City of Lincoln

CITY OF LINCOLN

DEPARTMENT OF PUBLIC WORKS

DESIGN CRITERIA
&
PROCEDURES MANUAL

June 2004

ORDINANCE NO. 760B

AN ORDINANCE OF THE CITY COUNCIL OF THE CITY OF LINCOLN REPEALING SECTION 13.20.010 OF THE LINCOLN MUNICIPAL CODE AND RE-ENACTING SECTION 13.20.010 REGARDING THE PUBLIC FACILITIES IMPROVEMENT STANDARDS

THE CITY COUNCIL OF THE CITY OF LINCOLN DOES HEREBY ORDAIN AS FOLLOWS:

Section 1. Section 13.20.010 of the Lincoln Municipal Code is hereby repealed.

Section 2. Section 13.20.010 is hereby added to the Lincoln Municipal Code to read as follows:

Section 13.20.010 Public Facilities Improvement Standards. The City Council adopts the "January 2004 Public Facilities Improvement Standards" and the "January 2004 Design Criteria & Procedures Manual" both of which are incorporated by reference and copies of which are on file in the office of the City Clerk.

Section 3. Within fifteen (15) days of the passage of this ordinance, a copy shall be published once in the News Messenger, a newspaper of general circulation within the City.

PASSED AND ADOPTED this 25th day of May, 2004 by the following roll call vote:

AYES: COUNCILMEMBERS: Santini, Nakata, Sprague, Cosgrove, Short

NOES: COUNCILMEMBERS: none

ABSENT: COUNCILMEMBERS: none

Mayor

ATTEST:

City Clerk

APPROVED AS TO FORM:

CITY OF LINCOLN

DEPARTMENT OF PUBLIC WORKS

DESIGN CRITERIA & PROCEDURES MANUAL

June 2004

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SECTION 1

PURPOSE AND DEFINITIONS

1-1 **PURPOSE** - The purpose of this Design Criteria and Procedures Manual is to provide minimum standards to be applied to improvements which are to be dedicated to the public and accepted by the City for maintenance or operation and certain private works, as well as improvements to be installed within existing rights-of-way and easements. This is necessary in order to provide for coordinated development of required facilities to be used by and for the protection of the public. These standards shall apply to, regulate, and guide preparation of traffic impact studies and the design and preparation of plans for construction of streets, highways, alleys, drainage, sewerage, traffic signals, site access, water supply facilities and related public improvements, and shall set guidelines for all private works which involve drainage, grading, trees, and related improvements.

1-2 **DESIGN PRACTICE** - Because it is virtually impossible to anticipate all situations that may arise or to prescribe standards applicable to every situation, any items or situations not included in this manual shall be designed in accordance with accepted engineering practice, the Lincoln Public Facilities Improvement Standards, the State of California "Highway Design Manual" and "Traffic Manual", and as specified by the City Engineer.

All designs shall be based on NAD 83 horizontal datum and NGVD 29 vertical datum.

The City Engineer may require additional standards and/or regulations not inconsistent herewith when deemed necessary to protect the health, safety, and welfare of the public.

1-3 **DEFINITIONS** - Whenever the following terms or titles are used in these standards, or in any document or instrument where these standards govern, the intent and meaning shall be as herein defined:

A. **Applicant** - shall mean the same as the Developer or his consulting engineer working on his behalf.

B. **Building Division** - Shall mean the Building Division of the City of Lincoln.

C. **City** - Shall mean the City of Lincoln and its applicable Departments.

D. **City Engineer** - Shall mean the City Engineer/Director of Public Works of the City of Lincoln acting either directly or through the staff of the appropriate Divisions of the Department of Public Works or their authorized representatives.

E. **Conditions of Approval** – Shall refer to the specific requirements developed as part of the entitlement process which must be done as a condition for the approval of the project.

F. **Consulting Engineer** - Shall mean any person or persons, firm, partnerships or corporation legally licensed and authorized to practice professional engineering in the State of California who prepares or submits improvement plans and specifications to the Department of Public Works of the City of Lincoln for approval.

G. **Contractor** - Shall mean any person or persons, firm, partnership, corporation, or combination thereof, licensed to perform the type of work involved, who has entered into a contract with any person, corporation or company, or his or their legal representatives, for the construction of any improvement or portions of any improvement within the City of Lincoln.

H. **Department of Public Works** - Shall mean the Department of Public Works of the City of Lincoln.

I. **Developer** - Shall mean any persons, firm, partnership, corporation, or combination thereof, financially responsible for the work involved.

J. **Development** - Shall mean the act or process of any construction on properties as well as subdivision improvement.

K. **Development or Subdivision Agreement** – Shall refer to a specific project(s) adopted agreement between a Developer and the City related to project requirements.

L. **Improvements** - Refers to street work, sidewalk, curb, gutter, driveways, water mains, sanitary sewer, storm drainage, street lighting, traffic signals, public utilities, landscaping, irrigation, parks, fences, backflow devices, pressure reducing stations, pump stations, and other facilities to be constructed or installed within an existing or future public right of way or easement and other improvements which the Department of Public Works is responsible for performing plan check or inspection.

M. **Laboratory** - Shall mean any testing agency or testing firm which has been approved by the Department of Public Works.

N. **Manual of Traffic Controls** - Shall mean the "Manual of Traffic Controls for Construction and Maintenance Work Zones," of the State of California, Department of Transportation, latest edition.

O. **Public Works** - Shall mean the Public Works of the City of Lincoln.

P. **Public Works Director** - Shall mean the Public Works Director of the City of Lincoln acting either directly or through the staff of the appropriate Divisions of the Public Works Department or their authorized representatives.

Q. **Public Facilities Improvement Standards** - Shall mean the latest edition of the "Public Facilities Improvement Standards" adopted by the Lincoln City Council and any amendments thereto governing the construction of roads, streets, sanitary sewers, storm drainage, concrete structures, water supply, traffic signals, street lighting, landscaping and irrigation, and other facilities within the City of Lincoln.

R. **Soils Report** - Shall mean a report as prepared by any person or persons, firm, partnership, or corporation legally licensed to prepare "Soils Reports" in the State of California.

S. **Standard Drawings and Construction Specifications** - Shall mean the standard drawings and construction specifications as set forth in the Public Facilities Improvement Standards, approved by the City Engineer and any amendments.

T. **State** - As used in State Specifications, shall mean the Standard Plans of the State of California, Department of Transportation, latest edition.

U. **State Highway Design Manual** - Shall mean the "Highway Design Manual" of the State of California, Department of Transportation, latest edition.

V. **State Standard Plans** - Shall mean the Standard Plans of the State of California, Department of Transportation, latest edition.

W. **State Standard Specifications** - Shall mean the "Standard Specifications" of the State of California, Department of Transportation, latest edition.

X. **State Traffic Manual** - Shall mean the "Traffic Manual" of the State of California, Department of Transportation, latest edition.

Y. **Storm Water Manual** – Shall mean the "Storm Water Management Manual," latest edition, as published by the Placer County Flood Control and Water Conservation District.

Z. **SWPPP** – Shall mean "Storm Water Pollution Prevention Plan" as required by National Pollution Discharge Elimination System (NPDES) permit.

AA. **Subdivision Ordinance** - Shall mean the "Subdivision Ordinance" of the City Code as adopted by the City Council of the City of Lincoln.

BB. **Zoning Ordinance** - Shall mean the "Zoning Ordinance" of the City Code as adopted by the City Council of the City of Lincoln.

SECTION 2

GENERAL REQUIREMENTS

2-1 GRADING PERMITS, ENCROACHMENT PERMITS, AND SUBDIVISION AGREEMENTS - No work of any type shall be performed within the City rights-of-way and easements without approved plans and an encroachment permit, grading permit or subdivision agreement. All necessary bonds and insurances shall be approved prior to approval of the plans and the issuance of any permits. This section contains the City's requirements for each of these permits. Unless prohibited by a condition of approval, a developer may obtain a grading permit to rough grade the project site prior to obtaining approval of the project's civil improvement plans. In the event the plans show work on private property not owned by the developer, the developer shall submit to the Public Works Department a notarized right-of-entry from the owner of said property prior to plan approval.

A. **Grading Permits** - The Uniform Building Code (UBC) requires that a grading permit be obtained from the City prior to beginning any grading work unless the work meets certain exemptions specified in the UBC. See Section 2-7 for plan submittal requirements.

1. **Fees** - Plan review, inspection and permit fee for grading shall be the greater of 3% of the construction Cost estimates or Chapter 70 of the UBC (latest edition as adopted by the City) plus a $50 administrative fee. The entire fee will be required at the time of plan submittal.

