maximum. _____ watt on 28’6” poles with 12’ arms. (min. luminance ratio is 6 to 1).
- _____ 4. Collector Streets – evenly spaced at _____ feet maximum. _____ watt on 28’6” poles with 12-foot arms. (min. luminance ratio is 4 to 1).
- _____ 5. Arterial Streets – evenly spaced at _____ feet maximum, _____ watt on 30’00” poles with 15 foot arms. (min. luminance ratio is 3 to 1).
- _____ 6. Wattage and pole heights indicated on plans.
- _____ 7. Provide calculations

XI. ENGINEERING COST ESTIMATE

- _____ 1. Verify that unit costs agree with City Standard Costs. Check that costs are current version.
- _____ 2. Verify quantities of all items
- _____ 3. Review with plans to determine if there are missing items
- _____ 4. 20% contingency required
- _____ 5. Grading quantities shown – lump sum not acceptable
- _____ 6. Driveways included as separate item
- _____ 7. Sidewalk on lineal foot not included in curb and gutter item
- _____ 8. Increase costs of facilities installed in existing streets by 50%
- _____ 9. Check groundwater depth. If pipes installed below water table, increase costs by \$15.00 per lineal foot.

- _____ 10. For each 20 electroliers, one extra is required
- _____ 11. At re-submittal, changes in plans are reflected in the estimate.

APPENDIX B

General Record Maps Review Checklist

GENERAL RECORD MAPS REVIEW CHECK LIST

GENERAL

- _____ 18" x 26" sheets
- _____ CLEAR 1" margin around sheet
- _____ Map legibly drawn and printed
- _____ Map in black on tracing cloth or polyester film
- _____ Each sheet numbered with respect to the total number of sheets
- _____ ALL lettering and numbering a minimum 0.10" high
- _____ Map title appropriately worded containing geographic location
- _____ Map have appropriate statements/certificates:
- | | |
|--------------------------|--|
| 1. Owner's | 8. County Surveyor's |
| 2. Trustee's | 9. City Engineer's |
| 3. Beneficiary's | 10. Planning Commission's |
| 4. Engineer's | 11. City Clerk's |
| 5. Surveyor's | 12. City Council's |
| 6. Irrigation District's | 13. Clerk of the Board of Supervisors' |
| 7. Planning Director's | 14. County Recorder's |
- _____ All statements/certificates dated, signed and sealed as appropriate
- | | |
|--------------------------|--|
| 1. Owner's | 8. County Surveyor's |
| 2. Trustee's | 9. City Engineer's |
| 3. Beneficiary's | 10. Planning Commission's |
| 4. Engineer's | 11. City Clerk's |
| 5. Surveyor's | 12. City Council's |
| 6. Irrigation District's | 13. Clerk of the Board of Supervisors' |
| 7. Planning Director's | 14. County Recorder's |
- _____ All registration expiration dates noted
- _____ Deed References shown on map
- _____ REQUIRED vicinity map, scale, and the site location clearly shown
- _____ REQUIRED index (key) map shown (for more than 2 sheets only)

- _____ Each sheet's relationship to adjoining sheets shown
- _____ Map oriented with north to top or left side
- _____ North arrow and scale shown
- _____ Scale large enough to show details clearly
- _____ Boundary of subject property shown with a HEAVY line
- _____ Proper survey procedures used (i.e., perorations section breakdowns, deed interpretations, proper control scheme). Section and 1/4 section corners physically set and not just calculated (3/4" x 30" iron pin-minimum monument size)
- _____ ALL surrounding surveys and the related monumentation properly evidence the establishment of boundary shown
- _____ Sections, townships, ranges and grants properly labeled
- _____ Discrepancies of less than 1/10,000 in precision with existing record data shown
- _____ Record data shown by individual reference
- _____ All City limits and County lines shown
- _____ All Easements show Deed Reference, size and location relative to property lines
- _____ PRIVATE Easements properly labeled
- _____ Restricted Access areas labeled and shown
- _____ All curve data shown (i.e., lot/curve No., radius, central angle, arc length, chord bearing, chord distance and radial bearings of non-radial lines.)
- _____ Curve data for the TOTAL curve shown
- _____ Sum of the parts EQUAL the total distance or central angle
- _____ All street names shown along with their widths
- _____ "Basis of Bearings" shown and does it identify the actual bearing and the filing data of the referenced map (Must be between two found monuments)

- _____ If California Coordinate System – 83, Zone III is used as a basis of bearings, shown bearing, grid factor and filing data
- _____ Control scheme shown along with Description of Monuments found for CCS-83, Zone III California Grid coordinates shown, if required
- _____ Legend include symbols for monuments founds, set or replaced and a listing of ALL abbreviations used on map (See “ABBREVIATIONS, SYMBOLS, AND NOTES” in Section 2-4.2 or the City of Lathrop Design and Construction Standards).
- _____ Calcs show radial bearings
- _____ Existing street names spelled correctly
- _____ References to Record of Surveys use “Volume” for 1 thru 12 and “Book” 13 to Present
- _____ Monuments found or replaced, described as to kind, size, location, tag no., and other data relating thereto. Reference given to a record map or field book where the monument was set or accepted. If none, state no record or origin unknown.
- _____ San Joaquin County Surveyor’s Base Map Sheet No. shown in the lower left corner, but not in margin – SAMPLE: (D.D. Sheet No.)
- _____ Does original submittal include:
- A. Two (2) prints of map signed/notarized by Owners and Trustees?
 - B. Map checking Fee payable to City of Lathrop
 - C. Boundary closure Calcs?
 - D. California Coordinate Systems Calcs, if required?
 - E. Copies of any unfiled surveys used on maps?
 - F. Copies of Deeds referenced on map including subject property deed?
 - G. Copies of all senior conveyances/deeds called for in the surveyed property’s deed?
 - H. Subdivision/Parcel Map Guarantee?

- I. Preliminary Title Report less than 6 months old?
- J. Two (2) copies of signed, sealed new legal description?

APPENDIX C

Final Map Checklist

**CITY OF LATHROP
FINAL MAP CHECK LIST**

Tract Name: _____ Subdivision No.: _____
 Engineering Firm _____
 Contact Person _____
 Telephone Number _____
 Tentative Map Expiration Date _____

I. GENERAL

- _____ 1. Agrees with the approved Tentative Map
- _____ 2. Tentative Map Current or Extended
- _____ 3. Complies with Conditions of Approval (i.e. survey, dedications, notes)
- _____ 4. Easements and monuments correspond with improvement plans
- _____ 5. Title Report current (within 6 months)
- _____ 6. Reference maps, deed, etc. of adjacent properties and those referred to in Title

II. DEDICATION AND STATEMENTS

- _____ 1. Owner's statement with dedication
- _____ 2. Trustee's statement.
- _____ 3. Surveyor's/Design Engineer's statement including signature, seal, number and expiration date
- _____ 4. Soils Engineer statement
- _____ 5. All statements, signed and acknowledged with signatures and notary seals legible, using black India ink
- _____ 6. All Engineers' and Surveyors' numbers comply with Subdivision Map Act. (i.e. Pre-1982 CE No. is smaller than 33966)
- _____ 7. Clerk's statement accepting dedications made in Owner's statement.

* See statements in Section 2-5. 1 of the Design and Construction Standards.

III. MONUMENTATION

- _____ 1. All found monuments tied by survey and described with tag numbers and recorded reference.
- _____ 2. Basis of bearings: Two found monuments of record must appear in a statement and be labeled on the map.
- _____ 3. Show tie to basis of bearings.
- _____ 4. Monument the ROW, at B.C., E.C., and boundary line if necessary.
- _____ 5. A monumental line shall be shown on all new subdivision streets with ties to right-of-way and boundary.
- _____ 6. All tract corners to be monumental (tagged I. P.).
- _____ 7. Add note: Chisel 'X' in curb at property line extension.

IV. DISTANCE AND BEARINGS

- _____ 1. Show all bearings, distances, and curve information shown to nearest .01 foot and nearest second.
- _____ 2. Curve data (interior angle, delta, radius, and curve length).
- _____ 3. Radial bearing on all non-tangent curves.
- _____ 4. Basics of Bearing statement on each map sheet.
- _____ 5. Areas net and gross (to nearest .01 square foot of area).
- _____ 6. Minimum road centerline radius as Agency directs. Street width setback lines, and/or required widening must be shown on map.
- _____ 7. Common radial bearings shall be identical in the closures.
- _____ 8. Radial/curve relationship shall be tangent.
- _____ 9. Lot size shall be verified by area, width and depth.
- _____ 10. Sums of lines or curves shall be equal to the incremental parts.
- _____ 11. Math closures must be correct to one part in 20,000 for lots and one part in 100,000 for boundary.
- _____ 12. Math closures are traverse type and on an acceptable common coordinate system. (no inverse).
- _____ 13. Curve/bearing data table on each sheet.

V. MAP BODY

- _____ 1. Map suitable for microfilming, if applicable.

APPENDIX D

Parcel Map Checklist

PARCEL MAP CHECK LIST

I. GENERAL

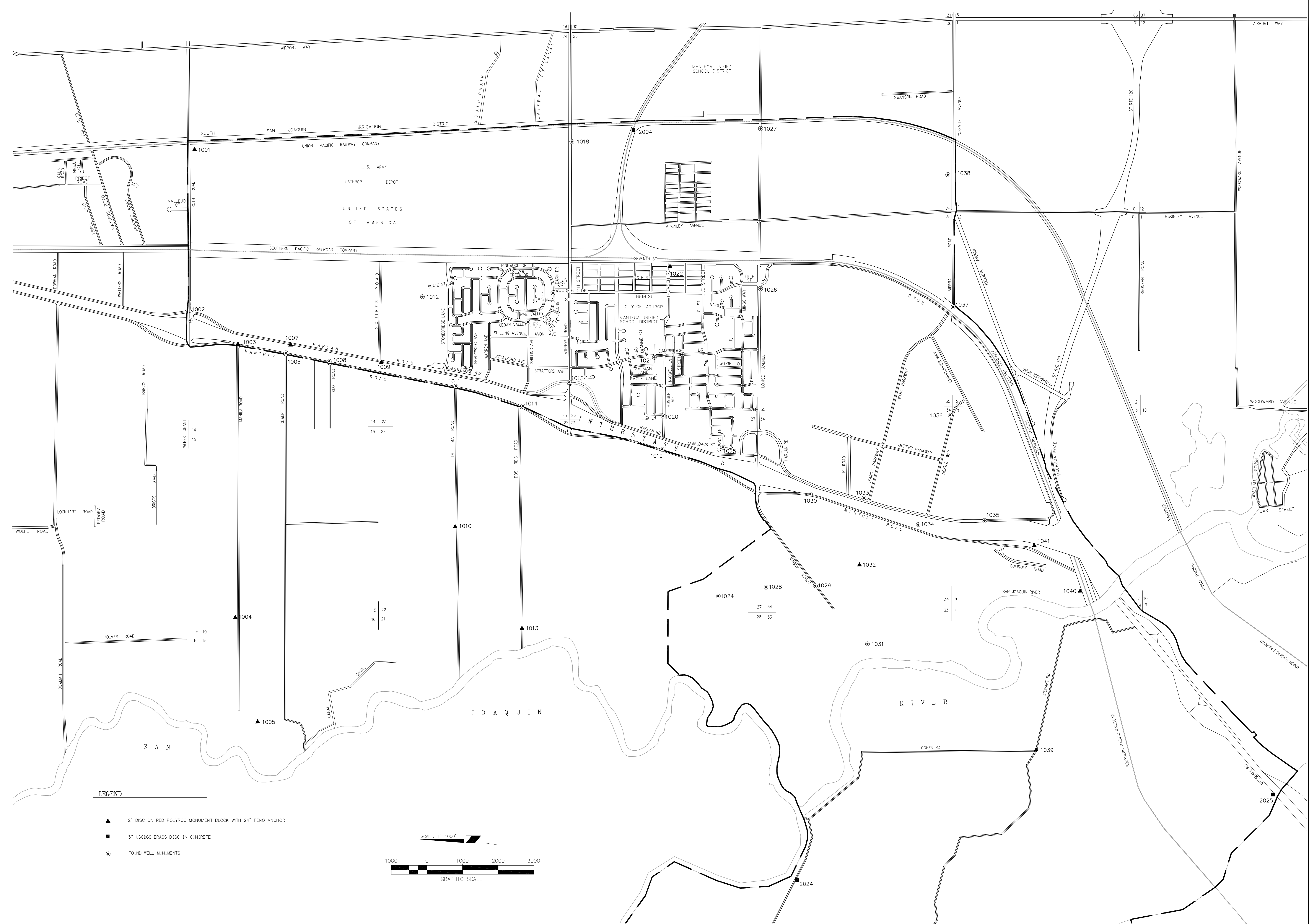
- _____ Parcel Map Guarantee matches **EXACTLY** with Owner's/Trustee's/
Beneficiary's names.
- _____ All Owner's/Trustee's/Beneficiary's signatures dated and notarized.
- _____ Date of Owner's/Trustee's/Beneficiary's signatures match the corresponding
certificate.
- _____ Notary **PRINTED** his name under his signature and shows the expiration date
of his Notary License.
- _____ Notary's Seal, if used, matches certificate as to State/County and expiration
Date.
- _____ **ALL** necessary Offers of Dedication to the Public for Public Use are made
(i.e., Streets, Roads, right-of-way widening, Public Utility Easements, etc.).
- _____ All necessary Offers of Dedication to the local agency are made (i.e., Access
rights, lot (No.), storm drain retention pond site, well site, pump station site,
etc.); Certificate of Dedication required?
- _____ Appropriate statement/certificate accepting or rejecting Offers of Dedication
match **EXACTLY** the Offer of Dedication made by Owners.
- _____ **ALL** Easements and Restricted Access Rights reflected in the Preliminary
Title Report are shown.
- _____ All street widening is properly labeled (i.e., 10' right-of-way dedication).
- _____ Parcels on the Parcel Map are numbered or lettered.