2. **Bond** – Unless work is included within the scope of a Development Agreement with appropriate bonding in place, a grading permit bond shall be submitted for all activities requiring a grading permit. The amount of the bond shall be equivalent to ten percent of the valuation of the grading and erosion and sediment control measures. Minimum bond amount shall be $500.00. A cost estimate shall be provided to the Public Works Department for review and approval as a part of plan submittal.

3. **Insurance** - Insurance certificate is not required where the proposed grading is not within existing City rights-of-way and easements. Where grading is proposed within City rights-of-way and easements, an insurance certificate is required and an encroachment permit shall be issued concurrently with the grading permit. See "B" below for information regarding encroachment permit requirements.

4. **Release of Bond** - The bond shall be released within 30 days following completion of all conditions of the grading permit to the satisfaction of the City.

B. **Encroachment Permit** - An encroachment permit is required for any work performed within the City's rights-of-way and easements. See Sections 2-5 and/or 2-6 for plan submittal requirements. See "C" below for information regarding subdivision agreements.

1. **Fees** - Plan review and inspection fee for encroachment permits are based on the value of the public improvements to be constructed within existing and proposed City rights-of-way and easements. A cost estimate for the improvements, including any required construction staking, shall be provided to the Public Works Department for review and approval. All cost estimates shall include a ten percent contingency. The fee schedule shall be as adopted by City Council resolution. Contact the Public Works Department for the current schedule in effect. Where grading is proposed in conjunction with the improvements a grading permit shall be issued concurrently with the encroachment permit. See "A" above for information

regarding grading permits.

2. **Bond** - An encroachment permit faithful performance bond shall be submitted prior to the issuance of an encroachment permit. The bond shall be equal to 100 percent of the value of the improvements in existing City rights-of-way and easements. Those improvements to be constructed within future City rights-of-way and easements are not required to be bonded for under an encroachment permit. A cost estimate for the improvements, including any required construction staking, shall be provided to the Public Works Department for review and approval. All costs shall include a 10 percent contingency. The bond shall be approved by the City Attorney prior to issuance of the Encroachment permit.

3. **Insurance** - Insurance is required for all work within City rights-of-way and easements. Contact the Public Works Department for information regarding minimum insurance requirements.

4. **Release of Bond** - The encroachment permit faithful performance bond shall be released 180 days (six months) after all conditions of the encroachment permit have been completed to the satisfaction of the City. In the case of subdivision improvements being constructed under an encroachment permit, the encroachment permit faithful performance bond shall be released as specified above unless, prior to the completion of the improvements, a subdivision agreement is executed for the improvements. In such case, the encroachment permit faithful performance bond shall be released immediately following execution of the subdivision agreement.

5. **Completion of Subdivision Improvements Prior to Map Approval** - Where all improvements required of a subdivision are completed and field accepted by the City under an encroachment permit prior to final map approval, a one year subdivision maintenance bond equal to 10 percent of the valuation of the public improvements shall be posted prior to recordation of the final map and acceptance of the improvements for maintenance. In such cases, the developer shall, as a condition of map approval, submit a current title report showing any non-payment liens. In addition, the developer shall submit written proof that his/her contractors and suppliers have been paid.

C. **Subdivision Agreement** -

1. **Fees** - Plan review and inspection fee shall be paid prior to execution of the subdivision agreement or approval of the improvement plans. Said fees are based on the value of the public improvements to be constructed within existing and proposed City rights-of-way and easements. A cost estimate for the improvements, including any required construction staking, shall be provided to the Public Works Department for review and approval. All cost estimates shall include a 10 percent contingency. The fee schedule shall be as adopted by City Council resolution. Contact the Public Works Department for the current schedule in effect.

2. **Bonds** - A subdivision labor and materials bond, subdivision faithful performance bond, and subdivision maintenance bond shall be submitted prior to execution of the subdivision agreement. A subdivision maintenance bond shall be submitted after completion of all improvements and prior to issuance of a subdivision Notice of Completion. Unless a different amount is specified in the Subdivision Agreements the payment and performance bond amounts shall each be equal to 110 percent of the total cost of the public improvements within existing and future public rights-of-way and easements. The maintenance bond shall be equal to 20 percent of the

total cost of said public improvements. A cost estimate for the improvements shall be provided to the Public Works Department for review and approval. All cost estimates shall include construction staking and a 10 percent contingency. All bonds shall require approval by the City Attorney and the City Engineer.

3. **Insurance** - Insurance is required for all subdivision agreements. Contact the Public Works Department for information regarding minimum insurance requirements.

4. **Release of Bonds** - Both the subdivision labor and materials bond and faithful performance bonds shall be released at such time as all conditions of approval for the subdivision have been completed to the satisfaction of the City and evidence of notice of completion has been filed for the subdivision improvements. The maintenance bond shall remain in place for a period of one year subsequent to the City acceptance of improvements. The City reserves the right to increase the maintenance bond if the project costs increased significantly from the preconstruction estimate. The consulting engineer shall submit a revised cost estimate at the end of construction.

2-2 **PLANS BY AN APPROPRIATE ENGINEER** - All plans and specifications for improvements, private and public, which are to be accepted for maintenance by the City, and plans and specifications for private on-site sewer, water, drainage, grading, roads, traffic controls, etc. shall be prepared by a California licensed engineer of the appropriate branch of engineering covering the work submitted.

2-3 **APPROVED PLANS** - Complete plans and specifications for all proposed streets, bikeways, grading, drainage facilities, sewerage, traffic signals, water distribution systems, storage, wells, PRV station, industrial developments, commercial developments, and subdivisions, including any necessary dedications, easements, and rights of entry, shall be submitted to the Department of Public Works for approval. This approval shall be substantiated by the signature of the City Engineer, the responsible charge Consulting Engineer and the Geotechnical Engineer (if required by the City Engineer) prior to the beginning of construction of any such improvements. The Director shall order any Contractor to cease work on any project if said Contractor does not have properly approved plans in possession at the construction site.

2-4 **REFERENCE TO CITY SPECIFICATIONS AND STANDARDS** - The following note shall be included on all improvement plans:

All construction and materials shall be in accordance with the latest edition of the City of Lincoln Public Facilities Improvement Standards.

2-5 **SUBMISSION OF SUBDIVISION IMPROVEMENT PLANS** - The following are the procedures and requirements when submitting improvement plans for subdivisions to the City of Lincoln for review. Incomplete submittals will not be accepted. Rough grading plans and improvement plans, and parcel maps or subdivision maps may be submitted only after approval of the tentative map by the approving body and after the Conditions of Approval are available.

The Public Works Department acts as the lead agency in the submittal process for subdivision improvement plans. The initial submittal package should be submitted directly to the Public Works Department for routing to the following City Departments as applicable:

1. Public Works Department
2. Police Department
3. Planning Department
4. Parks and Recreation Department

5. Fire Prevention Division
6. Building Department

Submittal packages for all of the above referenced Departments shall be submitted together as a whole directly to the Public Works Department or the package will be deemed incomplete *(See "Submittal Requirements" below).*

Once the submittal has been deemed complete by Engineering, the packets will be distributed by the Public Works Department to the respective departments. Each department will then review the improvement plans and forward comments directly to the Developer or his Consulting Engineer. The time required for each department's review of the plans is dependent on that department's workload at the time of the submittal. See Table 1 for improvement plan approval process for subdivisions.

The Developer or his Engineer shall respond directly to each department to address each department's comments. The City Engineer will not approve the plans until all other departments have approved the plans, and not until this occurs will construction be permitted to begin.

A. Submittal Requirements - The following are the submittal requirements for subdivisions:

1. Seven (7) sets of improvement plans per this manual unless otherwise requested by the City staff. Details should be provided for tree preservation measures (aeration systems, special paving, fencing locations, etc) and notes called out for special tree preservation procedures (hand trenching, boring, no grading, etc).

2. Seven (7) sets of landscaping and irrigation plans per this manual.

3. Two (2) copies of the 10 and 100 year storm drain calculations based on this manual and Placer County's Stormwater Management Manual. Two (2) copies of any "Master Drainage Plans" approved for the project area.

4. Three (3) copies of the drainage shed map.

5. Two (2) copies of any necessary hydraulic studies and any necessary HEC analysis. These analyses, when required, shall include the following:

   a. Program printouts for both the before and after conditions.

   b. A plan showing contours, stream centerlines, limits of proposed construction, cross section locations numbered to correspond to X1 card numbering, floodplain and floodway boundaries as calculated by the analysis, and boundaries as established by the best available information, if applicable.

   c. Cross section plots of before and after conditions for all sections affected by the development.

6. Two (2) copies of sewer calculations in accordance with this manual, if required by the Public Works Department.

7. Two (2) copies of a network analysis for the water system in accordance with this manual, if required by the Public Works Department.