APPENDIX E

City of Lathrop Benchmark Monument Reports

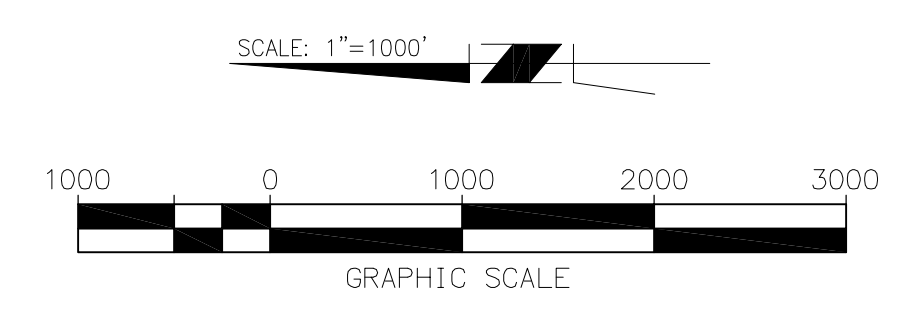
CITY OF LATHROP

HORIZONTAL CONTROL & BENCHMARK NETWORK



Point ID	Northing	Easting	Elevation
1001	2134817.082	6340020.208	23.97
1002	2134942.056	6336154.298	18.72
1003	2133598.027	6335470.091	17.28
1004	2133675.038	6327798.778	10.98
1005	2133046.993	6324873.116	27.25
1006	2132259.626	6335225.764	18.04
1007	2132119.983	6335447.979	18.49
1008	2131038.814	6334988.262	16.53
1009	2129578.418	6334958.872	17.46
1010	2127596.827	6330346.446	0.56
1011	2127489.831	6334288.097	14.56
1012	2129424.736	6335682.101	14.39
1013	2125632.971	6327495.401	28.70
1014	2125610.394	6333736.102	15.03
1015	2124307.667	6334307.85	18.70
1016	2125469.465	6336993.952	16.70
1017	2124762.373	6336910.152	16.57
1018	2124232.436	6341152.87	54.16
1019	2121699.964	6332520.31	14.97
1020	2121668.939	6333449.582	15.55
1021	2121917.234	6335098.17	18.75
1022	2121481.063	6337648.817	19.96
1023	2118370.598	6314090.646	11.04
1024	2120124.712	6328404.5	10.42
1025	2119991.035	6332575.626	16.19
1026	2118943.012	6337027.605	22.37
1027	2118937.388	6341517.605	24.75
1028	2118788.617	6328650.881	13.56
1029	2117404.869	6328695.911	14.48
1030	2117542.77	6331265.114	14.53
1031	2115941.799	6327065.311	31.09
1032	2116165.968	6329275.539	10.76
1033	2116034.069	6331156.84	12.10
1034	2114519.445	6330407.973	11.85
1035	2112659.585	6330519.652	18.93
1036	2113618.048	6333477.335	11.28
1037	2113538.947	6336512.543	30.10
1038	2113688.527	6340204.889	24.45
1039	2111209.529	6324090.523	17.26
1040	2109977.103	6328543.235	33.56
1041	2111261.845	6329819.279	19.08
2004	2122503.667	6341480.849	21.17
2006	2144758.059	6333794.921	16.60
2024	2117914.272	6320437.62	19.23
2025	2104564.851	6322838.443	27.25

- LEGEND**
- ▲ 2" DISC ON RED POLYROC MONUMENT BLOCK WITH 24" FEND ANCHOR
 - 3" USCGS BRASS DISC IN CONCRETE
 - ⊙ FOUND WELL MONUMENTS



BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1001**
 Point Name: **DANIEL**

Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor

Stamping: DANIEL
 Center Mark: Triangle w/Punch

Location:

Exit Roth Road from I-5. Go east on Roth Road 0.8 miles to the Union Pacific Railroad tracks. Monument is set near the intersection of tracks and Roth Road, 70 feet southerly of edge of pavement, 30 feet west of nearest tracks and 30 feet southeasterly of the Union Pacific Railroad control box "833.921.K"



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°51'19.27074"N

Longitude: 121°15'52.47498"W

Ellipse Height (m): -24.693

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	650,693.548	2,134,817.08
Easting:	1,932,719.088	6,340,929.21
Combined Factor:	0.9999347	

NAVD88 Elevation (MSL)

Meters	Feet
7.31	23.97

FGDC Network Accuracy: 0.006

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1002**
 Point Name: **ROTH**

Monument Description: Found Date: 9/1/2005
 2" Disc in Concrete

Stamping: CA. DIV. OF HIGHWAYS "23"
 Center Mark: Punch

Location:

Exit Roth Road from I-5. Monument is in centerline of Roth Road in median on the easterly side of I-5, 180 feet easterly from north bound overpass.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°51'20.11477"N

Longitude: 121°16'52.27514"W

Ellipse Height (m): -26.315

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	650,731.640	2,134,942.06
Easting:	1,931,257.596	6,336,134.30
Combined Factor:	0.9999350	

NAVD88 Elevation (MSL)

Meters	Feet
5.71	18.72

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1003**
 Point Name:



Monument Description: Found Date: 9/1/2005
 2" Brass Disc

Stamping: S.J.CO. TU-31.3 1977
 Center Mark: Punch

Location:

Exit Roth Road from I-5. Go west 0.05 miles to Manthey Road. Go 0.2 miles south to Manila Road. Monument is located near the intersection of Manthey Road and Manila Road. Found in east curb 10 feet southerly of the centerline prolongation of Manila Road.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°51'06.77238"N

Longitude: 121°17'00.41677"W

Ellipse Height (m): -26.764

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	650,321.979	2,133,598.03
Easting:	1,931,055.146	6,335,470.09
Combined Factor:	0.9999349	

NAVD88 Elevation (MSL)

Meters	Feet
5.27	17.28

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1004**
 Point Name: **BROOK**



Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor

Stamping: BROOK
 Center Mark: Triangle w/Punch

Location:

Exit Roth Road from I-5. Take Roth Road west 0.05 miles to Manthey Road. Go south on Manthey Road 0.2 miles to Manila Road. Take Manila Road west 1.5 miles to private gate at the end of the county portion of Manila Road. The monument was set 34 feet northerly of centerline of Manila Road, 12 feet northerly and 7 feet easterly of a brick pilastar.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°51'06.88804"N

Longitude: 121°18'36.07305"W

Ellipse Height (m): -28.984

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.013

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	650,345.452	2,133,675.04
Easting:	1,928,716.924	6,327,798.78
Combined Factor:	0.9999353	

NAVD88 Elevation (MSL)

Meters	Feet
3.08	10.10

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1005**
 Point Name: **LOGAN**

Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor

Stamping: LOGAN
 Center Mark: Triangle w/Punch

Location:

Exit Roth Road from I-5. Go west 0.05 miles to Manthey Road. Go south 0.4 miles to Frewert Road. Go west on Frewert Road 1.8 miles to end of county portion of Frewert Road. Then follow private road 0.1 miles to top of levee, veer right and head northerly along levee 100 feet to gate. Monument is located along levee 47 feet north of gate



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°51'00.42708"N

Longitude: 121°19'12.48230"W

Ellipse Height (m): -23.772

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.013

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	650,154.024	2,133,046.99
Easting:	1,927,825.182	6,324,873.12
Combined Factor:	0.9999344	

NAVD88 Elevation (MSL)

Meters	Feet
8.31	27.25

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1006**
 Point Name:



Monument Description: Found Date: 9/1/2005
 1" Pin

Stamping: N/A
 Center Mark: Apparent Center

Location:

Exit Roth Road from I-5. Go west 0.05 miles to Manthey Road. Take Manthey Road south 0.4 miles to the intersection of Manthey Road and Frewert Road. Monument is located at centerline prolongation of Frewert Road on the east side of Manthey Road 1 foot westerly from fence line along Manthey Road and 1 foot easterly from the most easterly edge of pavement.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°50'53.52026"N

Longitude: 121°17'03.32326"W

Ellipse Height (m): -26.538

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.014

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	649,914.034	2,132,259.63
Easting:	1,930,980.675	6,335,225.76
Combined Factor:	0.9999348	

NAVD88 Elevation (MSL)

Meters	Feet
5.50	18.04

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1007**
 Point Name: **AUNDREA**

Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor

Stamping: AUNDREA
 Center Mark: Triangle w/Punch

Location:

Exit Lathrop Road from I-5. Go east on Lathrop Road for approximately 0.1 miles to Harlan Road. Go north on Harlan Road for 1.5 miles to 11900 Harlan Road. Westerly from the most southerly driveway, monument set on the westerly side of Harlan Road 2.5' west of the face of curb 60 feet north of signpost and 130 feet south of power pole 8/15.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°50'52.15811"N

Longitude: 121°17'00.53818"W

Ellipse Height (m): -26.402

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.014

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	649,871.471	2,132,119.98
Easting:	1,931,048.406	6,335,447.98
Combined Factor:	0.9999347	

NAVD88 Elevation (MSL)

Meters	Feet
5.64	18.49

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1008**
 Point Name:



Monument Description: Found Date: 9/1/2005
 1" Pin in Concrete

Stamping:
 Center Mark: Apparent Center

Location:

Exit Roth Road from I-5. Go west 0.05 miles to Manthey Road Take Manthey Road south approximately 0.6 mile to Klo Road. Monument is located near intersection of Manthey Road and Klo Road. Found 20 feet north of centerline prolongation of Klo Road and 5 feet east of edge of pavement of Manthey Road

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°50'41.43122"N

Longitude: 121°17'06.15668"W

Ellipse Height (m): -27.008

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	649,541.930	2,131,038.81
Easting:	1,930,908.284	6,334,988.26
Combined Factor:	0.9999348	

NAVD88 Elevation (MSL)

Meters	Feet
5.04	16.53

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1009**
 Point Name: **SLATE**

Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor
Stamping: SLATE
Center Mark: Triangle w/Punch
Location:

Exit Lathrop Road from I-5. Go east on Lathrop Road for approximately 0.1 miles to Harlan Road. Head north 1.0 miles to Slate Street. Monument is located near the intersection of Slate Street and Harlan Road. Monument is 43 feet southerly of centerline prolongation of Slate Street at the midpoint between a speed limit sign and directional sign, 2 feet easterly from freeway right of way fence line, 2.5 feet westerly of curb



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°50'26.99081"N
 Longitude: 121°17'06.36910"W
 Ellipse Height (m): -26.731

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	649,096.800	2,129,578.42
Easting:	1,930,899.356	6,334,958.97
Combined Factor:	0.9999346	

NAVD88 Elevation (MSL)

Meters	Feet
5.32	17.46

FGDC Network Accuracy: 0.006

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005



BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1010**
 Point Name: **DELIMA**



Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor
Stamping: DELIMA
Center Mark: Triangle w/Punch
Location:

Exit Lathrop Road from I-5. Go 0.05 miles west on Lathrop Road to Manthey Road. From Manthey Road go north 0.5 miles to De Lima Road. Go west 0.7 miles on De Lima Road to the gate with the "Dead End" sign. The monument is set 3 feet southerly of the most southerly edge of pavement and 8 feet easterly of the gate.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°50'06.12391"N

Longitude: 121°18'03.64972"W

Ellipse Height (m): -28.862

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	648,465.378	2,127,506.83
Easting:	1,929,493.456	6,330,346.45
Combined Factor:	0.9999348	

NAVD88 Elevation (MSL)

Meters	Feet
3.22	10.56

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1011**

Point Name:

Monument Description: Found Date: 9/1/2005
1" Pin in Concrete

Stamping: N/A

Center Mark: Apparent Center

Location:

Exit Roth Road from I-5. Go 0.05 miles west to Manthey Road. From Manthey Road go north 0.5 miles to De Lima Road. Monument is located 10 feet southerly of the centerline prolongation of De Lima Road, 2 feet westerly from right-of-way fence line on the east side of Manthey Road.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°50'06.28658"N

Longitude: 121°17'14.51344"W

Ellipse Height (m): -27.629

Calif. Coord.
System of
1983(Epoch
2004.00) Zone 3

FGDC Network Accuracy: 0.008

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	648,460.197	2,127,489.83
Easting:	1,930,694.873	6,334,288.10
Combined Factor:	0.9999346	

NAVD88 Elevation (MSL)

Meters	Feet
4.44	14.56

FGDC Network Accuracy: 0.006

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1012**
 Point Name:



Monument Description: Found Date: 9/1/2005
 2.5" Brass Disc in Well Monument

Stamping: Illegible
 Center Mark:

Location:
 Exit Lathrop Road from I-5. Go east on Lathrop Road for 0.1 mile to Harlan Road. Go north 1.0 miles to Slate Street. Go east 0.5 miles on Slate Street to intersection of Kirkwood Avenue and Slate Street. Monument is located at centerline intersection of Kirkwood Avenue and Slate Street.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°50'15.73736"N

Longitude: 121°16'43.27217"W

Ellipse Height (m): -27.666

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	648,745.157	2,128,424.74
Easting:	1,931,461.143	6,336,802.10
Combined Factor:	0.9999347	

NAVD88 Elevation (MSL)

Meters	Feet
4.38	14.39

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1013**
 Point Name: **PAT**

Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor

Stamping: PAT
 Center Mark: Triangle w/Punch

Location:

Exit Lathrop Road from I-5. Go west on Lathrop Road 0.05 miles to Manthey Road. Go north on Manthey Road 0.3 miles to Dos Reis Road, then west on Dos Reis Road 1.2 miles to Dos Reis Road Park and top of levee. Monument is located 105 feet southerly of the centerline of Dos Reis Road, 7 feet south of metal gate at the top of levee.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'47.35559"N

Longitude: 121°18'38.98683"W

Ellipse Height (m): -23.353

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	647,894.226	2,125,632.97
Easting:	1,928,624.456	6,327,495.40
Combined Factor:	0.9999338	

NAVD88 Elevation (MSL)

Meters	Feet
8.75	28.70

FGDC Network Accuracy: 0.006

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1014**
 Point Name:

Monument Description: Found Date: 9/1/2005
 1" Pin in Concrete

Stamping: N/A
 Center Mark: Apparent Center

Location:

Exit Lathrop Road from I-5. Go west on Lathrop Road 0.05 miles to Manthey Road. Go north on Manthey Road 0.3 miles to Dos Reis Road. Monument is located near the intersection of Manthey Road and Dos Reis Road. Found 115 feet south of the centerline prolongation of Dos Reis Road, 1.5 feet westerly of the freeway right-of-way fence line on the east side of Manthey Road.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'47.65983"N

Longitude: 121°17'21.19674"W

Ellipse Height (m): -27.497

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	647,887.344	2,125,610.39
Easting:	1,930,526.625	6,333,736.10
Combined Factor:	0.9999344	

NAVD88 Elevation (MSL)

Meters	Feet
4.58	15.03

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1015**
 Point Name:

Monument Description: Found Date: 9/1/2005
 2.5" Brass Disc in Well Monument

Stamping: LS 5816
 Center Mark: Punch

Location:

Exit Lathrop Road from I-5. Go east on Lathrop Road 0.1 miles to the intersection of Lathrop Road and Harlan Road. Monument is located at the centerline intersection of Lathrop Road and Harlan Road.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'34.83567"N

Longitude: 121°17'12.81178"W

Ellipse Height (m): -26.381

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	647,490.272	2,124,307.67
Easting:	1,930,728.326	6,334,397.85
Combined Factor:	0.9999342	

NAVD88 Elevation (MSL)

Meters	Feet
5.70	18.70

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1016**
 Point Name:



Monument Description: Found Date: 9/1/2005
 3/4" IP w/ plug/tack in Well Monument

Stamping: L.S. 5840
 Center Mark: Tack

Location:

Exit Lathrop Road from I-5. Go east 0.1 miles to Harlan Road. Go north on Harlan Road 0.2 miles to Shilling Avenue. Go 0.3 miles east on Shilling Avenue to Cedar Valley Drive. Monument is located at centerline intersection of Cedar Valley Drive and Shilling Avenue.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'46.46212"N

Longitude: 121°16'51.79241"W

Ellipse Height (m): -26.978

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	647,844.389	2,125,469.47
Easting:	1,931,245.299	6,336,093.95
Combined Factor:	0.9999343	

NAVD88 Elevation (MSL)

Meters	Feet
5.09	16.70

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1017**
 Point Name:



Monument Description: Found Date: 9/1/2005
 1" IP w/ plug/tack in Well Monument

Stamping: LS 5340
 Center Mark: Tack

Location:

Exit Lathrop Road from I-5. Take Lathrop Road 0.6 miles east to Woodfield Drive. Take Woodfield Drive 0.1 miles north to intersection of Woodfield Drive and Long Barn Drive. Monument is located at the centerline intersection of Woodfield Drive and Long Barn Drive.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'39.53877"N

Longitude: 121°16'41.54557"W

Ellipse Height (m): -27.019

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	647,628.867	2,124,762.37
Easting:	1,931,494.077	6,336,910.15
Combined Factor:	0.9999343	

NAVD88 Elevation (MSL)

Meters	Feet
5.05	16.57

FGDC Network Accuracy: 0.006

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1018**
 Point Name:



Monument Description: Found Date: 9/1/2005
 2.5" Brass Disc in Well Monument

Stamping: LS 6314
 Center Mark: Punch

Location:

Exit Lathrop Road from I-5. Take Lathrop Road 1.4 miles to railroad overcrossing. Monument is located in a 4 foot wide median on Lathrop Road 87 feet west of the westerly edge of bridge deck

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'34.64512"N

Longitude: 121°15'48.60940"W

Ellipse Height (m): -15.544

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	647,467.342	2,124,232.44
Easting:	1,932,787.260	6,341,152.87
Combined Factor:	0.9999325	

NAVD88 Elevation (MSL)

Meters	Feet
16.51	54.16

FGDC Network Accuracy: 0.005

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1019**
 Point Name:



Monument Description: Found Date: 9/1/2005
 3/4" Pin

Stamping: N/A
 Center Mark: Apparent Center

Location:

Exit Lathrop Road for I-5. Go west on Lathrop Road 0.05 miles to Manthey Road. Go 0.5 miles south on Manthey Road. Monument is located on the easterly side of Manthey Road, 75 feet north of a private driveway on west side of road, 8 feet north of power pole, 5 feet east of edge of pavement, and 1 foot west of freeway right-of-way fenceline.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'08.89823"N

Longitude: 121°17'35.93790"W

Ellipse Height (m): -27.538

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	646,695.442	2,121,699.96
Easting:	1,930,156.051	6,332,520.31
Combined Factor:	0.9999342	

NAVD88 Elevation (MSL)

Meters	Feet
4.56	14.97

FGDC Network Accuracy: 0.006

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1020**
 Point Name:



Monument Description: Found Date: 9/1/2005
 1 1/2" Disk in Well Monument

Stamping: S.J.C.O. Re 11988
 Center Mark: Punch

Location:

Exit Louise Avenue from I-5. Go east 0.1 miles to Harlan Road. Go north on Harlan Road 0.6 miles to Thomsen Road. Go east on Thomsen Road 0.1 miles to Lisa Lane. Monument is located 13 feet east of centerline intersection of Thomsen Road and Lisa Lane on the centerline of Thomsen Road.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'08.66922"N

Longitude: 121°17'24.35332"W

Ellipse Height (m): -27.358

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.012

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	646,656.986	2,121,668.94
Easting:	1,930,439.293	6,333,449.58
Combined Factor:	0.9999342	

NAVD88 Elevation (MSL)

Meters	Feet
4.74	15.55

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1021**
 Point Name:



Monument Description: Found Date: 9/1/2005
 1" Rebar in Well Monument

Stamping: N/A
 Center Mark: Apparent Center

Location:

Exit Louise Avenue from I-5. Go east on Louise Avenue 0.1 miles to Harlan Road. Go north on Harlan Road 0.6 miles to Thomsen Road. Go east on Thomsen Road 0.4 miles to Cambridge Drive. Go north on Cambridge Drive 0.1 miles to Steven Place. Monument is located at centerline intersection of Cambridge Drive and Steven Place.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'11.26107"N

Longitude: 121°17'03.83326"W

Ellipse Height (m): -26.374

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	646,761.666	2,121,917.23
Easting:	1,930,941.784	6,335,098.17
Combined Factor:	0.9999340	

NAVD88 Elevation (MSL)

Meters	Feet
5.72	18.75

FGDC Network Accuracy: 0.008

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1022**
 Point Name: **JAMES**

Monument Description: Set Date: 9/1/2005
 2" Disk on Red Polyroc Monument Block with 24" Feno Anchor

Stamping: JAMES
 Center Mark: Triangle w/Punch

Location:

Exit Louise Avenue from I-5. Go east on Louise Avenue 0.1 miles to Harlan Road. Go north on Harlan Road 0.6 miles to Thomsen Road. Go north on Thomsen Road 0.8 miles to 7th Street. Monument is located 40 feet southeasterly of centerline intersection of 7th Street and Thomsen Road, on the east side of 7th Street, 40 feet south from electrical pole, 5 feet west from fence line, and 5 feet east from edge of pavement.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'07.15908"N

Longitude: 121°16'31.99972"W

Ellipse Height (m): -25.997

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	646,628.721	2,121,481.06
Easting:	1,931,719.223	6,337,648.82
Combined Factor:	0.9999340	

NAVD88 Elevation (MSL)

Meters	Feet
6.08	19.96

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1023**
 Point Name: **PARADISE**

Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor

Stamping: PARADISE
 Center Mark: Triangle w/Punch

Location:

Exit Louise Avenue from I-5. Go west 0.05 miles to Manthey Road. Go south on Manthey Road 2.1 miles to Stewart Road. Go westerly on Stewart Road 1.1 miles to Cohen Road. Go northerly and westerly on Cohen Road 2.7 miles to Paradise Avenue. Go south 0.5 miles to Stewart Road. Monument is located 80 feet southeasterly of the centerline intersection, 13 feet northerly of top edge of bank and 10 feet southerly of most southerly edge of pavement.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'34.37634"N

Longitude: 121°21'25.24144"W

Ellipse Height (m): -28.813

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	645,680.650	2,118,370.60
Easting:	1,924,538.678	6,314,090.65
Combined Factor:	0.9999342	

NAVD88 Elevation (MSL)

Meters	Feet
3.37	11.04

FGDC Network Accuracy: 0.008

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1024**
 Point Name:



Monument Description: Found Date: 9/1/2005
 3" USC&GS Brass Disc in Concrete 2.5" Brass Disc
Stamping: LS 5412
Center Mark: Punch
Location:

Exit Louise Avenue from I-5. Go west for 0.6 miles to McKee Boulevard. Head north 0.2 miles to Barbara Terry Boulevard. Monument is located at the centerline intersection of McKee Boulevard and Barbara Terry Boulevard.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'52.97666"N

Longitude: 121°18'27.06288"W

Ellipse Height (m): -28.945

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	646,215.305	2,120,124.71
Easting:	1,928,901.549	6,328,404.50
Combined Factor:	0.9999343	

NAVD88 Elevation (MSL)

Meters	Feet
3.18	10.42

FGDC Network Accuracy: 0.005

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1025**
 Point Name:



Monument Description: Found Date: 9/1/2005
 3/4" IP with Plastic Plug in Well Monument

Stamping: L84876
 Center Mark: Tack

Location:

Exit Louise Avenue from I-5. Go 0.1 miles east to Harlan Road. Go north on Harlan Road 0.3 miles to Camelback Drive. Go east on Camelback Drive 150 feet to intersection with Sedona Lane. Monument is located at the centerline intersection of Camelback Drive and Sedona Lane.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'52.00773"N

Longitude: 121°17'35.06802"W

Ellipse Height (m): -27.171

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	646,174.560	2,119,991.04
Easting:	1,930,172.911	6,332,575.63
Combined Factor:	0.9999341	

NAVD88 Elevation (MSL)

Meters	Feet
4.94	16.19

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1026**
 Point Name:



Monument Description: Found Date: 9/1/2005
 2" Disc found in curb

Stamping: B.M. L.S. 4450
 Center Mark:

Location:

Exit Louise Avenue from I-5. Go east on Louise approximately 0.7 miles to 5th Street/ Howland Road. Monument is located at the southwest corner of intersection of Louise Avenue and 5th Street/ Howland Road, in the curb, 4 feet east of a traffic signal pole at the west edge of the handicap ramp

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'42.01592"N

Longitude: 121°16'39.47888"W

Ellipse Height (m): -25.277

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	645,855.122	2,118,943.01
Easting:	1,931,529.877	6,337,027.61
Combined Factor:	0.9999337	

NAVD88 Elevation (MSL)

Meters	Feet
6.82	22.37

FGDC Network Accuracy: 0.008

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1027**
 Point Name: **BRYCE**

Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24"
 Feno Anchor

Stamping: BRYCE
 Center Mark: Triangle w/Punch

Location:

Exit Louise Avenue from I-5. Go east on Louise
 1.5 miles to the Southern Pacific Railroad
 Company tracks. Monument is located on south
 side of Louise Avenue, 10 feet west of railroad
 tracks and 20 feet south of railroad crossing
 arms. **DESTROYED**

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'42.32549"N

Longitude: 121°15'43.52589"W

Ellipse Height (m): -24.507

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.014

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	645,853.408	2,118,937.39
Easting:	1,932,898.432	6,341,517.61
Combined Factor:	0.9999336	

NAVD88 Elevation (MSL)

Meters	Feet
7.54	24.75

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005



BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1028**
 Point Name:



Monument Description: Found Date: 9/1/2005
 2.5" Brass Disc in Well Monument

Stamping: LS 5412
 Center Mark: Punch

Location:

Exit Louise Avenue from I-5. Go west on Louise Avenue for 0.6 miles to McKee Boulevard. Monument is located at the centerline intersection of River Island Parkway and McKee Boulevard.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'39.78852"N

Longitude: 121°18'23.84896"W

Ellipse Height (m): -27.994

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	645,808.062	2,118,788.62
Easting:	1,928,976.646	6,328,650.88
Combined Factor:	0.9999341	

NAVD88 Elevation (MSL)

Meters	Feet
4.13	13.56

FGDC Network Accuracy: 0.005

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1029**
 Point Name:

Monument Description: Found Date: 9/1/2005
 2.5" Brass Disc in Well Monument

Stamping: LS5412

Center Mark:

Location:

Exit Louise Avenue from I-5. Go west 0.6 miles to McKee Boulevard. Go south on McKee Boulevard 0.2 miles to Johnson Ferry Boulevard. Go west 0.1 miles to Gold Nugget Trail. Monument is located at the centerline intersection of Johnson Ferry Boulevard and Gold Nugget Trail.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'26.11209"N

Longitude: 121°18'23.13922"W

Ellipse Height (m): -27.718

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	645,386.295	2,117,404.87
Easting:	1,928,990.372	6,328,695.91
Combined Factor:	0.9999340	

NAVD88 Elevation (MSL)

Meters	Feet
4.41	14.48

FGDC Network Accuracy: 0.005

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1030**
 Point Name:



Monument Description: Found Date: 9/1/2005
 1" Pin in Concrete

Stamping: N/A
 Center Mark: Apparent Center

Location:
 Exit Louise Avenue from I-5. Go west on Louise Avenue 0.05 miles Manthey Road. Go 0.2 miles south on Manthey Road. Monument is located on the east side of Manthey Road, 5 feet west of freeway right-of-way fence, and 3 feet east of "Stop Ahead" sign

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'27.69311"N

Longitude: 121°17'51.13959"W

Ellipse Height (m): -27.694

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	645,428.327	2,117,542.77
Easting:	1,929,773.466	6,331,265.11
Combined Factor:	0.9999340	

NAVD88 Elevation (MSL)

Meters	Feet
4.43	14.53

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1031**
 Point Name:



Monument Description: Found Date: 9/1/2005
 1/2" Pin Mushroomed on Top

Stamping: N/A
 Center Mark: Cross

Location:

Exit Louise Avenue from I-5. Go west 0.05 miles to Manthey Road. Take Manthey Road south 0.8 miles to Brookhurst Boulevard. Go west on Brookhurst Boulevard 0.2 miles to McKee Boulevard. Go north on McKee Boulevard 0.3 miles to a roundabout at Towne Centre Drive. Go west on Towne Centre Drive 0.4 miles to a dead end and an access road to the levee. Go south along the levee access road 0.1 mile to the top of the levee. Monument is located 100 feet north of an outfall structure and 60 feet south of the access road on the westerly side of the levee.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'11.50820"N

Longitude: 121°18'43.29956"W

Ellipse Height (m): -22.679

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	644,940.350	2,115,941.80
Easting:	1,928,493.364	6,327,065.31
Combined Factor:	0.9999331	

NAVD88 Elevation (MSL)

Meters	Feet
9.47	31.05

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1032**
 Point Name: **CITY HALL**

Monument Description: Set Date: 9/1/2005
 2" Disc in Concrete

Stamping: CITY HALL
 Center Mark: Triangle w/Punch

Location:

Exit Louise Avenue from I-5. Go west 0.05 miles to Manthey Road. Take Manthey Road south 0.8 miles to Brookhurst Boulevard. Go west on Brookhurst Boulevard 0.2 miles to McKee Boulevard. Go north on McKee Boulevard 0.3 miles to Lathrop City Hall on the south side of McKee Boulevard. Monument is located at the northwest corner of concrete base of the flag pole at the southwest side of the City Hall building, 23 feet east from face of curb.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'13.91314"N