8. Two (2) copies of the soils report for the site (See Section 2-10).

9. Cross sections of existing street widening with existing and proposed elevations.

10. Two (2) copies of the Clerk's Notice of Approval and conditions of approval for the project.

11. Two (2) copies of the approved tentative map.

12. An itemized engineer's opinion of construction cost based upon reasonable and current unit costs. All cost estimates shall include a ten (10) percent contingency. The cost estimate shall also include all public landscaping improvements, grading proposed within public rights of way and easements (if not paid for previously under 2-1 (A) above), and construction staking. The Engineer may be requested to substantiate unit costs used through recent bids, contractor prices, etc.

13. Payment (100%) of the estimated plan check and inspection fee. Fees shall be as adopted by City Council resolution. The City reserves the right to collect additional plan check and inspection fees based on actual cost incurred.

14. Any additional information required as a condition of the Tree Preservation Ordinance.

2-6 **SUBMISSION OF DEVELOPMENT (NON SUBDIVISION) PLANS** - The following are the Public Works Department's requirements for the submittal of development plans for commercial, industrial, and multi-family projects. These plans shall be submitted to the Building Division at the time an application is made for a building permit. Projects which have been approved by the appropriate City Commission and are not proceeding under appeal or normal process to the City Council may be submitted only after the meeting of the Commission which approved the project and after the Conditions of Approval are available from the Planning Department. See Table 1 for improvement plan approval process for non-subdivisions.

A. **Submittal Requirements** - The following are the submittal requirements for non-subdivisions:

1. Seven (7) sets of improvement plans prepared per this manual.

2. Two (2) copies of the Soils Report for the project (See Section 2-10).

3. Two (2) copies of the 10 and 100 year storm drain calculations based on this manual and Placer County's Storm Water Management Manual.

4. Three (3) copies of the water shed map.

5. Two (2) copies of the Clerk's Notice of Approval for the Use Permit or Site Review and list of the Conditions of Approval.

6. One (1) copy of a recent title report, issued within the last six months.

7. Fire flow analysis with location of backflow devices.

8. An itemized engineer's opinion of construction cost based upon reasonable and current unit costs. All cost estimates shall include a ten (10) percent contingency. The cost estimate shall also include all public landscaping improvements, grading proposed within public rights of way and easements, and construction staking. The Engineer may be requested to substantiate unit costs used through recent bids,

contractor prices, etc.

9. Water and sewer use calculations based on case studies and/or other relevant information. Water and sewer are not to be based on fixture units. Refer to Sections 8 and 9.

10. Payment of the estimated plan check and inspection fee is required at the time of submittal. The City reserves the right to collect additional plan check and inspection fees based on actual cost incurred.

2-7 **SUBMISSION OF ROUGH GRADING PLANS** - Rough grading plans may be submitted only after approval of the tentative map, use permit, or site review by the approving body of the City and after the Conditions of Approval are available from the Planning Department.

A. **Submittal Requirements** - The following are the Public Works Department's submittal requirements for rough grading plans:

1. Five (5) sets of the proposed rough grading plan conforming to the requirements of this manual (See Section 11).

2. Two (2) sets of approved conditions of approval for the project.

3. Two (2) copies of an erosion and sedimentation control plan in accordance with Section 11 of this manual. In lieu of providing a separate plan, this information may be shown on the rough grading plan.

4. Two (2) copies of a Soils Report for the project unless the design engineer requests a deviation from the grading standards, where permitted, within this manual.

5. Payment of the estimated Grading Plan Review and inspection fee. Grading Plan Review fees will be as stated in Section 2-1 (A) above.

2-8 **SUBMISSION OF LANDSCAPING AND IRRIGATION PLANS** - Seven (7) sets of landscaping and irrigation plans, as specified in Section 13 of this manual, shall be submitted and approved concurrently with the improvement plans. The Public Works Department will distribute the plans to all reviewing departments. All irrigation landscape plans shall be accompanied by water use calculations including and not limited to peak hour, peak day and peak month, along with the number of and location of backflow devices. The City Department of Public Works will approximately size the water meter based on these calculations.

TABLE 1 CITY OF LINCOLN IMPROVEMENT PLAN APPROVAL PROCESS	
SUBDIVISION	**NON - SUBDIVISION**
Private Engineer submits improvement plans in accordance with Section 2-5 to the Public Works Department.	Private Engineer submits improvement plans in accordance with Section 2-6 to the Building Division which are routed to Engineering.
Engineering distributes plan sets as follows (as applicable):	
1 – Building Department 1 – Planning 2 – Fire & Police 3 – Engineering	1 – Building Department 1 – Planning 2 – Fire & Police 3 – Engineering
Engineering includes one sign-off sheet for each department above. For non-subdivisions projects, Engineering will also send a sign-off sheet to the Building Division who will review the site plans for handicap compatibility. Each City Department will work out changes to the plans directly with the private engineer. Once the Departments are satisfied with the plans the sign-off sheet will be returned to the Public Works Department.	
The private engineer shall submit the mylars to the Public Works Department for the City Engineer's signature along with the final deposit for plan check and inspection fees, bonds, insurance, and a filled-out encroachment permit. Engineering will return the signed mylars and a validated encroachment permit to the private engineer. The private engineer shall then submit six sets of prints to the Public Works Department prior to beginning construction.	The private engineer shall submit the mylars to the Public Works Department for the City Engineer's signature along with the final deposit for plan check and inspection fees, bonds, insurance, Engineering will return the signed mylars to the private engineer. The private engineer shall then submit five sets of prints to the Public Works Department prior to beginning construction. Traffic and Drainage fees to be collected by the Planning and Building Division prior to issuance of a building permit.
Public Works then distributes stamped "APPROVED" plans as follows:	
3 – Public Works Inspector 2 – Plan file 1 – Planning and Building Division	3 – Public Works Inspector 1 – Plan file 1 – Planning and Building Division

If it is determined by the Public Works Department that substantial changes may be required on the landscaping plans due to limited information on future utility fixtures, then the submittal of the landscaping plans may be deferred until such time that all necessary information is available to complete their design. The approved landscaping and irrigation plans shall be considered as part of the approved improvement plans and it is the responsibility of the engineer or design professional to ensure that the design of the improvements shown on both plans are consistent and compatible.

2-9 **SUBMISSION OF FINAL AND PARCEL MAPS** - Final and Parcel maps may be submitted only after approval of the tentative map by the City Council and after the Conditions of Approval are available from the Planning Department.

A. **Submittal Requirements** - Submittal requirements for a final or parcel map submittal package shall include the following:

1. Six (6) copies of the final or parcel map.

2. Payment of map checking fees in accordance with the Department of Public Works established fee schedule.

3. Three copies of boundary and parcel closure calculations.

4. Three copies of the Clerk's Notice of Approval, Tentative Map, and list of the Conditions of Approval.

5. Preliminary Title Report dated within six months and if map approval extends beyond six months, a new report is required.

6. Any additional information/documentation as required by Section 3-6 of this manual.

Once the map checking process has been completed and no additional changes to the map are required, two separate 3.5-inch computer disks or compact disk, each with a copy of the map in either DXF or DWG format, shall be submitted to the Public Works Department prior to approval of the final or parcel map.

2-10 **SUBMISSION OF LOT LINE ADJUSTMENTS** - The following shall be submitted to the Public Works Department prior to recordation of a lot line adjustment:

A. Two (2) copies of the resultant property boundary descriptions with an exhibit map (8.5" x 11" sheet).

B. Two (2) copies of the boundary closure calculations for the resulting lots. Items A and B shall be stamped and signed by a California Licensed Land Surveyor or Registered Civil Engineer authorized to practice land surveying.

C. Application signed by all affected property owners attesting to their approval of the lot line adjustment.

D. Deed(s) to convey interest in the affected properties.

E. Preliminary title report no older than six months for all properties involved.

F. Two copies of the Conditions of Approval.

2-11 **SUBMISSION OF DEDICATION BY SEPARATE INSTRUMENT** - Dedications for public rights-of-way or public easements requested by the Public Works Department shall be submitted to the Public Works Department. Dedications for easements requested by other City Departments shall be submitted directly to those Departments for review. For submittals to Engineering, all of the following items are required:

A. Grant document on 8.5" x 11" sheet(s) containing notarized signature(s) of the owners(s) and affected property(ies) as follows:

1. If the property is owned by individuals, the easement grant shall be signed by all property owners.

2. If the property is owned by a partnership, the easement grant can be signed by either partner.

3. If the property is owned by a corporation, the easement grant shall be signed by two corporate officers or one corporate officer with an official corporate seal. A copy of the corporation's by-laws shall be submitted if only one signature appears on the document.

The names and titles shall be typed or printed under each signature.

The grant document shall have a two inch wide margin at the top. The following address shall appear in the left half of the margin:

AFTER RECORDING RETURN TO:
City Clerk
City of Lincoln
640 Fifth Street
Lincoln, CA 95648

The grant document shall contain a legal description sufficient to retrace property boundaries in metes and bounds format of the area being granted. The purpose(s) for which the area is being granted shall be included. Legal descriptions shall be prepared stamped and signed by a licensed Land Surveyor or Registered Civil Engineer authorized to practice land surveying and written in accordance with accepted practice.

B. An exhibit map on 8.5" x 11" sheet. The map shall show the physical location of the area being granted as described in the legal description. The map shall contain the following information:

1. North arrow.

2. Scale of map.

3. Point of beginning of the description.

4. Bearings and distances of the description.

5. Easement width and type.

6. Reference to other supporting documents.

C. Lot closure calculations and supporting documents used to verify that legal lines are in their proper locations.

D. One copy of the "Preliminary Title Report". The date on the title report shall be less than six months from the current date, otherwise, it will need to be updated prior to approval.

If Deeds of Trust or Mechanic (or other) liens on the property appear in the Title Report for the property, subordination agreements shall be submitted. The agreement shall be signed and notarized by all property owners and beneficiaries.

Once items A through D above have been submitted, the entire package will be reviewed by the Public Works Department. If errors, corrections, or questions arise, the applicant or the applicant's engineer shall resolve them.

After the City Engineer has approved the total package, the grant deed, exhibits, and any required agreements will be forwarded to the City Clerk's Office. A resolution accepting the grant of easement will be prepared and all documents will be forwarded to the Placer County Recorder for recording with extra copies of the document returned to the Clerk upon recordation. Until the conforming copy containing the recording information is returned by the County Recorder to the Clerk's Office, the City has no authority to proceed with construction or entry on the area being granted. The project applicant may obtain the records duplicate stamp of book and page to speed the process.

2-12 **SOILS REPORTS** - Soils Reports shall be submitted in 8-1/2 x 11 bound folders. The analysis shall, as a minimum, include a map of the subject area showing proposed and existing streets, contours and location of type of soils obtained. The results of all field data and laboratory tests shall be included. Design for street sections shall be a part of the report. Street structural section design shall include recommendations for natural subgrade, geotextile fabric, subbase, base and pavement compaction and thickness to achieve design strength. For commercial, industrial, and multi-family projects, the report shall contain recommendations for on-site pavement sections. Traffic Index values (TI) shall be in accordance with Section 7 of this manual.

2-13 **RESUBMITTAL REQUIREMENTS** - All resubmittals shall be sent directly to the department or division requesting the revision. All resubmittals shall include the previous check prints, comment sheets, or whatever the department previously returned to the consulting engineer as a result of the plan check. The number of plans required shall be as specified in Section 2-5. All comments shall be either addressed on the plans or, if a comment is not specifically addressed on the plans, a written explanation shall be provided stating why the comment was not addressed on the plans.

Plans being resubmitted that contain alterations or revisions other that those required by the City shall require the consulting engineer to bring those revisions or alterations to the attention of the City.

2-14 **PLAN CHECK AND INSPECTION FEES** - When improvement plans are initially submitted to the Public Works Department for checking, a deposit of one hundred percent (100%) of the estimated plan checking and inspection fee is required (see Section 2-5). Fees shall be as adopted by City Council resolution. Contact the Public Works Department for the current fee schedule in effect. The City reserves the right to collect additional plan check and inspection fees based on actual cost incurred.

2-15 **PLAN APPROVAL** - See Table 1 for the City's plan approval process for both subdivision and non-subdivision development projects.

Once the consulting engineer receives approval of the plans, the consulting engineer shall work with PG&E and Pacific Bell for design of electrical and joint trench plans. A design meeting (at least one) to be conducted with City Representative, Pacific Bell, PG&E, and others.

2-16 **EXPIRATION OF PLANS** - Every permit issued under the requirements of this manual shall, at the discretion of the City Engineer, become null and void if the construction of work authorized by such permit is not commenced within one year from the date of such permit, or if the construction of work authorized by such permit is suspended or abandoned at any time after the work is commenced for a period of six months. At such time, the plans shall be subject to review by City staff to determine conformance with current City standards.

2-17 **IMPROVEMENT PLAN REVISIONS DURING CONSTRUCTION** - Should changes to public improvement plans become necessary during construction, such changes shall be subject to approval of the Public Works Department.

The procedure for obtaining approval shall be as follows:

A. The Consulting Engineer shall submit two (2) copies of the proposed change on "blue-line" sheets shown in red. The Public Works Department shall route the proposed revision to all applicable City Departments for review.

B. Following review and approval by the Public Works Department and all other City Departments of the proposed change, the Consulting Engineer shall submit the current approved plan in reproducible form showing the proposed change.

C. If determined acceptable, the Public Works Department will indicate approval for the change by initialing the plans in the revision box.

D. Following return of the reproducible plan to the consulting Engineer, the consulting Engineer shall provide three blue-line sheets for each plan sheet affected by the change.

After receiving approval, actual revisions shall be made in accordance with the following:

A. Unless approved by the City Engineer, the original design shall not be eradicated from the plans but shall be lined out.

B. In the event that eradicating the original design is necessary to maintain clarity of the plans, approval must first be obtained from the Public Works Department.

C. The changes shall be clearly shown on the plans with the changes and approval noted on a revision signature block.

D. 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 during construction which do not affect the basic design of the improvements may be made upon authorization of the Public Works Department without formally revising the plans. **These changes shall appear in the record drawings.**

The City Engineer may order changes in the plans in order to complete the necessary facilities or to conform to this manual, the Lincoln Public Facilities Improvement Standards, and the Standard Drawings or accepted engineering standards. The procedure for making changes in the plans ordered by the City Engineer shall conform to the above outlined procedure and standards.

2-18 **RECORD PLANS** - The contractor/developer shall keep an accurate record of all approved deviations from the plans before and during construction. For subdivisions, one complete set of mylars of the record civil plans shall be submitted to the Public Works Department prior to final acceptance of the completed improvements. For non-subdivision work, one complete set of prints of the record civil plans shall be submitted to the Public Works Department prior to final acceptance of the completed improvements. Each sheet of the plans shall be marked "RECORD DRAWING." "Record Drawings" of signal plans, water, sewer, and storm drain composite in plan view only shall also be submitted on computer disk in DXF or DWG format. The entire set of Record Drawings in DXF or DWG format shall be submitted on CD on the same datum as the design drawings. All "record drawings" shall contain the design engineer's RCE stamp and signature. The City Engineer may require profile revisions to the plans when grades are changed more than one (1) foot from the original approved plans.

2-19 **CONFLICTS, ERRORS, AND OMISSIONS** - Excepted from City approval are any features of the

plans that are contrary to, in conflict with, or do not conform to this manual, the Lincoln Public Facilities Improvement Standards, any California State Law, City Ordinance or Resolution, conditions of approval, or generally accepted good engineering practice, in keeping with the standards of the profession, even though such errors, omissions or conflicts may have been overlooked in the City's review of the plans. The responsibility of accurate plans which provide for a safe and proper design rests with the consulting engineer, not the City.

2-20 **CHANGE IN CONSULTING ENGINEER** - If the Developer elects to have a Registered Civil Engineer or Licensed Surveyor other than the engineer who prepared the plans provide the construction staking, the Developer shall provide the Director in writing the name of the individual or firm one week prior to the staking of the project for construction. The Developer shall then be responsible for proving all construction, the preparation of revised plans for construction changes, and the preparation of "record" plans upon completion of the construction.

In the Developer's notification of a change in the firm providing construction staking, the Developer shall acknowledge that he/she accepts responsibility for design changes and "record" information as noted above.

2-21 **OTHER AGENCY NOTIFICATION** - The Owner/Developer is responsible for obtaining required approvals and permits from all other governmental agencies, as required, prior to issuance of any City permits.

2-22 **INSPECTION REQUIREMENTS** - Any improvement constructed in conformance with this manual and the Lincoln Public Facilities Improvement Standards for which the City is intended to assume maintenance responsibility, shall be inspected during construction by the City Engineer. Each phase of construction shall be inspected and approved prior to proceeding to subsequent phases. Private on-site grading, erosion control, drainage, and dust control shall also be inspected during construction by the City Engineer. Requests for inspections shall be given 1 working day (24 hours) in advance, without exception.

Any improvement 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 Public Facilities Improvement Standards and will not be accepted by the City for maintenance purposes. The Contractor shall notify the City Engineer 1 working day (24 hours) prior to construction staking.