Longitude: 121°18'15.78392"W

Ellipse Height (m): -28.856

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	645,008.677	2,116,165.97
Easting:	1,929,167.043	6,329,275.54
Combined Factor:	0.9999341	

NAVD88 Elevation (MSL)

Meters	Feet
3.28	10.76

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1033**
 Point Name:



Monument Description: Found Date: 9/1/2005
 1" Rebar w/ Cap/ Tack in Well Monument

Stamping: RCE 24XX
 Center Mark: Tack

Location:

Exit Louise Road from I-5. Go 0.2 miles west to Harlan Road. Go south on Harlan Road 0.7 miles to D'arcy Parkway. Monument is located at the centerline intersection of Harlan Road and D'Arcy Parkway.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'12.76836"N

Longitude: 121°17'52.32725"W

Ellipse Height (m): -28.441

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	644,968.474	2,116,034.07
Easting:	1,929,740.495	6,331,156.94
Combined Factor:	0.9999341	

NAVD88 Elevation (MSL)

Meters	Feet
3.69	12.10

FGDC Network Accuracy: 0.006

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1034**
 Point Name:



Monument Description: Found Date: 9/1/2005
 1/2" Rebar

Stamping: N/A
 Center Mark: N/A

Location:
 Exit Louise Avenue from I-5. Go west 0.05 miles to Manthey Road. Go South on Manthey Road 0.8 miles to Brookhurst Boulevard. Monument is located 4 feet south of centerline prolongation of Brookhurst Boulevard, 2 feet east of freeway right-of-way fence, and 8 feet east of the edge of pavement.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°47'57.73094"N

Longitude: 121°18'01.49807"W

Ellipse Height (m): -28.527

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.011

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	644,506.816	2,114,519.45
Easting:	1,929,512.209	6,330,407.97
Combined Factor:	0.9999340	

NAVD88 Elevation (MSL)

Meters	Feet
3.61	11.85

FGDC Network Accuracy: 0.006

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005



BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1035**
 Point Name:



Monument Description: Found Date: 9/1/2005
 2.5" Brass Disc in Well Monument

Stamping: Illegible

Center Mark:

Location:

Exit Louise Road from I-5. Go east 0.2 miles to Harlan Road. Take Harlan Road south 1.3 miles till it dead ends at the entrance to The Home Depot Factory Center. Monument is located at the center of the cul-de-sac

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°47'39.35303"N

Longitude: 121°17'59.90853"W

Ellipse Height (m): -26.375

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.012

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	643,939.929	2,112,659.59
Easting:	1,929,546.249	6,330,519.65
Combined Factor:	0.9999336	

NAVD88 Elevation (MSL)

Meters	Feet
5.77	18.93

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1036**
 Point Name:



Monument Description: Found Date: 9/1/2005
 2 1/2" Brass Disc in Well Monument

Stamping: LS 6369
 Center Mark: Punch

Location:

Exit Louise Avenue from I-5. Go east on Louise Road 0.2 miles to Harlan Road. Go south on Harlan Road 1.0 miles to Nestle Way. Go east on Nestle Way 0.5 miles. Monument is located on the centerline of Nestle Way 300 feet east of the railroad tracks at the beginning of curve, 50 feet northeasterly of light pole no. 690, and 27 feet south of railroad crossing sign at Building 601.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°47'49.07716"N

Longitude: 121°17'23.16068"W

Ellipse Height (m): -28.694

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.012

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	644,232.069	2,113,618.05
Easting:	1,930,447.753	6,333,477.34
Combined Factor:	0.9999340	

NAVD88 Elevation (MSL)

Meters	Feet
3.44	11.28

FGDC Network Accuracy: 0.008

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1037**
 Point Name:

Monument Description: Found Date: 9/1/2005
 2 1/2" Brass Disc in Well Monument

Stamping: PLS 6173

Center Mark: Punch

Location:

Exit Lathrop Road from I-5. Go east on Lathrop Road for approximately 0.2 miles to Harlan Road. Take Harlan Road 0.7 miles to D'Arcy Parkway. Head east on D'Arcy Parkway 1.0 miles to the railroad tracks. Monument is located 280 feet southeasterly of tracks at apparent centerline intersection of D'Arcy Parkway and a future cross street.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°47'48.54669"N

Longitude: 121°16'45.33658"W

Ellipse Height (m): -22.944

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.012

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	644,207.959	2,113,538.95
Easting:	1,931,372.886	6,336,512.54
Combined Factor:	0.9999331	

NAVD88 Elevation (MSL)

Meters	Feet
9.18	30.10

FGDC Network Accuracy: 0.008

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1038**
 Point Name:



Monument Description: Found Date: 9/1/2005
 2.5" Brass Disc in Well Monument

Stamping: LS 5182 2001
 Center Mark:

Location:

Exit Louise Avenue from I-5. Go east 1.2 miles on Louise Avenue to McKinley Road. Go south on McKinley Road 1.0 miles to Yosemite Avenue East. Go east on Yosemite Avenue 0.2 miles to Shideler Parkway. Monument is located at the centerline intersection of Yosemite Avenue and Shideler Parkway.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°47'50.32860"N

Longitude: 121°15'59.09949"W

Ellipse Height (m): -24.652

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.012

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	644,253.551	2,113,688.53
Easting:	1,932,504.411	6,340,224.89
Combined Factor:	0.9999334	

NAVD88 Elevation (MSL)

Meters	Feet
7.45	24.45

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1039**
 Point Name: **CLAIRE**

Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor

Stamping: CLAIRE
 Center Mark: Triangle w/Punch

Location:

Eixt Louise Avenue from I-5. Go west 0.05 miles to Manthey Road. Go south 2.0 miles to Stewart Road. Go westerly on Stewart road for 1.1 miles to Cohen Road. Monument is located at the northwest corner of intersection, 50 feet south of the southeast corner of fence surrounding equipment yard and 90 feet easterly of power pole 1235. DESTORYED

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°47'24.46629"N

Longitude: 121°19'19.84760"W

Ellipse Height (m): -26.871

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.012

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	643,497.951	2,111,209.53
Easting:	1,927,586.647	6,324,090.52
Combined Factor:	0.9999336	

NAVD88 Elevation (MSL)

Meters	Feet
5.26	17.26

FGDC Network Accuracy: 0.008

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005



BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1040**
 Point Name: **LAUNCH**

Monument Description: Set Date: 9/1/2005
 2" Disc in Concrete Headwall

Stamping: LAUNCH
 Center Mark: Triangle w/Punch

Location:

Exit Louise Avenue from I-5. Go west 0.05 miles to Manthey Road. Go south on Manthey Road 1.7 miles to Mossdale Crossing Park and Launch Facility. Enter the park and go to the boat launch ramp. The monument is located in the concrete headwall at the top of the boat launch ramp.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°47'12.66513"N

Longitude: 121°18'24.24356"W

Ellipse Height (m): -21.930

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.010

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	643,122.307	2,109,977.10
Easting:	1,928,943.842	6,328,543.26
Combined Factor:	0.9999328	

NAVD88 Elevation (MSL)

Meters	Feet
10.23	33.56

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **1041**
 Point Name: **TRISHA**

Monument Description: Set Date: 9/1/2005
 2" Disc on Red Polyroc Monument Block with 24" Feno Anchor
Stamping: TRISHA
Center Mark: Triangle w/Punch
Location:

Exit Louise Avenue from I-5. Go west on Louise Avenue 0.05 miles to Manthey Road. Go South on Manthey Road 1.5 miles. Monument is located about 500 feet north of railroad track bridge, 2 feet west of fence line on the east side of Manthey Road, 65 feet south of pole 541P and driveway at 18570 Manthey Road.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°47'25.47510"N

Longitude: 121°18'08.48489"W

Ellipse Height (m): -26.336

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.008

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	643,513.897	2,111,261.85
Easting:	1,929,332.775	6,329,819.28
Combined Factor:	0.9999335	

NAVD88 Elevation (MSL)

Meters	Feet
5.82	19.08

FGDC Network Accuracy: 0.005

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005



BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **2004**
 Point Name:



Monument Description: Found Date: 9/1/2005
 3.75" USC&GS Brass Disc

Stamping: E799 1946
 Center Mark: Cross

Location:

Exit Lathrop Road of I-5. Go east on Lathrop Road approximately 1.5 miles. Turn right onto dirt road after you go over the Southern Pacific Railroad Company tracks. Follow road to "T" into the Railroad tracks and canal. Make a left and follow that dirt road parallel with the canal. Stay to the left approximately 0.4 miles till you can cross over tracks and canal. Make a right after crossing over and head northwest for 100 feet. Monument is located on canal headwall

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°49'17.58024"N

Longitude: 121°15'44.34594"W

Ellipse Height (m): -25.607

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.006

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	646,940.412	2,122,503.67
Easting:	1,932,887.228	6,341,480.85
Combined Factor:	0.9999340	

NAVD88 Elevation (MSL)

Meters	Feet
6.45	21.17

FGDC Network Accuracy: 0.000

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **2006**
 Point Name: **MATHEW**

Monument Description: Found Date: 9/1/2005
 3" USC&GS Brass Disc

Stamping: MATHEW 1959
 Center Mark: Cross

Location:

Exit Mathews Road from I-5. Go west on Mathews Road 0.6 miles to the San Joaquin County Juvenile Justice Center located at 535 Mathews. Monument is located 50 feet west of a fire hydrant, and 10 feet north of edge of road.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°52'56.96453"N

Longitude: 121°17'22.47728"W

Ellipse Height (m): -26.920

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.007

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	653,723.564	2,144,758.06
Easting:	1,930,544.553	6,333,794.92
Combined Factor:	0.9999360	

NAVD88 Elevation (MSL)

Meters	Feet
5.06	16.60

FGDC Network Accuracy: 0.000

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **2024**
 Point Name: **TIDAL 6**

Monument Description: Found Date: 9/1/2005
 3" USC&GS Brass Disc in Concrete

Stamping: NO. 6 1949 Reset 1958
 Center Mark: Cross

Location:

Exit Louise Avenue from I-5. Go west on Louise Avenue 0.05 to Manthey Road. Take Manthey Road south 2.1 miles to Stewart Road. Go westerly on Stewart Road 1.1 miles to Cohen Road. Go northerly and westerly on Cohen Road 1.7 miles. Monument is located 10 feet northerly of the edge of the pavement on a 7'x 7' concrete slab for a 20" standpipe.



NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°48'30.43221"N

Longitude: 121°20'06.10028"W

Ellipse Height (m): -26.297

Calif. Coord. System of 1983(Epoch 2004.00) Zone 3

FGDC Network Accuracy: 0.005

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	645,541.561	2,117,914.27
Easting:	1,926,473.239	6,320,437.62
Combined Factor:	0.9999338	

NAVD88 Elevation (MSL)

Meters	Feet
5.86	19.23

FGDC Network Accuracy: 0.000

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

BENCH MARK MONUMENT REPORT

CITY OF LATHROP

Date Printed: 5/5/2006

Point ID: **2025**
 Point Name:



Monument Description: Found Date: 9/1/2005
 3.75" USC & GS Brass Disk

Stamping: USC & GS H1041 1959
 Center Mark: Cross

Location:

Exit Louise Avenue from I-5. Go west on Louise Avenue 0.05 to Manthey Road. Take Manthey Road 3.3 miles to a concrete bridge. Monument is located at the northeast concrete bridge abutment on Manthey Road.

NAD 83 Coordinates, Epoch 2004.00

Survey by: RBF Date: NOV 2005

Ellipsoidal Coordinates, GRS 80

Latitude: 37°46'18.66517"N

Longitude: 121°19'34.71494"W

Ellipse Height (m): -23.890

Calif. Coord.
 System of
 1983(Epoch
 2004.00) Zone 3

FGDC Network Accuracy: 0.009

+/- Meters at 95% Confidence

	Meters	US Survey Feet
Northing:	641,472.650	2,104,564.85
Easting:	1,927,205.012	6,322,838.44
Combined Factor:	0.9999330	

NAVD88 Elevation (MSL)

Meters	Feet
8.31	27.25

FGDC Network Accuracy: 0.000

+/- Meters at 95% Confidence

Survey by: RBF Date: NOV 2005

APPENDIX F

RTU/PLC Programming Guidelines for SCADA Interface

RTU/PLC PROGRAMMING GUIDELINES FOR SCADA INTERFACE

1. Introduction

This document is intended to guide programming of programmable logic controllers (PLCs) for interface with the City of Lathrop's supervisory control and data acquisition (SCADA) system. This guideline applies to PLCs controlling domestic water, recycled water, storm water and wastewater facilities throughout the city. All of these sites will be integrated into a radio telemetry system headed by two master PLCs at Corporation Yard and City Hall.

2. Revision History

The table below shows the history of revisions to this document.

Rev.	Description	By	Date
Draft	Issued to City for comment	MCC – MH	19-Jan-05

3. Hardware

Modicon PLCs equipped with Ethernet (Modbus/TCP) ports will be used at all sites. Locus Ethernet radios are used to create a citywide control network. Internet Protocol (IP) addresses must be assigned correctly to avoid duplicate addresses in the network.

3.1 IP Addressing

IP addresses will be assigned based on the type of site the PLC controls, the number of the site, and the type of device. The IP addressing scheme is based on a private Class B address space. The subnet mask for all devices is 255.255.0.0.

First Octet	Second Octet	Third Octet				Fourth Octet
<i>172 for all</i>	<i>16 for all</i>	<i>First 2 digits = Site Type</i>		<i>Last digit = Device Type</i>		<i>Site Number</i>
		10	Master Control	0	Radio	
		11	Water Well	1	PLC	
		12	Water Booster	2	Operator Interface (OIT)	
		13	Waste Water	3	SCADA Server	
		14	Recycled Water	4	Programming PC	
		15	Storm Water	5	SCADA Client	
				6	Printer	

An example of how this scheme is applied appears below:

Device	IP Address
Well 21 Radio	172.16.110.21
Well 21 PLC	172.16.111.21
Well 21 OIT	172.16.112.21
Corporation Yard Radio	172.16.100.1
Corporation Yard PLC	172.16.101.1
Corporation Yard SCADA	172.16.103.1

4. Data Tables

PLC data tables must be programmed to allow for efficient communication with the master PLCs at Corporation Yard and City Hall. Many sites feature local operator interface terminals (OITs) that allow an operator to change set points and modes locally. To avoid conflict between local set point entry and entries made at the SCADA system, each PLC will be programmed with two control modes. In local mode, the set points entered at the OIT will prevail. These set points will be read by the master PLC and the SCADA system will be updated with any new entries made at the site. In SCADA mode, set points written from the master PLC are used for control and the local OIT is updated with the latest entries. One or two pushbuttons are generally provided on the local OIT to allow for local / SCADA mode selection. SCADA mode may also be requested from the SCADA system if an operator leaves a site in local mode. All data that is written or read by the master PLC must be mapped to tightly packed 40xxxx registers. All set points read by the master PLC and all set points written by the master PLC must be contiguous.