2-23 **FINAL INSPECTION** - Upon completion of any improvements which are constructed in conformance with this manual and the Lincoln Public Facilities Improvement Standards and prior to requesting final inspection, the area shall be thoroughly cleaned of all rubbish, excess material and equipment, and all portions of the work shall be left in a neat and orderly condition satisfactory to the City Engineer.

Within 10 working days after receiving the 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 Lincoln Public Facilities Improvement Standards. The Building Division will not allow occupancy of the project's buildings until the Building Division receives notification from the Public Works Department that all improvements to be constructed in accordance with the approved grading and improvement plans have been accepted as complete by the City.

On assessment districts and projects where the City of Lincoln participates in the costs thereof, quantities will be measured in the presence of the City Engineer, Consulting Engineer, and

Contractor and witnessed accordingly.

2-24 **OVERTIME INSPECTION SERVICES** - Any inspection services performed beyond normal working hours, or on weekends or holidays, either at the request of the contractor/developer or at the discretion of the City Engineer, shall constitute overtime inspection work. Payment of fees in addition to the normal plan checking and inspection fees shall be made for these services. The amount of the additional fees shall conform to the fee schedule for plan checking and inspection fees as adopted by City Council. **If the overtime services are provided at the request of the contractor/developer, requests and payment shall be made at least 48 hours in advance unless an initial deposit for plan checking and inspection fees has been paid.** Granting of the request to provide overtime inspection shall be at the sole discretion of the City Engineer and may be subject to the availability of inspection personnel.

2-25 **ACCEPTANCE OF IMPROVEMENTS** - No improvements will be accepted by the City until all improvements required of the subdivision or development project have been completed and approved by the City Engineer and "record" plans have been submitted to the Public Works Department per Section 2-18. Acceptance of improvements associated with a subdivision will be signified by the City Council approving the Notice of Completion. Acceptance of all other improvements will be signified by the City inspector signing off the encroachment permit.

Prior to acceptance of improvements required of subdivisions and the approval of occupancy of buildings associated with site development for commercial, industrial, or multi-family dwellings, the consulting engineer shall certify, in writing, that all on-site grading was performed in accordance with the approved grading plan, including minimum pad elevations. **Also required prior to acceptance of subdivision improvements are letters from each utility company indicating that all required utility work has been completed to the satisfaction of the company.**

2-26 **SPECIAL NOTICES AND PERMITS** - The Consulting Engineer shall be responsible for advising the Contractor to give the following notices and have in his possession the following permits and plans:

A. Contractor shall be in receipt of official City approved plans prior to construction.

B. Contractor shall notify the Department of Public Works and all utility companies involved in the development at least 48 hours prior to beginning of work.

C. Contractor shall notify "Underground Service Alert" and have construction area marked at least two working days prior to any digging.

D. Contractor shall be responsible for the protection of all existing monuments and/or other survey monuments.

E. Contractor shall be responsible for conducting his operation entirely outside of any prohibited area. These areas shall be clearly delineated in the field prior to construction.

2-27 **BRIDGES AND OTHER STRUCTURAL ROADWAY ITEMS** - The following is the City's procedure for plan checking and construction inspecting of structural roadway items such as bridges, roadway retaining walls, non-standard culverts, etc.

A. **Private Improvements** - Where structural roadway items are to be constructed on private property which is intended to remain privately owned, the design engineer shall submit a letter along with the plan submittal which certifies that the item has been designed in accordance with accepted engineering practice. Said letter shall be wet stamped with the design engineer's RCE stamp and wet signed by the design engineer. The City will not plan check the design of the item as related to structural integrity. The responsibility for ensuring

said integrity rests with the design engineer.

For inspection of private structural roadway items, the design engineer shall submit a letter to the Public Works Department certifying that the item has been constructed in accordance with accepted test methods. Said letter shall be wet stamped with the design engineer's RCE stamp and wet signed by the design engineer. It shall be the developer's responsibility to make arrangements, as necessary, with the design engineer to enable said engineer to provide said letter as described above. The City will not inspect the construction of the item as related to structural integrity. The responsibility for ensuring said integrity rests with the design engineer.

NOTE: The above is not to be confused with private on-site retaining walls, buildings, etc., as these items require a building permit and therefore are plan checked and inspected by the Building Division. The structural items addressed in this section primarily pertain to improvements associated with private roadways.

B. **Public Improvements** - Where structural roadway items are to be constructed on public property, public right-of-way, or on private property which is intended to become public property or right-of-way, improvement plans shall be submitted to the Public Works Department for plan check along with the roadway improvement plans. The City will forward plans of the structural roadway item to the City's consultant for plan checking. The consultant's comments will be forwarded to the City for incorporation with City comments to the design engineer.

For inspection of public structural roadway items, the Public Works Department will provide inspection services similar to typical public roadway inspection.

2-28 **DEVIATION FROM STANDARDS** - All requests for approval of exceptions from the design requirements contained within this manual shall be submitted in writing to the Public Works Department. Approval for exceptions shall be sought as early as possible in the project development process, particularly where the project concept and/or cost estimate depend on the proposed design exceptions.

Requests for design exceptions shall include the following:

1. A statement of the specific standard for which a design exception is requested.

2. A thorough but brief description of the reason for the request for the design exception.

3. A description of any non-standard safety enhancements to be provided such as median barriers, guardrail upgrades, etc.

4. An estimate of the additional cost required to conform with this manual.

The approval of all deviations from these standards shall be at the discretion of the City Engineer.

SECTION 3

PLAN SHEET REQUIREMENTS

3-1 **GENERAL** – Public improvement plans shall be prepared for public improvements required of subdivisions and all other work performed within City rights-of-way or easements that is in excess of minor work. For the purposes of this section, minor work shall consist generally of the construction, or the removal and replacement of curbs, gutters, sidewalks or driveways; minor street widening; connections to existing water, sewer or storm drainage facilities adjacent to site development; and utility related work. Public improvement plans shall be prepared using version 14 compatible AutoCAD.

The following requirements apply to the form of public improvement plans:

3-2 **PLAN AND PROFILE SHEETS** – All improvement plans shall be clearly and legibly drawn in ink on engineering mylar, or approved equal, 24 inches by 36 inches in dimension ("D" size). Sheets shall have a 1-1/2 inch wide clear margin at the left edge and a 1-inch wide margin on all other edges, or as otherwise approved by the City Engineer.

A. **Drafting Standards** – All line work shall be neat, clearly legible, and opaque to light. Letters and numerals shall have a minimum length of 1/8 inch and be well formed and sharp. Numerals showing profile elevations shall not be bisected by station grid lines. Dimension lines shall be terminated by sharp, solid arrowheads.

B. **Scale** – Horizontal scale shall be 1-inch = 20, 40 or 50 feet. Vertical scale shall be 1-inch = 2, 4, or 5 feet.

C. **Title Block** – A title block must be shown on each sheet within the set of drawings and shall show the subdivision or project name, sheet title, sheet number, date, scale (plus bar scale), and the Consulting Engineer's name, signature, license number, and expiration date. The title block shall be placed along the lower edge or right side of the sheet.

3-3 **TITLE OR GENERAL INFORMATION SHEET** – Each set of improvement plans shall have a Title or General Information Sheet. This sheet shall be sheet one of the plans and shall include the following:

A.* A vicinity map drawn to a convenient scale, preferably not less than 1-inch = 2000 feet. The north arrow must point to the top of the sheet.

B.* A north arrow and scale.

C.* Sewer, water, storm drainage and streetlight network. (This information may be shown on a separate sheet for clarity.)

D.* Index of sheets.

E.* Signature blocks for the City Engineer per STD DWG CD-1..

F.* Utility information block.

G.* Date improvements plans completed.

H. The entire subdivision or parcel drawn to scale not less than 1-inch = 200 feet, or as approved by the City Engineer.

I. Streets and street names of all streets within or contiguous to the project.

J. Adjacent subdivisions or parcels properly identified including names, lot lines and lot numbers (or Assessor's Parcel Numbers).

K. All property lines and easements.

L. Legend of symbols conforming to the Standard Drawings (PS-1).

M. All of the City of Lincoln General Notes, shown verbatim.

N. Typical street sections including T1 and R values. Reference to Geotechnical report substantiating R values and structural sections proposed.

O. Temporary and permanent benchmarks with description. The Consulting Engineer shall contact the Department of Public Works for the location and elevation of the nearest official benchmark.

Improvement plans consisting of fewer than four sheets, except traffic signal plans, shall not include a title sheet, but instead shall show all of the above information on the plans. If a title sheet is not required, those items marked with an (*) shall be shown on the first sheet.