4.1 Read Table

For most sites, the read table should consume less than 100 registers. If more than 100 registers are required, multiple read tables may be configured. A typical read table arrangement follows:

Starting Address	Length	Description
400400	1	PLC bits – local mode indicator, handshake bit, etc.
400401	5	Discrete status bits for the process (digital inputs, derived coils, etc.)
400406	4	Discrete Alarm bits
400411	20	Analog process values, flow totals, runtime totals, etc.
400451	3	Momentary pushbuttons echo to master
400454	2	Maintained selectors echo to master
400456	30	Current control and alarm set points

4.2 Write Table

For nearly all sites, the write table should consume less than 100 registers. If more than 100 registers are required, multiple write tables may be configured. A typical write table arrangement follows:

Starting Address	Length	Description
400600	1	PLC bits – local mode indicator, handshake bit, etc.
400601	3	Momentary pushbuttons (Alarm Reset, Start, Total Reset, etc.)
400604	2	Maintained selectors (Auto/Man, etc.)
400606	30	Control and alarm set points from SCADA

5. SCADA Control

An operator at a SCADA terminal should have access to all pertinent control and alarm set points and delays. Where possible, consolidation of delay set points is encouraged so that the number of registers transmitted over the radio network can be reduced. Examples include: the use of a single pump fail delay set point that applies to all pumps at a site; the use of a single level transmitter alarm delay that applies to high, low, very high, very low, and transmitter fail alarms.

Where manual operation will not present a problem with critical interlocks, a manual mode should be provided in which an operator can start or stop a pump on demand. This should be implemented with the use of 3 bits. One of these bits is a maintained auto / manual selector and the other two are momentary start / stop bits.

Where a large number of set points will force the read table over 100 registers, decisions may be made to have certain set points only available on the OIT rather than accessible at both OIT and SCADA. Examples of this type of set point might include configuration parameters that will not be frequently accessed such as PID settings.

6. Conclusion

These guidelines are a brief summary of considerations and recommendations for the programming of PLCs that will be part of the City of Lathrop SCADA system. Coordination between the site control system provider and the City's SCADA programmer will be required for final configuration and commissioning. It is recommended that the site control system provider review these guidelines and submit a proposed communication data table layout for review by the City prior to commencing the programming effort.

APPENDIX G

SECURED FACILITIES

1. Introduction

This document is intended to provide guidelines for securing City facilities including recycled water ponds, pump stations, and booster stations.

2. Locking Systems and Security Systems

All of the City facilities mentioned in Section 1 above shall be fitted with Cyberlock locking systems, security systems including cameras, motion detection and monitored 24/7.

2.1 Locks

The new lock system shall be Cyberlock key system manufactured by Videx. The entry door locks shall be schlage setups with a Cyberlock tumbler installed. The padlocks shall be Brinks locks, with the CyberLock tumbler installed in the lock.

2.2 Communication

All of these facilities shall have a secured communication link with a 3DES Encryption at a minimum to these facilities.

2.3 Perimeter Controls

Perimeter controls shall consist of:

- a. Security perimeter fencing, or proximity photo with infrared
- b. 24-hour monitoring and a Federal crime to tamper with shall be installed on the perimeter fence.

2.4 Access Controls

Access controls shall include:

- a. Vandal resistant locks on gates, ladders, fuel storage tans, valve operators, and electrical panels.
- b. Vandal resistant gate latch and lock.
- c. Ladder lockout/access controls.
- d. Vent screens with heavy gauge expanded metal.

2.5 Detection

Detection shall include:

- a. Photo infrared motion detectors at each facility connected to exterior lighting.

- b. Exterior lighting.
- c. Dry contacts on doors, hatches, and access covers.
- d. Motion detection on tank ladders.
- e. Pan, tilt, zoom (PTZ) color, web-enabled low light CCTV at critical facilities.
- f. Recording appliance, security controller, integration software, and ancillary devices.
- g. Beacon and horn to intrusion alarms.

2.6 Cyber-Security

Cyber-security shall include:

- a. Encrypt data transmissions 3DES at minimum.
- b. Password protocols and procedures.

2.7 Policies and Procedures

Policies and procedures shall include:

- a. Neighborhood watch program.
- b. Remote site entry/alarm notification protocols.
- c. Written key control policy.
- d. Update emergency response plan to include lock down, shelter-in-place, and VA security recommendations.
- e. Emergency isolation, system decontamination, and shut down procedures.
- f. Public relations/media policy.
- g. Unusual event reporting log.
- h. Security awareness training.
- i. Passwords Compliance.

APPENDIX H

WASTEWATER AND STORM WATER PUMP STATION CRITERIA

The use of wastewater and storm drainage pumping systems shall be avoided whenever possible. Where such facilities can not be avoided, approval of the City Engineer shall be required. The request shall include documentation demonstrating the need for each proposed facility. All pump stations designs shall be prepared by a Registered California Civil and Electrical Engineer, and approved by City Engineer.

A. Storm Water Pump Station – Specific Design Criteria

1. Station shall be designed to provide for gravity outfall during the summer months and other periods of low water stages. If a low stage gravity outfall is impossible or impractical, an alternate pump of smaller capacity for low stage flow shall be provided.
2. Pumps shall be preceded by trash racks. Pump stations with capacities exceeding 1.0 cfs shall be equipped with mechanically cleaned trash racks. Trash racks shall have 2-inch clear openings between bars and shall be designed so that the velocity through a clean rack does not exceed 1.0 feet per second under any operating conditions. Manually cleaned trash racks shall be designed so that the velocity through a clean rack does not exceed 0.5 feet per second.
3. Pump stations with capacities over 9,000 gpm (20 cfs) shall be equipped with vertical mix flow pumps. Pump motors and controls shall be enclosed in a building that is aesthetically pleasing and architecturally compatible with the surrounding area in residential areas; in non-residential areas, an appropriate enclosure shall be provided (i.e. fence or vault). A bridge crane and adequate work access shall be provided for either open or enclosed pump stations.
4. The backflow of water from a receiving water body shall be prevented by establishing the invert of all discharge pipes above the means high water elevation in the receiving water, and installing an air release/siphon breaker valves at the high point of the discharge end of each discharge pipe. Rubber “Tide Flex” valves mounted on concrete headwalls shall be provided at the discharge end of each discharge pipe.

B. Wastewater Pump station – Specific Design Criteria

1. Odor control facilities shall be provided at pump station and wet well.
2. Paved and concrete areas, after the driveway, shall slope to a drain inlet that is connected to the wet well with a gravity check valve.

3. Structures shall be reinforced concrete, fiberglass, and fusion epoxy coated.
4. A hatch shall be provided suitable for the removal and replacement of major equipment components. Hatches shall be spring loaded (Bilco type) made of stainless steel or aluminum materials an inner safety fall grate.
5. Valve and other vaults shall incorporate an automatic sump pump or 4” gravity drain (slope floor to sump/drain) at option of City Engineer, with check valve in discharge pipe to wet well.
 - a. Provide standby pumping capacity equal to the largest single unit.
 - b. Sump pumps shall be easily removable for maintenance.
 - c. Gravity drain shall be positioned in sump with removable debris grate
6. Provide an emergency shower and eye wash station.

C. General Pump Station Design

1. Pump stations shall design for flow computations in accordance with the latest edition of the “Hydraulic Institute Standards”:
2. Submersible lift station shall meet the minimum requirements of “SWPA Handbook, Submersible Sewage Pumping Systems” by Submersible Wastewater Pump Association.
3. Submersible pumps shall be rail mounted with auto disconnect.
4. All pumps shall be capable of passing 3-inch spherical solids. 2” is allowed at the discretion of the City Engineer.
5. Capacity shall be provided for the ultimate peak flow or design storm with the largest pump out of service.
 - a. Staged installation is allowed when more than two pumps are required for build-out conditions.
 - b. Space shall be provided for future installations. Where slide mount submersible pumps are used, a duplex installation of 100% design capacity may be used if a complete spare pump assembly is supplied to the City.
 - c. Where design flows exceed 1.0 cfs, a low flow pump shall be provided in addition to the design rated pumps. The low flow pump shall have a

capacity of 5% to 10% of the design flow and shall operate as the lead pump.

6. Water level control shall be from submersible pressure transducer.
7. High & Low Float Switches
 - a. Station shall incorporate a high and low float positioned above and below the normal operating range of the wet well.
 - b. Floats shall bypass PLC controls and start or stop two pumps through direct call to the VFDs. Addition pump may be called based on pump station design.
 - c. Floats shall initiate all alarm annunciations available to the station through the PLC.
 - d. An emergency high level float switch, positioned above the High float switch may be required that annunciates an independent alarm system (separate from the PLC). The need for this additional capability will be at the discretion of the City Engineer.
8. Locks, keyed to the City master system (Cyberlock), shall be provided by the City and paid for by the developer at the entry to the pump station and to the wet well.
9. A lifting loop, pad mount crane or bridge crane over each pump/motor, or similar provisions for removal of the pump(s) shall be provided at the discretion of the City Engineer. Permanent hoists shall be required when removal of larger pumps is otherwise impractical.
10. The well rim and electrical panel shall be 12” above the 200-Year Flood Elevation.
11. Corrosion protection shall be provided at pump station and wet well.
12. Pump curves, operating voltage and phasing, horsepower, etc., shall be in accordance with approved submittal per Section 74-1.01C of the Standard Specifications.
13. Submersible pumps shall be capable of running in air without damage. Moisture sensing circuit breakers in terminal chamber shall be incorporated into submersible pumps.
14. A min NEMA-3 weatherproof enclosure and panels shall be provided. Electric service shall be provided by underground conduit to the utility service pedestal.

15. Programmable Logic Controllers (PLC)
 - a. The pump station shall be controlled and connected to the City's Supervisory Control and Data Acquisition (SCADA) system in accordance with the PLC Requirements in Appendix F of these Design and Construction Standards. City contractor will program SCADA.
 - b. A standby battery and charger shall be supplied. The battery is to be able to operate the controller for two weeks with the external power source removed.
 - c. An adjustable time delay before any restart shall be incorporated which allows delays from 1 to 10 minutes.
 - d. Bubbler type controls will not be acceptable.
 - e. Switches for manual operation of each pump shall be included.
 - f. Pumps shall be equipped with Variable Frequency Drive speed controls of a type approved by the City Engineer.
 - g. SCADA shall test for leaks or clogs in the force mains exceeding 100 feet and shall shut off pumps and send SCADA alarm if detected.
16. An automatic telephone dialer and message capability for all alarms shall be installed.
17. Each pump shall have a gate valve and check valve on the discharge piping.
18. Access and work area of pump stations shall be paved with minimum 3" AC on 10" AB, if out-of-doors, and with full concrete floor within a building.
19. An 8-foot high chain link fence with privacy slats per Standard Details or as required by the project UDC, or approved by the Community Development Director, shall be constructed to enclose the pump station. The fence may be omitted on approval of the City Engineer.
20. The pump station shall not be in the City street right-of-way except with permission from the City Engineer.
21. The interior of the structure, all machinery, piping, and exterior above grade shall be painted or epoxy coated.
22. Emergency operation during power outages shall be provided by a diesel powered generator onsite with automatic transfer switch. The generator

shall have the capacity to operate the station at peak loads. The generator shall comply with applicable emission requirements of the local air quality maintenance district.

23. The City shall be provided with three complete sets of manufacturer's brochures, technical data, O&M manuals, schematics, wiring diagrams, etc., for all equipment and controls.

D. Structural Design

1. Structural components shall be designed and constructed in strict conformance with the following codes and standards:
 - a. California Building Code (CBC), latest edition
 - b. Building Code Requirements for Reinforced Concrete (ACI 318-14) and Commentary (ACI 318R-14)
 - c. Manual of Steel Construction Allowable Stress, 14th edition, American Institute of Steel Construction (AISC)
 - d. Environmental Engineering Concrete Structures Occupational Safety and Health Administration (OSHA) Standards
2. All outside exposed surfaces of all structures shall have Tex-Cote Graffiti-Gard®, or approved equal, applied to full height of structure.
3. Wherever required by the City Engineer, due to the size and facility requirements a pump house building is required, the building shall be reinforced masonry block. Access for equipment removal shall be provided without roof or door removal. Removable roof hatches may be considered.
4. All structures in residential areas shall be constructed or installed so as to be aesthetically compatible with the neighboring architecture. Aesthetic treatment and architectural features shall be approved by the Community Development Director.

F. Mechanical and Piping

1. All design shall satisfy the minimum requirements of the State Health Code.
2. A reduced pressure principle backflow prevention device is required on all domestic water connections.

3. A 1" metered connection is to be provided adjacent to the station with a ¾" hose bib on site complete with fabricated steel hose rack and ¾" x 50' industrial grade rubber hose.
4. In hazardous confined spaces, an automatic air blower system is to be provided to exchange air every 6 minutes (minimum). Air blowers shall be easily removable for maintenance.

G. Electrical

1. All electrical installations shall comply with the California Electric Code (CEC), NEMA, and Division of Industrial Safety requirements, County of San Joaquin and City of Lathrop Electrical Code.
2. Enclosed and mounted prefabricated electrical panels shall be used above ground level outside the pump station, where applicable.
3. Running time meters shall be provided for all motors (use reset type),
4. Explosion proof electrical appurtenances shall be provided below ground or an approved type disconnect and time delay shall be provided.
5. Separate blower system shall be provided in all electrical panels located below ground.
6. Adequate lighting and electrical outlets shall be provided outside facility and within buildings and wet wells.
7. Color code and number all wiring, switches, controls, relays, and piping per National Standard Coding.
8. The Developer shall meet all local utility requirements.
9. Where control cabinet is not adjacent to pumps, manual switches and emergency shutoffs shall be provided.