3-4 **STREET PLAN AND PROFILE SHEETS** – The following requirements are for all plans submitted to the City of Lincoln for review and approval:

A. **Plan View** – The plan view of each street to be improved shall be shown on separate sheets and shall include existing improvements and contours/elevations within 100 feet of the project boundary, proposed improvements and future improvements, if known. Proposed improvements shall include sidewalk, curbs, gutters, driveways, sewer mains, water mains, sewer lateral locations, storm drains, manholes, valves, fire hydrants, fencing, barricades, and survey monuments. Plan information shall include centerline stationing, curve data for all curves along centerline and curb returns and distinct elevations along the face of curb at all beginning and ends of curves and at all curb returns. Call-outs on the plans to City standard shall reference the Standard Drawing where these are shown. Other data may be required as specified by the City Engineer. The stationing shall normally read from left to right with the north arrow pointing either to the top or right edge of the sheet. All stationing shall be a continuation of that used for the design of existing improvements where possible.

B. **Profile View** – The profile view of each street shall be shown immediately below its plan view. The profile shall include centerline stationing, existing and proposed street centerline profiles, profiles of sewer mains, storm drains, water mains, public utility mains, all utility crossings, and gutter flow lines. Distinct elevations shall be shown for the street centerline and gutter flowline at 50-foot stations and grade break points, manhole and catch basin inverts and elevations, and water main crossings with other utilities. Rates of grade shall be shown on all profile lines. Elevations of the hydraulic grade line for the 10-year frequency storm shall be shown at all storm drain manholes, catch basins, and drain inlets where located above the top of the pipe. Elevations of the hydraulic grade line for 100-year frequency storms shall be shown at all crossings of arterials, culverts, and where determined necessary by the City Engineer.

C. **Signing and Striping Plan** – All existing and proposed traffic signing and striping shall be shown on a plan view and on separate sheets from all other improvements. Signing and striping to be shown shall include all existing and proposed traffic striping, pavement markings, pavement markers, regulatory signs and warning signs. All existing signing and striping within at least 200 feet of the project limits shall be shown.

D. **Rough Grading and Finished Grading Plans** – Rough grading and finished grading plans shall conform to the requirements of Section 11, GRADING, of this manual.

E. **Other Plans** – Other plans that shall be incorporated in the public improvement plans include, but are not limited to, landscaping and irrigation; retaining and decorative soundwalls; and traffic signals. The layout of meandering sidewalks, soundwalls, pedestrian pass-throughs, etc., shall be shown on the improvement plans along with any grading associated with these improvements in addition to being shown on the landscaping plans. Public improvements built under the landscaping plans shall be included in the cost estimate submitted with the improvement plans in order that they may be properly bonded for and inspection costs covered.

3-5 **DETAIL SHEETS** – Detail sheets, if necessary, shall delineate special details, structural designs, etc., for which no Public Works Department standard drawing exists, and when space is not available on the plan and profile sheets.

Plan views of the structure for which details of design are to be provided shall be shown on the detail sheet depicting the location of said structure in relation to street centerlines, stations, bearings, skews, grades, etc. Structural details shall be delineated at a scale that will clearly define all facets of the design.

Public Works Department standard drawings shall not be delineated on detail sheets or any other sheet unless reproduced in full.

3-6 **PARCEL AND FINAL MAPS** – The parcel or final map shall be prepared by or under the direction of a registered civil engineer authorized to practice land surveying or licensed land surveyor in the manner required by the State Subdivision Map Act and this manual.

A. **Preparation and Form** – Parcel and final maps shall conform to the following. Refer to map review checklist in appendix.

1. The general form and layout of the map, including size and type of lettering, drafting and location of acknowledgements, etc., shall be as approved by the City Engineer.

2. The scale of the map shall not be more than one inch equals one hundred feet, unless otherwise permitted by the City Engineer. All maps shall clearly show all details of the subdivision.

3. All dimensions shall be shown in feet and hundredths of a foot. No ditto marks shall be used.

4. If more than three sheets are necessary to show the entire subdivision, an index shall be included.

5. The subdivision designation, tract number, other numbers assigned by the City Engineer, scale and north point shall be shown on each sheet.

6. A title sheet, designated as page number one of the final map, shall be provided. Where the size of the subdivision permits, in lieu of a separate title sheet, the information required may be shown on the same sheet as the map of the subdivision.

7. The final map shall be legibly drawn in accordance with the requirements of the Subdivision Map Act, and as directed by the City Engineer. The parcel or final map, when filed, must be in such condition that legible prints and negatives can be made therefrom.

B. **Certificate Sheet** – The Certificate sheet shall contain the following information:

1. The title followed by the words "City of Lincoln."

2. Below the title shall be a subtitle, consisting of a description of all property being subdivided with reference to such map or maps of property shown thereon as shall have been last previously recorded or filed in the County Recorder's Office, or shall have been previously filed with the County Clerk pursuant to a final judgment in any action in partition, or shall have been previously filed in the office of the County Recorder under authority of the Subdivision Map Act or by reference to the plat of any United States survey.

3. The subtitle of maps filed for the purpose of reverting subdivided land to acreage shall consist of the words, "A reversion to acreage of....." (insert description as required herein).

4. Reference to tracts and subdivisions in the description must be worded identically with original records. References to book and page of record must be complete.

5. Affidavits, certificates, statements, acknowledgements, endorsements, acceptances,, dedications and notorial seals as required by law including, but not limited to, the Subdivision Map act and City Ordinance, each signed by the appropriate person.

C. **Information** – The parcel or final map shall substantially conform to the tentative map approved or conditionally approved by the City Council, including all approved modifications and shall contain the following information:

1. The boundary line of the subdivision shall be a solid, heavy inked line.

2. All areas shown on the map which do not constitute a part of the subdivision shall be labeled, "Not a part of this subdivision," or "N.A.P.O.T.S." All lines delineating such areas shall be dashed.

3. The following survey data and information shall be shown on the final map:

   a. Stakes, monuments (together with their precise position) or other evidence found on the ground, to determine the boundary of the subdivision.

   b. Corners of all adjoining properties identified by lot and block numbers, subdivision names, numbers and pages of record, or by section, township and range, or other proper designation.

   c. All information and data necessary to locate and retrace any point or line without reasonable difficulty.

   d. The location and description of any required monuments to be set after recording of the parcel map, and the statement that they are "to be set."

   e. Bearings and length of each lot line, block line and boundary line and each required bearing and distance.

   f. Radius, arc length and central angle of each curve.

   g. The survey centerlines and any street or alley in or adjacent to the parcel together with reference to a field book or map showing such centerline and the monuments which determine its position. If the monuments are determined by ties, that fact shall be so stated.

h. Such other survey data or information as may be required to be shown by the City or by the provisions of the Lincoln Municipal Code.

i. North arrow and scale of map including graphic scale.

4. All resulting lots or parcels being subdivided for the purpose of sale, lease, or financing, excluding those exempted by law, and all parcels offered for dedication to the City or any other public agency, for any purpose, with all dimensions, boundaries and courses clearly shown and defined. Dimensions of lots shall be as total dimensions, corner-to-corner, in addition to point-to-point dimensions. Lots of more than one acre shall show net acreage to the nearest one-hundredth of an acre. All others shall show net area to the nearest square foot.

5. All lots shall be numbered consecutively, without omissions or duplication, throughout the subdivision, starting with the number one, except units of a total development which shall be numbered consecutively throughout the development. Only parcels offered for dedication other than for streets or easements shall be designated by letters. However, in single family subdivisions, the parcels intended for other than single-family use may be designated by letters. Each numbered lot shall be shown entirely on one sheet.

6. The location and total width of all public streets, alleys, pedestrian ways, equestrian and hiking trails and biking paths, and railroad rights-of-way; the names of public streets and the width on each side of the centerline of each public street; the width of the portion of the street, alley, pedestrian way, equestrian and hiking trial and bike path being dedicated, and the width of the existing dedication, public or private, if any, within the subdivision.

7. All necessary data, including width and sidelines of all public utility easements to which the lots of the subdivision are subject. Each easement shall be clearly labeled as to nature and purpose and, if already of record, its recorded reference given. If any easement is not definitely located on record, a statement concerning the easement shall appear on map. Easements shall be denoted by fine dashed lines.

8. All limitations on rights of access to and from streets and lots and other parcels of land.

9. The lines of any natural watercourse, channel, stream, creek or body of water in or adjacent to the subdivision and/or officially adopted floodplain lines, which constitute parcel boundary lines or easement lines.

10. Any City boundary crossing or adjoining the subdivision clearly designated and tied in.

11. Total acreage within the subdivision.

12. The basis of bearings used for the map, making reference to some recorded subdivision map or other source acceptable to the City Engineer and the found monuments of the field survey. Basis of horizontal coordinate control shall be California Coordinate System (available from Public Works) and control point coordinates shall be clearly stated on the map.

D. **Additional Data Required for Recording** – The following statements, documents and other data, and as many additional copies thereof as may be required, shall be submitted with the parcel or final map when the map is ready to record.

1. An application for Recording with the names, addresses and telephone numbers of the record owners and subdivider and persons preparing the parcel or final map.

2. A guarantee of title or letter from a title company, certifying that the signatures of all persons whose consent is necessary to pass a clear title to the land being subdivided and all acknowledgements thereto, appear and are correctly shown on the proper certificates and are correctly shown on the final map, both as to consents for the making thereof and the affidavit of dedication.

3. Final traverse computation sheets in a computerized form approved by the City Engineer, giving bearings, distances and coordinates, and showing the mathematical closure. No manual computations will be accepted. All lots must close to within 0.01 feet or as specified by the City Engineer.

4. The complete, approved plans, specifications and applicable permits for the construction and installation of improvements as required by the Lincoln Municipal Code and subdivision conditions of approval.

5. All protective covenants, restrictions, or affirmative action obligations in the form in which the same are to be recorded when approved thereof by an officer of the City, if required as a condition of approval of the tentative map.

6. Any offer of dedication by separate instrument and an accompanying title report as may be required as a condition of approval of the tentative map. The dedication instrument and title report shall conform to the requirements of the Lincoln Municipal Code and Section 2-11 of this manual and shall be processed in accordance with the provisions of the Lincoln Municipal Code that relates to instruments of dedications of accompanying title reports.

   Whenever an offer of dedication by a separate instrument accompanies a parcel or final map, the parcel or final map shall not be accepted for filing by the City Engineer until he first approves the instrument of recordation.

7. All other data required by law as a condition of approval of the tentative map, including plans, reports, agreements, permits, fees, security or other requirements.

E. **Subdivision Agreement** – If the required improvements for the subdivision have not been completed to the satisfaction of the City Engineer and accepted by the City Council prior to recording of the parcel or final map, the subdivider shall enter into a subdivision agreement with the City. The form of the agreement shall be as approved by the City Attorney, and said agreement shall be approved by the City Council and recorded concurrent with the parcel or final map.

F. **Digital Copy** – Once the map checking process has been completed and no additional changes to the map are anticipated, two separate 3.5 inch computer disks or compact disks, each with a copy of the map (not signature page) in either DXF or DWG format, shall be submitted to the Public Works Department.

3-7 **PROPERTY OF CITY** – All plans, maps, reports and any other items submitted to the City shall become the property of the City. The City shall not be responsible for the return of these items once they are submitted.

SECTION 4

TRAFFIC IMPACT STUDIES

4-1 **RESPONSIBILITY FOR TRAFFIC STUDIES** - Traffic studies, when required by the City, shall adequately assess the impacts of a development proposal on the existing and/or planned street system. The primary responsibility for assessing the traffic impacts associated with a proposed development shall rest with the applicant, not the City. All traffic studies shall be subject to review and approval of the City Engineer.

The flow chart shown in Figure 4-1 shall be used to determine when a traffic study is required for a proposed project. There are two types of traffic studies: short term and long term. The only difference between the two is the short term study does not need to analyze the future scenarios as outlined in section 4-2 E (3 & 4) below. Short term traffic studies shall include an explanation as to why the future scenario need not be analyzed (e.g., the proposed land use is consistent with the General Plan, therefore the project's long term traffic impact is already accounted for via the City's Capital Improvement Program which was derived from the City-wide traffic model). The primary purpose of a short term traffic study is to identify the project's impact to the roadway network with existing traffic volumes, and to evaluate proposed site access. Where access points are not defined at the time the traffic study is prepared, additional traffic work may be required when the access points are defined.

Transportation consultants shall discuss proposed projects with the Planning and Public Works Departments prior to starting the study to identify which intersections to include in the study in addition to any other particular concerns or site specific issues.

A. **Preparation and Submittal Requirements** - Traffic studies shall be the responsibility of the applicant and shall be prepared by a Registered Traffic Engineer or a Registered Civil Engineer with demonstrated competence and adequate experience in Transportation Engineering.

Initially, three copies of the traffic study shall be submitted to the Planning Department. For development projects seeking discretionary approval, three copies of the traffic study shall be included with the application submittal. Traffic studies that are not in compliance with the requirements set forth in this manual will be considered incomplete, and may result in the application being deemed incomplete.

The Planning Department will forward two copies of the traffic study to the Public Works Department. The Planning and Public Works Departments will then review the study data sources, methods and findings. Written comments from the Public Works Department will be provided to the Planning Department which will forward the comments to the applicant. The applicant and the transportation consultant will then have an opportunity to incorporate necessary revisions or responses as part of the final report.

Fifteen copies of the final report shall be completed and submitted to the Planning Department for Project Review and Planning Commission Meetings. Twenty-three copies are required for City Council Meetings. All copies of the traffic study submitted to the City shall become the property of the City.

B. **Previous Traffic Studies** - All previous traffic studies relating to a development that are more than two years old shall be updated unless the Planning and Public Works Departments determine that conditions have not changed significantly.

4-2 **TRAFFIC STUDY FORMAT** - In order to provide consistency and to facilitate staff review of the studies, the following format shall be followed in the preparation of such studies by transportation consultants:

A. **Introduction** - The introduction of the report shall contain the following:

1. Land use designation, site and study area boundaries - A brief description of the size of the land parcel, general terrain features, and the location within the City and the region shall be included in this section. In addition, roadways that afford access to the site and those that are included in the study area shall be identified.

   The exact limits of the study area should be based on engineering judgement and an understanding of existing traffic conditions surrounding the site. In all instances, however, the study area limits shall be subject to approval of the Planning and Public Works Department. A vicinity map that shows the site and the study area boundaries in relation to the surrounding transportation system shall be included.

2. Existing and proposed site uses - The existing and proposed uses of the site shall be identified in terms of the various zoning categories of the City. In addition, the specific use for which the request is being made shall be identified, if known, since a number of uses may be permitted under existing ordinances. Parcels in the vicinity of the site shall also identify the zoning, land use and specific uses. This information shall include square footage of the various uses or the number and size of the units proposed.

   It shall be the intent of the traffic study to evaluate the worst case impacts for the proposed development allowed by zoning. If several different uses are permitted by the zoning, the land use with the greatest overall traffic impact shall be assumed for the study.

3. Existing and Proposed Roadways and Intersections - Within the study area, the applicant shall describe and provide volumes for existing roadways and intersections including geometric and traffic signal control as well as improvements that have been proposed by government agencies and other development projects. The study shall identify roadway improvements within the study area planned to be constructed by the City as part of the City's Capital Improvement Program.

B. **Project Trip Generation** - A summary table listing each specific use, the size involved, the trip generation rates used (total daily traffic and A.M./P.M. peak hours), and the resultant total trips generated shall be provided for the project site. The peak hour analyzed shall be that of the roadway system, not the proposed project. This section shall also include a discussion on how the project's trip generation rate compares with typical trip generation rates for the site's existing General Plan land use category. If the proposed project represents only a portion of a larger overall site, such as a phased project, then the traffic study shall discuss the degree to which both the initial phase and the ultimate development impact the roadway network.