H. Force Main Design

1. Redundant force mains may be required by the City Engineer.
2. Velocity Limits
 - a. Resuspension initial velocity of a minimum of 3.5 ft/s.
 - b. Minimum velocity shall be 2 ft/s.
 - c. Maximum velocity shall be 10 ft/s.

- d. Force mains shall be size to maintain a minimum and maximum velocity of 2 and 10 ft/s, respectively. Redundant force mains may be required by the City Engineer.
3. All force mains shall be designed with a storage volume of 24 hours at the pump station or a fully redundant parallel force main.
4. Combination air release/vacuum valves for sewage shall be provided for at all high points in a force main. The combination air release/vacuum valves shall be in accordance with City Standard Details.
5. A means of dewatering the force main(s) shall be provided.
- I. All pump stations shall be secured in accordance with the requirements of Appendix G, Secured Facilities.

APPENDIX I

Autocad Digital Submission Standards

AutoCAD Digital Submission Standards

Purpose

The City of Lathrop (City) maintains an ArcGIS 10.x enterprise Geographic Information System (GIS) database to manage all of its Public Works assets including storm, sewer and water lines. The CITY utilizes the local government model from ESRI - <http://resources.arcgis.com/content/local-government>. This document references the most current CITY requirements and provides technical details such as CAD layering standards. The purpose of this document is ensure the utmost quality of data submitted to the CITY as it is converted into the CITY's enterprise GIS database.

Format Requirements

Consulting Engineer shall submit both hard copies and electronic copies of the "Record Drawings" to the CITY. The two (2) electronic copies shall be submitted on DVD media in both AutoCAD (.dwg) and Adobe Portable Document Format (.pdf) files.

In addition to AutoCAD .dwg files, data may be submitted in ESRI Shapefiles (.shp) or ESRI File Geodatabase if the layer information is retained and referenced. It is also requested that an additional DVD with the Adobe Portable Document (.pdf) and Auto CAD Drawing (.dwg) be sent to the CITY's Information Technologies (IT) department concurrently with the record drawing submission to the Public Works Department. The Public Works department will verify that digital files are included and the IT department will perform the comprehensive digital data review.

CAD Layers

See Table 1 for a complete tabular list of CAD layers which includes the layer name, description and feature type (point, line, text). All lines shall be continuous with no duplicate lines in the same layers. If there are missing features in the "0" layer the developer will be notified of the errors during the review process and will be required to revise the digital drawing file. Correct capitalization and spelling of layer names must be consistent with the layer name table. Consistency in layer names is imperative in the GIS data conversion process as it will eliminate redundant processing steps and potential loss of valuable information. If the consulting engineer is unable to utilize the recommended layering system, we need supplemental documentation matching the layer name used by the consulting engineer to GIS feature type.

Sizes of Lines

It is required that the sizes of the lines for storm, sewer and water pipes be included in the digital CAD .dwg file. There are two options for storing the sizes, either the "Thickness" field in AutoCAD or noted appropriately in the layer name. For example, a six inch water pipe can be noted as EXWTPI-6. If the method of noting sizes in the layer names is used, the notations must be consistent, or they will be noted as errors and be sent to the developer for further revision.

Spatial Reference

The digital drawings must be spatially referenced to California State Plane Zone III Units Feet. The horizontal datum shall be NAD83, vertical datum NAVD88.

Three-Dimensional Information

Currently it is not required that all contents of the as-built drawings be submitted with three-dimensional information. It is recommended but not yet required that sewer, storm and water points contain point elevations. Contour points and monuments shall have the elevation stored in the point, not as a text label. It is recommended that a feature linked table be attached to the points if elevations are not stored within the points. Any issues regarding the procedures or technical constraints should be directed to the CITY.

Digital Data Review

All digital data will be reviewed by the CITY Public Works department and the IT department under the following criteria:

- a. Correct layering naming conventions
- b. Verification that digital and hardcopy drawings are consistent
- c. Correct geographical position (i.e. correct spatial reference)
- d. Review of points, lines and polygons and error checking

The developer will be notified if there are errors and a request will be made to correct and resubmit the correct digital file. Failure to resubmit the corrected files will potentially delay approval of project.

Table 1

LAYER NAME	DESCRIPTION	TYPE	Target GIS Layer
BLDG-EX	Existing Building	Polyline	Building Footprints
BLDG-FU	Future Building	Polyline	Building Footprints
BM	Benchmark	Point	Benchmark
BND	Boundary Lines	Continuous-Line	(various)
BND0FU	Future Boundary Lines	Continuous-Line	(various)
BND-EX	Existing Boundary Lines	Dashed-Line	(various)
CANAL	Canal	Continuous-Line	Canal
CTRLPT	Control Point	Point	Control Corners
DW-STR	Street Driveway		Driveway
ELEV	Elevation	Point	Elevations
LL-EX	Existing Lot Lines	Dashed-Line	Owner Parcels
LL-FU	Future Lot Lines	Continuous-Line	Owner Parcels
LTPOLE	Light Pole	Point	Poles
MON	Monuments	Monuments	Monuments
PUE	Easements	Polyline	Encumbrances

APPENDIX I

LAYER NAME	DESCRIPTION	TYPE	Target GIS Layer
PWCTVA-(#)	Potable Water Control Valves, (#) = diameter	Point	Water Control Valves
PWFIT-CA(#)	Potable Water Fittings-Cap, (#) = diameter	Point	Water Fittings
PWFIT-EJ(#)	Potable Water Fittings- Expansion Joint, (#) = diameter	Point	Water Fittings
PWFIT-RD(#)	Potable Water Fittings- Reducer, (#) = diameter	Point	Water Fittings
PWFIT-UK(#)	Potable Water Fittings- Unknown, (#) = diameter	Point	Water Fittings
PWHY	Potable Water Hydrants	Point	Water Hydrants
PWLA-(#)	Potable Water Laterals, (#) = size	Continuous - Line	Water Laterals
PWMA-(#)	Potable Water Main (#) = diameter	Continuous - Line	Water Mains
PWMA-EX	Existing Potable Water Main	Dashed - Line	Water Mains
PWMT	Potable Water Meter	Point	Water Service Connections
PWPU	Potable Water Pump Station	Point	Water Network Structures
PWPW	Potable Water Production Well	Point	Water Network Structures
PWSS	Potable Water Sampling Station	Point	Water Sampling Stations
PWTA	Potable Water Tanks (Enclosed Storage Facility)	Point	Water Network Structures
PWVA-(#)	Potable Water Valve, (#) - Diameter	Point	Water System Valves
RDCL	Road Centerlines	Continuous-Line	Road Centerlines
RIVER	River	Continous-Line	River
RR	Railroads	Continuous-Line	Railroads
RWPU	Reclaimed Water Pump	Point	Water Network Structures
RWPW	Reclaimed Water Production Well	Point	Water Network Structures
SD-EX	Existing Storm Drain	Dashed-Line	Storm Drain (Existing)
SDFIT-(#)	Storm Drain Fitting, (#) - Diameter	Point	Storm Fittings
SDIN	Storm Inlets - mainly catch basins	Point	Storm Inlets
SDLI	Storm Drain Lift Stations	Point	Storm Network Structures
SDMAFM-(#)	Storm Force Main, (#) - Diameter	Continuous - Line	Storm Pressurized Main
SDMAGV-(#)	Storm Drain Main - Gravity Feed (#) - Diameter	Continuous - Line	Storm Gravity Mains

APPENDIX I

LAYER NAME	DESCRIPTION	TYPE	Target GIS Layer
SDMH	Storm Drain manhole	Point	Storm Manholes
SDOU	Storm Water Outfall	Point	Storm Discharge Points
SDVA	Storm Drain Valve	Point	Storm System Valves
SN	Street Names	Annotation (Text)	Street Text (Anno)
SSARV	Sewer Air Release Valves	Point	Sewer Control Valves
SSCL	Sewer Clean Outs	Point	Sewer Clean Outs
SSFIT	Sewer Fittings	Point	Sewer Fittings
SSLA	Sewer Lateral Lines	Continuous - Line	Sewer Lateral Lines
SSLI	Sewer Lift Station	Point	Sewer Network Structures
SSMAFM- (#)	Sewer Force Mains, (#) - Diameter	Continuous - Line	Sewer Pressurized Lines
SSMAGV- (#)	Sewer Gravity Lines, (#) - Diameter	Continuous - Line	Sewer Gravity Lines
SSMH	Sewer Manhole	Point	Sewer Manhole
SSTP	Sewer Treatment Plant	Point	Sewer Network Structures
SSVA	Sewer Valves	Point	Sewer System Valves
SSW-EX	Existing Street Sidewalk	Continuous-Line	Sidewalks
SSW-FU	Future Street Sidewalk	Continuous-Line	Sidewalks
CNTR-IND	Contour Index	Continous-Line	Contours
CNTR-IMD	Contour Intermediate	Continous-Line	Contours

(#) - Insert numeric value for diameter/size

APPENDIX J
CLEANING AND CLOSED-CIRCUIT TELEVISION INSPECTION
OF SANITARY SEWER AND STORM DRAIN PIPELINES

CLEANING AND CLOSED-CIRCUIT TELEVISION INSPECTION OF SANITARY SEWER AND STORM DRAIN PIPELINES

OBJECTIVE

These specifications define the minimum requirements for the preparatory cleaning and closed-circuit television (CCTV) inspection of new or existing sanitary sewer and storm drainage pipelines, and for required warranty CCTV inspections of pipelines. The purpose of this work will be to determine the condition of the pipeline, document the location of connections and other key features, identify any structural deficiencies, and to locate defects that may be allowing groundwater to infiltrate into the pipeline.

GENERAL

Experienced and pre-qualified personnel utilizing equipment and materials meeting the requirements of these specifications shall perform all work. Pre-qualification shall require that the contracting company and the job supervisor each have a minimum of three (3) years experience in the performance of the type of work specified and shall have specifically performed at least 100,000 feet of cleaning and television inspection within the past three years. A company with less than three (3) years experience may pre-qualify if they can demonstrate to the satisfaction of the City that they have the capabilities and overall experience, equipment and expertise to satisfactorily complete the project in accordance with these specifications.

All work shall be performed to the minimum standards of the industry. Where not conflicting with the requirements of these specifications, the most current available edition of the National Association of Sewer Service Companies (NASSCO) Specifications Guidelines and the NASSCO Inspector Handbook shall be used as a measure of the standard of practice for this work.

The Contractor shall use designated City and standard industry terminology in the performance and documentation of the CCTV inspection work. Pipeline joints, as used within these specifications, refer to the junction of two pipes. The term, "manhole section" as used in these specifications shall mean the length of pipe connecting two manholes or a manhole and a clean-out.

Before final acceptance of the work by the City, the Contractor shall review with the City the findings of the fieldwork to confirm that all necessary work has been performed as needed. This shall include a review of finished written records of defects found, the videotapes, and any sketches or diagrams prepared to illustrate defects found.

ACCESSIBILITY

Due to some site constraints, it is highly recommended that all prospective CCTV Contractors review the project site locations for accessibility. Entry onto private

property without permission is not authorized. Where permission is denied, it shall be the Contractors burden to develop an alternative approach to inspecting the pipeline.

SOUND CONTROL

The noise level from the Contractor's operations, between the hours of 10:00 PM and 7:00 AM, shall not exceed 50 dba at the exterior of any residential unit within 1,000 feet of the Contractor's work. This requirement does not relieve the Contractor of the responsibility for complying with local ordinances regulating noise level.

Said noise level requirement shall apply to all equipment on the job or related to the job, including but not limited to trucks, transit mixers or transit equipment that may or may not be owned by the Contractor. The use of loud sound signals between the hours of 10:00 PM and 7:00 AM shall be avoided in favor of light warnings except those required by safety laws for the protection of personnel.

SAFETY

The Contractor shall submit to the City a copy of the Contractor's safety program demonstrating that the Contractor's equipment, methods and procedures meets or exceeds all applicable CAL-OSHA and FED-OSHA regulations, with emphasis on hazard-free confined space entry. When work will be performed on one of the City's major streets or highways, traffic control plans shall be submitted to the City and, when appropriate, Caltrans, prior to commencing work. The Contractor shall obtain approved safety programs and traffic control plans from the City, and Caltrans, when applicable, before proceeding with fieldwork.

PREPARATORY CLEANING

Prior to CCTV work, pipeline(s) shall be cleaned so any cracks or other defects can be observed during the CCTV inspection work. The designated manhole section(s) shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. The Contractor shall clean the pipeline with a minimum of two (2) passes of a high-velocity jet-cleaning machine (hydroflusher). Newly constructed pipelines shall be cleaned to remove all foreign materials from the pipelines. Pipelines to be inspected for warranty acceptance shall be cleaned to remove all foreign material. Larger pipelines that may have minor deposits in the barrel shall be cleaned to restore carrying capacity to a minimum of 95% of original. Grease accumulations in sanitary sewer pipelines shall be removed so cracks and breaks can be observed during TV inspection. Cleaning shall be performed before inspection but not more than 48 hours before the CCTV inspection of the pipeline is started. All debris and loose material shall be removed at the next downstream manhole structure, transported to a disposal site and disposed of lawfully.

Sewer hydrocleaning equipment (hydroflusher) of high-velocity type shall be truck or trailer mounted. The equipment shall have a minimum of 500 feet of high-pressure hose with a selection of two or more cleaning nozzles. The equipment shall be capable of supplying water at 60 gallons per minute at a minimum working pressure of 1,200 pounds per square inch (psi), and regulated to not exceed a maximum pressure of 1,500 psi. The nozzles shall be capable of producing a scouring action for any pipeline size scheduled to be cleaned. All controls shall be located so that the equipment can be operated above ground at minimal interference to existing traffic and/or danger to the operator. Due to possible accessibility constraints, additional lengths of high-pressure hose may be required. Where accessibility constraints exist, reduced flow and pressure may be used subject to the approval of the City. However, the performance criteria for cleaning of the manhole section shall remain unchanged.

It is recognized that there are some conditions such as broken pipe and blockages that prevent cleaning from being completed or where additional damage would result if cleaning were attempted or continued. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on another manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it shall be assumed that a major blockage exists, work shall be stopped on the manhole segment in question, and the City shall be immediately notified. Where a broken pipe or a major blockage is suspected, the Contractor shall not proceed with additional cleaning, except at own risk, without the specific written direction of the City.

When hydraulic cleaning equipment is used, the Contractor shall be responsible to plan and control the cleaning operations to prevent flooding of the sewers/storm drains and public or private property. Movable dam type equipment shall be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer/storm drain. Movable dam equipment shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to ensure removal of grease.

Whenever lines to be cleaned show evidence of being more than one-half filled with solids, bucket machines and rodding machines shall be utilized to remove most of materials before hydraulic equipment is brought into use for finishing the cleaning of the pipeline. The Contractor shall also use bucket machines or rodding machines in instances where severe root intrusion or heavy grease is encountered. Bucket machines shall be operated in pairs with each machine powered by an engine with a minimum of 16 horsepower to ensure sufficient pulling power. Power rodding machines shall be of a continuous rod-type capable of holding a minimum of 1,000 lineal feet of rod. The machine shall have a positive rod drive to produce a 2,000-pound rod pull. To ensure safe operations, the machine shall have a fully enclosed body and an automatic safety throw-clutch and other safety equipment required by law. Bucket machines and rodders

shall be equipped with proper tools for all types of cleaning in the sizes of pipe in which work is to be performed.

Whenever bucket machines are used, the bucketing process shall be in one manhole section at a time. A bucket of proper size shall be placed in the downstream manhole and pulled at intervals toward the upstream manhole until the entire manhole section has been cleaned. Upon completion of the bucketing operation, hydraulically propelled or high-velocity sewer/storm drain cleaning equipment shall be used to ensure that all sand, grease and other fine materials have been removed. Satisfactory precautions shall be taken to protect the pipelines from damage that might be inflicted by the improper use of cleaning equipment.

After cleaning the mainline, the Contractor shall spray or wash down the interior walls of each manhole with a nozzle or gun using approximately 500 psi of water.

When the Contractor has been authorized to take water from fire hydrants:

- The water shall be conserved and not used unnecessarily.
- Only approved fire hydrant wrenches and shut off valves shall be used.
- A visible air gap shall be maintained between the discharge of the fire hose and the Contractor's water storage tank. The air gap shall be visible from the ground surface.
- No fire hydrant shall be obstructed except to refill empty water tanks.

All sludge, dirt, rocks, sand, grease and other solids or semisolid materials resulting from all types of cleaning operations shall be trapped and removed at the downstream manhole of the section being cleaned. Passing materials from manhole section to manhole section, which could cause line stoppage, accumulations of sand in wet wells or damage to pumping equipment, shall not be permitted. All solids or semi-solid material removed from the wastewater collection system during the cleaning operation shall be removed from the site and disposed of in a lawful manner.

Final acceptance of the cleaning work will be made after CCTV inspection completion.

FLOW CONTROL

The maximum allowable depth of flow in pipelines to be inspected using closed-circuit television (CCTV) equipment varies by the pipe size as shown in the following table.

PIPE SIZE	PERCENT OF PIPE DIAMETER
6" – 10" Pipe	20% of pipe diameter
12" – 24" Pipe	25% of pipe diameter
27" & up Pipe	30% of pipe diameter

When the depth of flow in the sanitary or storm drain pipeline is above the maximum allowable, or inspection of the complete periphery of the pipe is necessary to effectively conduct the television inspection operations, one or more of the following methods of flow control shall be used. Where high flows are encountered after the pipelines have been cleaned, priority consideration shall be given to scheduling the CCTV inspection work for the late night hours between 11:00 p.m. and 6:00 a.m.

When and where bypass pumping is required to meet the requirements for the maximum depth of flow, the Contractor shall submit to the City detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor to implement bypass pumping. The plan shall be specific and complete, including such items as: schedules, notifications to the users of the manhole section when the CCTV inspection is to occur with any special instructions, locations, elevations, capacities of equipment, materials and all other incidental items necessary and/or required to ensure proper protection of the facilities. The plan shall include compliance with the City's National Pollution Discharge Elimination System (NPDES) permit requirements and conditions. No work shall begin until all provisions and requirements have been reviewed and approved by the City.

- A. Plugging and Blocking: plugs shall be inserted into sanitary or storm drain pipelines at a manhole upstream from the section to be inspected, tested and/or sealed. the plug shall be so designed that a portion of the sewer/storm drainage flows can be released. flows shall be substantially reduced or temporarily stopped to properly inspect the pipe.
- B. Bypass Pumping: when bypass pumping is required to ensure completion of the television work, the contractor shall be required to furnish the pumping equipment, conduits, etc. Necessary to perform this item of work. The design, installation and operation of the temporary pumping system shall be the contractor's responsibility.

All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. The pumps may be electric or diesel powered. All pumps used must be constructed to allow dry running for long periods of time to accommodate flow variations. All discharge

systems shall be constructed of rigid pipe with positive, restrained joints to prevent accidental spills.

TELEVISION INSPECTION

After the pipeline has been cleaned, the manhole sections shall be visually inspected by means of closed-circuit television. The inspection shall be done one manhole section at a time and the flow in the section being inspected shall be suitably controlled as specified herein. Closed-circuit television (CCTV) inspection shall be used to assess:

- The condition of existing pipeline.
- Root intrusion problems, if any.
- Internal defects that should be corrected and applicable repair or rehabilitation methods.
- Infiltration sources.

The Contractor shall be responsible for providing quality audio, video, and written documentation of pipeline condition. This shall include recording all defects, including visual evidence of groundwater infiltration and any structural defects.

If the CCTV inspection work reveals any defects or conditions that could reasonably lead to an emergency blockage or pipe failure, the Contractor shall immediately notify the City and, as applicable, move on to other pipelines, continuing work uninterrupted. Additionally, any obstructions that significantly restricts the flow and could cause a sewer surcharging or flooding problem shall be reported to the City immediately and the Contractor's crew shall move on to other pipelines, continuing work, as applicable.

The Contractor shall coordinate on a daily basis and make provisions to ensure the City representative is present whenever CCTV inspection work is being performed. While it is understood that the City representative(s) may not always be present, the Contractor understands that the City representative(s) may be present at various points during the work to assess that quality requirements are carried on throughout the work.

Inspections shall be performed while the line segments are in service without the need for plugging or flow diversion unless previously approved by the City. If necessary, the Contractor shall schedule the work to be performed late at night between the hours of 11:00 PM and 6:00 AM. Late night CCTV inspection work shall not begin until the Contractor has received approval from the City for a nighttime traffic control plan submitted by the Contractor.

All line segments shall be televised complete from starting manhole to ending manhole on the same video in a continuous run. Partial televising on one video and then completing the run on another is unacceptable and segments so documented shall be rejected.

Cracks, chips visible infiltrations and other defects not consistent with these Standards shall be corrected in a manner acceptable to the City. The failing section of pipe shall be again CCTV inspected after the repair work has been completed.

- A. Equipment and Procedure: The CCTV inspection shall be completed using a cable-pulled or self-propelled closed circuit television camera. The camera shall be operative under 100 percent moisture conditions. Cameras used for CCTV inspection of pipelines eight inches in diameter and larger shall be of the articulating head type to allow laterals, joints and defects to be viewed directly.

The television camera used for the inspection shall be a color format specifically designed and constructed for such inspections. Lighting and camera quality shall be suitable to allow a clear and focused picture clearly showing the entire inside periphery of the sanitary or storm drain pipeline for a minimum of six lineal feet ahead of the camera. The camera shall have a minimum capability of 350 line resolutions. The camera shall be equipped with a variable intensity control of the camera lights with remote control adjustments for focus to ensure peak picture quality throughout all conditions encountered during the survey. Focal distance shall be adjustable. Camera monitors shall be located where a City representative can view the monitor and make notes in addition to the operating technician. Monitors shall have a resolution capability of no less than 525 lines. The date of the survey, the number or location of the beginning and ending manholes for the pipeline being surveyed, and a continuous forward and reverse read-out of the camera distance from the manhole of reference shall be continuously displayed on the monitors as part of the video presentation.

A Polaroid-type or a digital camera with a resolution of capacity no less than 720 by 1024 lines per inch shall be available for making still photos for reproduction from the video monitor(s). The still cameras shall be equipped with proper lens and mountings to frame the monitor. Photos shall be taken at the request of the City's representative or the discretion of the operating technician to record conditions of interest during the survey.

The Contractor shall control the movement of the television camera at all times. This may be accomplished by means of remote control winches or by telephone or other suitable means of communication between the winches at either end of the manhole section being surveyed. The travel

speed of the camera shall be uniform and shall not exceed 30 feet per minute. Any means of propelling the camera through the sewer/storm drain that would exceed this rate of speed or produce non-uniform or jerky movements shall not be acceptable. In no case shall the hose of a high-velocity water cleaning machine be allowed for use as a tow cable. The camera shall be stopped and/or backed up to view and analyze apparent defects and unusual or uncommon conditions within the pipeline. The Contractor shall at all times be able to move the camera through the line in either direction without loss of quality in the video presentation on the monitor. The picture shall provide a clear, stable image of the resolutions specified.

The Contractor shall furnish the City with video of an actual sewer/storm drain line inspection that is satisfactory to the City and meets the job specifications for television inspection to establish working criteria for video picture quality which must be maintained throughout the project. This video shall become the property of the City and shall be used throughout the project as a standard that the Contractor's video picture quality must meet.

The pipe diameter shall be obtained by physical measurement in the upstream (or downstream) access structure. Pipe material, i.e., RCP, VCP, CMP, and lengths between manholes shall also be verified and documented.

- B. Video: The Contractor shall provide an acceptable picture that is in focus, distinct, clear, and properly illuminated, with good contrast and without distortion. The picture shall be of true and adequate color and tint, free from interference and distortion. The picture shall show at least 70 percent of the pipe periphery above the waterline. All recording shall be in color on approved digital format in media as determined by the City using an articulating head type camera with the ability to achieve and maintain proper balance of tint and brightness. The loss of color or severe redness due to equipment malfunction and black and whites pictures irrespective of quality shall be cause for rejection.

The camera lens shall be kept clean and clear and any fogging due to oil, grease, or other material or debris. Material that obscures the lens shall be cleaned off before proceeding with the recording operation. If debris or other obstructions cause reduced visibility, or if the image is obscured, the Contractor shall make reasonable attempts to clear the lens of the camera before continuing inspection.

The camera lens shall remain above the visible water level and may submerge only while passing through clearly identifiable line sags. If at any time the flow exceeds 25 percent of the diameter of the pipeline, the inspection must be stopped until the flow subsides or, if necessary, the

Contractor shall reschedule the inspection, possibly for a late night inspection of the pipeline.

The camera shall be stopped, for a minimum of five (5) seconds at every lateral to look up the lateral and see any apparent defects, broken pipe, root intrusion, or other defects. The lens and lighting shall be readjusted, if necessary, in order to ensure a clear, distinct, and properly lighted feature. Additionally, a five (5) second blank space shall be inserted between line segments to more clearly mark the end of one (1) televised line and the beginning of another.

1. *Illumination.* The picture shall have adequate light to clearly ascertain any pipeline defects like cracks and their severity in addition to clearly seeing other features like laterals and joints.
2. *Focusing.* The picture shall be clear and distinct without being obscured by dirty lenses or foggy pipeline condition, or out of focus due to operator alertness.
3. *Color.* Loss of color for all or a part of a line may be cause for rejection.
4. *Water Depth.* High flows causing the depth of water to exceed the foregoing criteria shall be cause to reject the televised line segment. Surcharging (and flooding of the camera lens) shall not be excusable. Any condition where the camera goes under water for a reason other than a pipeline sag condition shall, in general, be an unacceptable recording condition, and the televised pipeline segment shall be subject to rejection. Surcharging (and flooding of the camera lens) shall not be an excusable condition if it has been artificially created upstream from the placement of flow plugs or flushing of the sanitary sewer.

Other unacceptable conditions that shall serve as a cause for rejection of submitted videos include, but are not necessarily limited to:

- Loss of vertical hold which impacts the ability to read and interpret the video.
- Incorrect manhole identifications if it is not clear which line has been televised.
- Inaccurate footage readings. The footage measurements shall form the basis for possible subsequent sewer repair or rehabilitation work. Therefore any inaccuracy in the continuous footage measurement to a defect or any identifiable feature which leaves doubt as to the accuracy of the location of a specific defect or the total length of the manhole-

to-manhole segment shall render the video of the line segment as unacceptable.

- Any other unidentifiable defect such as equipment interference or malfunction, blurred or obscured images from an unknown source that detracts from the ability to read the video with reliable accuracy.

- C. Audio: All recordings shall have an audio descriptive narration to supplement the CCTV inspection report log. The Contractor shall clearly identify on the audio portion of the video the date of the work and the location of the beginning and ending manholes complete with the street intersections and, where applicable, house numbers. The Contractor shall also clearly identify on the audio portion of the video all important features such as the location of all laterals, taps, breaks, roots, and other defects in addition to information identifying which manhole-to-manhole segment is being inspected. These features are to also be noted on the written video log.

The audio portion of the composite signal shall be sufficiently free from electrical interference and background noise to provide complete intelligibility of the oral report. Audio reports shall be recorded on the videos as the CCTV inspection is being completed and shall include the location of the pipeline segment being inspected, street location or manhole numbers involved, a manhole-to-manhole direction of travel, and a description of the pipeline conditions as they are encountered.

The Contractor shall narrate the video as the pipeline is being inspected. The audio portion of the video shall conform to the following:

1. *Clear Speaking*. The technician shall speak clearly and directly without interruptions. Unintelligible speech shall not be accepted and shall be grounds for rejection of the completed video.
2. *Minimal Background Noise*. The microphone shall be positioned so that noise shall not be present from passing automobiles, trucks and construction equipment. Excessive noise is unacceptable and shall be grounds for rejection of the completed video.
3. *No Coughing or Yawning*. Personal noises from the operator while describing video recording situations shall not be accepted and shall be grounds for rejection of the completed video.
4. *No Recording On Used Video Media*. All videos and logs shall be project specific. There shall be no other recordings or portions of recordings on the same video media with another project.

Violation of any of the requirements for the audio portion of the performed work shall serve as full justification for rejection of the fieldwork. No payment will be made for rejected work.

- D. Documentation: Work products for CCTV inspection shall consist of videos, CCTV inspection log sheets, and any still pictures taken of specific defects as the work proceeded. Before videos and written inspection reports are turned over to the Engineer, they shall be reviewed by a trained individual who has a minimum of three years documented experience in evaluating and prioritizing problems in sanitary/storm sewer systems. The Contractor shall prepare a written report stating the Contractor's opinions of the best method of repairing each manhole section.

The City shall review prior to acceptance the CCTV inspection documentation for an entire manhole-to-manhole pipeline segment. If any portion of a line is unacceptable, the entire segment shall be deemed unacceptable and shall be re-televised and resubmitted. A line that is partially televised and is incomplete due to an excusable condition such as a partially collapsed pipeline shall be accepted for the televised length only. CCTV inspection forms shall be evaluated against the video for accuracy and completeness, prior to City acceptance.

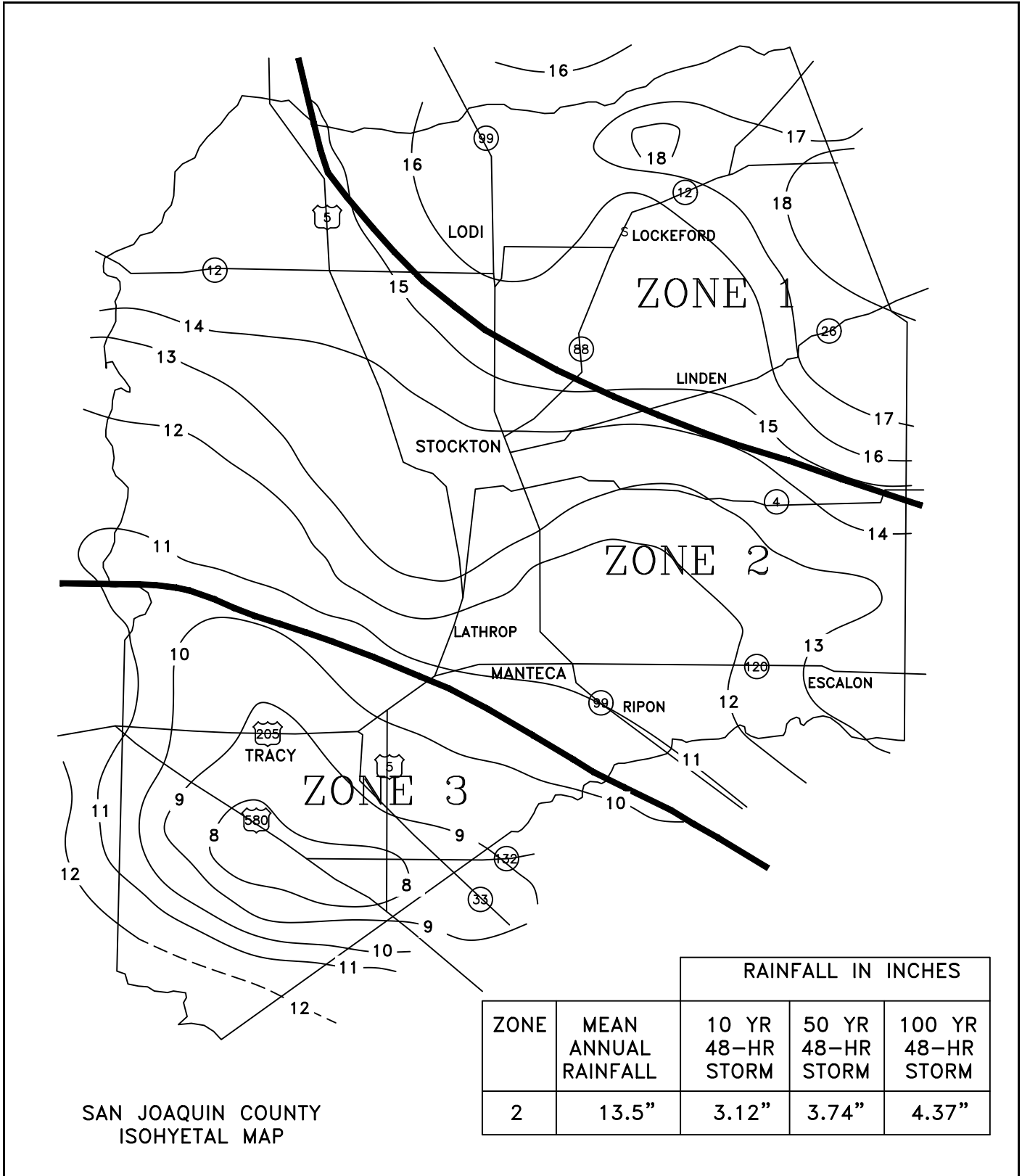
The videotaping and the monitoring equipment shall have the capability to instantly review both video and audio quality of the video productions at all times during the television survey. The purpose of the video recording shall be to supply a permanent visual and audio record of the manhole section surveyed. The videos shall become the property of the City upon completion of the project.

Printed location records shall be kept by the Contractor clearly showing the exact location in relation to the adjacent manholes of each infiltration point, building sewer or storm drain connections, all joints which are infiltrating or exhibit other unusual condition, roots, sanitary or storm drain connections, collapsed sections of pipe, joints sealed, presence of scale or corrosion and other discernible features. This information shall be presented to the City in a typewritten report within two weeks of the completion of the fieldwork.

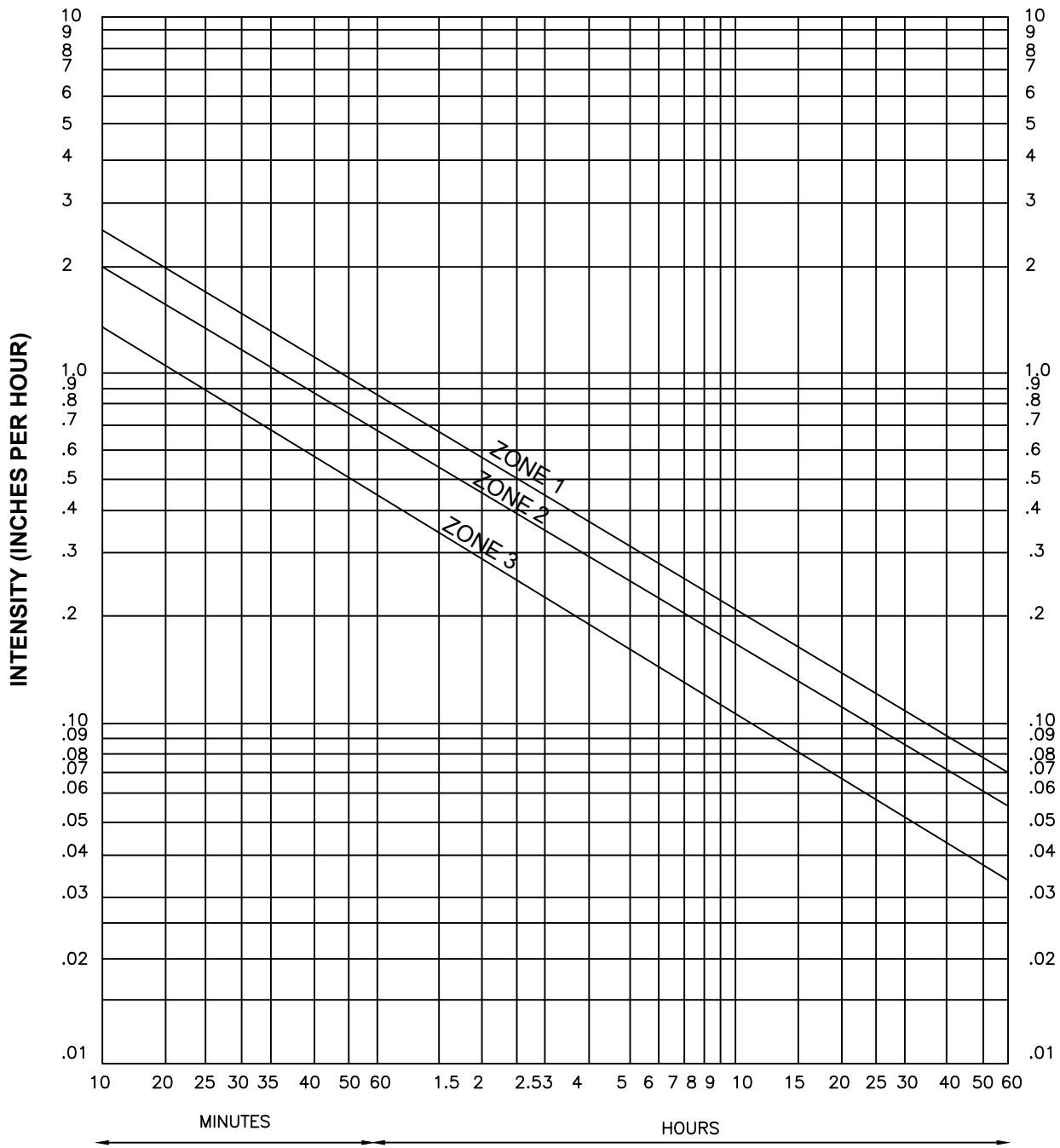
- E. Video Inspection of City Service Laterals: Video Inspection of City service laterals are subject to all the above requirements and shall additionally meet the following requirements.
- Video shall include data view display feature capable of showing the following information.
 - Lateral address (Lot # if no address is known)

- Date and time of inspection
 - Contractor name
 - Inside pipe diameter and type
 - On-going footage counter accurate within 3 percent
 - Identify access and starting point for video inspection, e.g., cleanout to the mainline
- The travel speed of the camera shall be uniform and shall not exceed 20 feet per minute.
 - It is desirable to record during dry weather. The contractor shall introduce water prior to video inspection of the lateral.
 - The direction of recording shall be forward from upstream to downstream and lengths shall be measured from cleanout to mainline.
 - Video Filename: Video file for each sewer segment shall be name in one or more of the following fashions. The Contractor shall submit for approval the preferred file naming scheme prior to commencement of work.
- 1) For sewer mains between manholes and/or flushing branches
 - b. Street name or easement name with name of cross streets (ex. MainSt Broadway to Hollywood).
 - c. Pipe segment designation and street name (ex. PS1564. mp4)
 - d. Manhole designation in the following fashion, upstreamMH downstream MH. (ex. S1548 S1547.mp4)
 - 1) For sewer lateral and other connection off a sewer main
 - a. Street name and address number (ex. MainSt 313.mp4).
 - b. Facility name, address, and location of lateral inspection (ex. Macys 123MainSt SWcorner.mp4)
 - Hard copy of video log to accompany the video inspection and all deficiencies are identified on the log sheet.
 - City project manager notes and sign off on review of material prior to turning over to the O&M supervisor. Package must be neat and orderly.

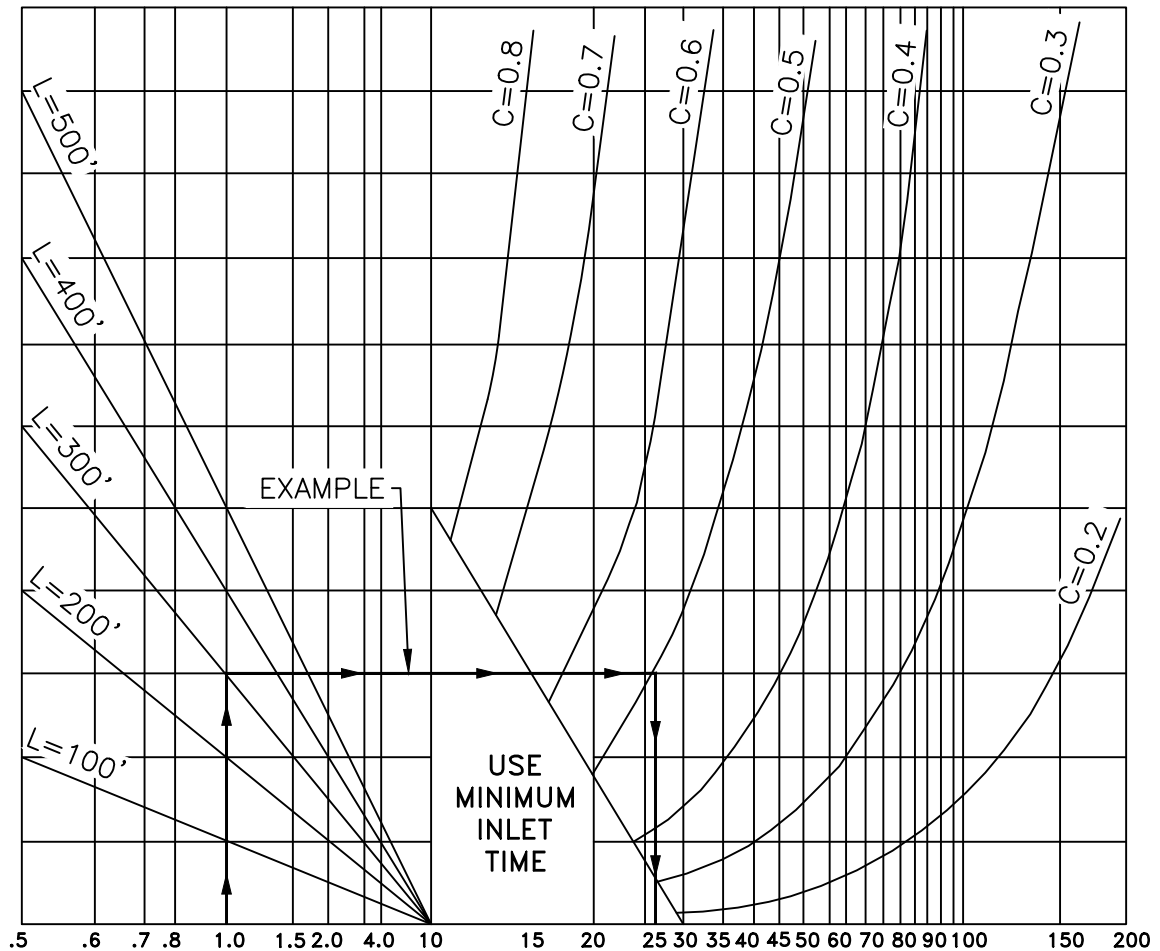
APPENDIX K



MEAN ANNUAL PERCIPITATION



INTENSITY-DURATION CURVE 10-YEAR RAINFALL



SLOPE %

INLET TIME (MIN.)

EXAMPLE

GIVEN: SLOPE = 1%
 LENGTH = 300-FT
 COEFFICIENT OF RUNOFF = 0.5
 READ: INLET TIME = 26 MINUTES

NOTE

WHERE FIRST INLET IS IN A PUBLIC STREET, SUCH AS IN A SINGLE-FAMILY SUBDIVISION, USE ONLY SLOPE AND DISTANCE FROM BACK OF LOT TO THE STREET GUTTER. (DISREGARD STREET GUTTER FLOW TIME)/

INLET TIME