TO DETERMINE WHEN A TRAFFIC STUDY IS REQUIRED

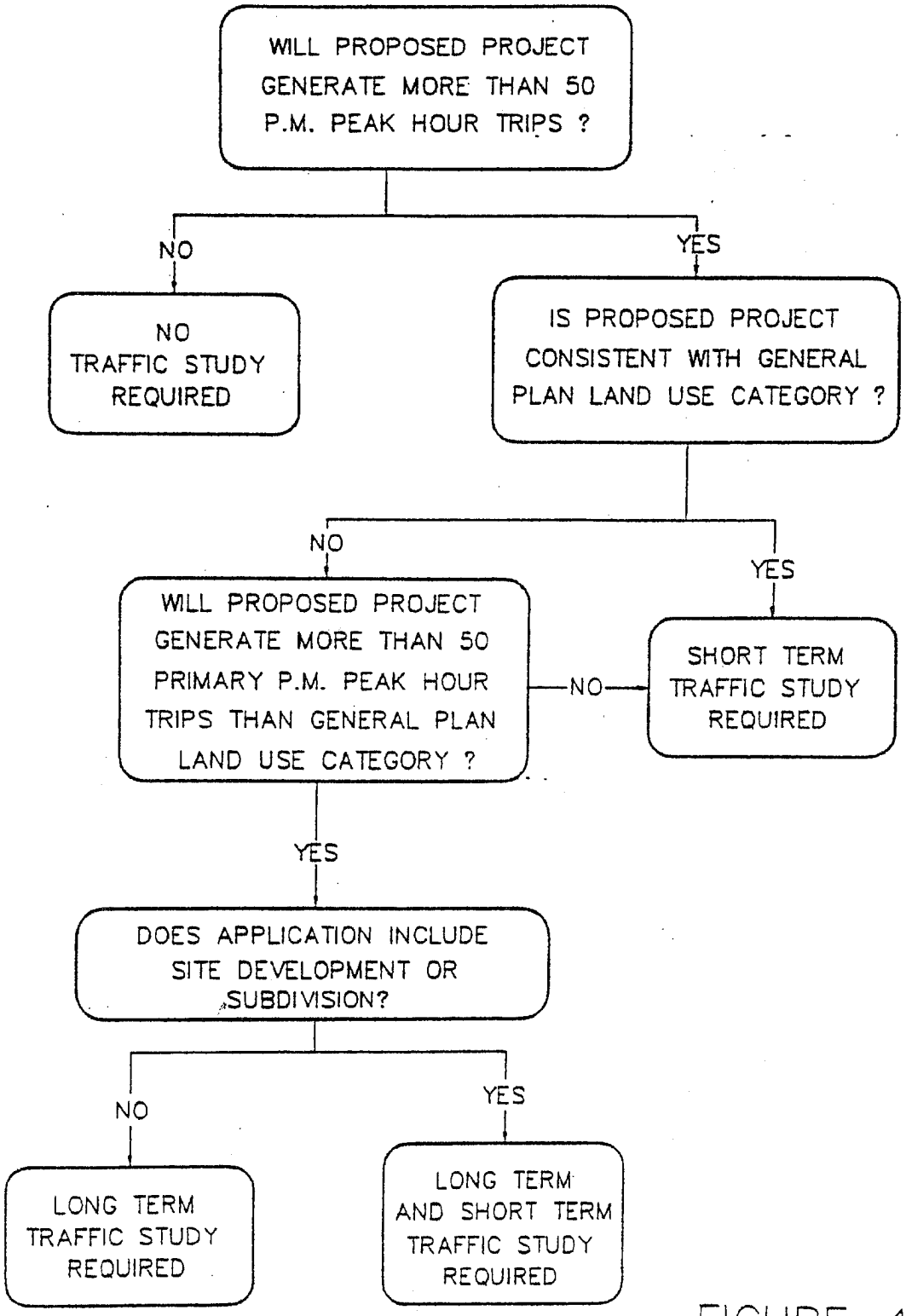


FIGURE 4-1

Trip generation shall be calculated based on data contained within the latest edition of the Institute of Transportation Engineer's (ITE) Trip Generation Manual or more appropriate local data as approved by the Public Works Department. Any internal trip reductions or modal split assumptions will require analytical support to demonstrate how the figures were derived. Peak hour reductions for Transportation Systems Management (TSM) will be allowed but only to the extent as provided per the City's TSM ordinance.

Pass-by trip factors may be used to reduce the estimated additional total daily traffic to streets serving a proposed development. They are not to be applied to reduce turning movement volumes at driveways serving the proposed development. The percentage of pass-by trips used shall be in accordance with data available in the ITE Trip Generation Manual. If no such data is available in the manual, then the rates shown in Table 4-1 may be used. Percentages other than ITE's or those shown below also may be used provided that supporting data is included in the study, and that the City finds the data acceptable.

TABLE 4-1

LAND USE	PASS BY TRIPS
Banks	14 %
Regional Shopping Center	9 %
Supermarkets	28 %
Hardware Stores	8 %
Auxiliary Commercial Uses	16 %
Neighborhood Convenience Centers	40 %
Drive-In Restaurant	40 %
Service Stations	50 %

C. **Trip Distribution** - The estimates of percentage distribution of trips generated by the proposed development onto the roadway network shall be shown on a map. The methodology of distribution shall be discussed in the study. The transportation consultant shall use the City's traffic model to estimate trip distribution.

D. **Traffic Assignment** - The volume of site-generated traffic on the area's street system shall be shown on a map. The technical analysis steps, basic methods, and assumptions used in this work shall be clearly stated. The assumed trip distribution and assignment shall represent the most logically traveled route for drivers accessing the proposed development. These routes can be determined by observation of travel patterns to existing land uses in the study area.

E. **Short Term -vs- Long Term Traffic Studies** - A short term traffic study shall include items 1, 2, and 3 below.

Graphics shall be provided which show the following traffic volumes for private access

points, intersections, and streets:

1. Existing P.M. peak hour directional roadway traffic volumes including turning movements at intersections.

2. The data in item 1 above plus projected site traffic volumes for the development scenario being analyzed. Include projected turning movements at driveways. It is acceptable to combine items 1 and 2 into one graphic.

3. Other peak hours which are determined by the City to be critical to site traffic and the street system in the study area shall be included and shall show the same information as is provided for above. Examples of other peak hours are A.M. peak, noon peak, and project peak.

A long term traffic study is typically prompted by a request for a rezone of property. A long term traffic study shall address the long term impact to the City's Capital Improvement Program (C.I.P.) caused by the rezone. This requires changing the land use in the City's latest version of the Citywide traffic model and rerunning the model to identify any impact to the C.I.P. The term "impact" in this case refers to any additional improvements needed to maintain the City's level of service policy, or any change as to when a previously identified improvement is needed.

It shall be the consultant's responsibility to provide up-to-date existing roadway volumes and intersection turning movements. The consultant may obtain recent (1 year or less) traffic count data on file with the Public Works Department, if available. If no such data exists, the consultant shall collect new traffic count data in the field. "Future", as used above, refers to the horizon year of the City's computer traffic model and Capital Improvement Program.

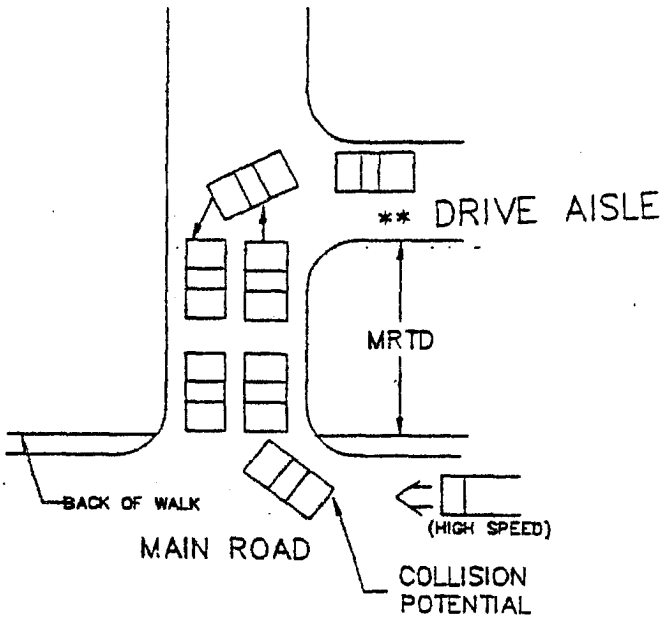
The City may request any traffic study to include 2020 traffic data to project traffic volumes.

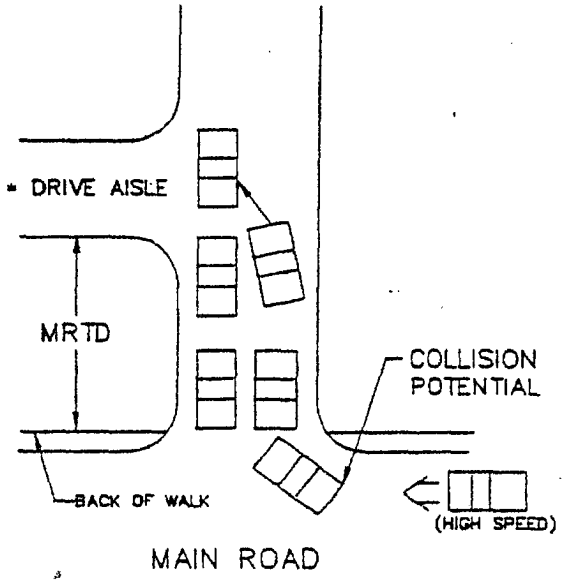
F. **Traffic Index** – Long term traffic studies shall contain an estimate of the Traffic Index (TI) for the study streets. The estimated TI shall be for a 20 year period and follow procedures in Caltrans Highway Design Manual. Both short term and long term traffic studies shall include an evaluation of construction traffic routes and recommend adjustment of TI's to account for construction traffic. Traffic Indexes shall be approved by the City prior to publication of the final traffic study.

G. **Level of Service (LOS)** - This section shall include tables showing the level of service and volume/capacity ratio for each roadway intersection for each scenario. These parameters shall be calculated using the Transportation Research Board (TRB) Circular 212 Planning Method. If the intersection is unsignalized, then the methodology in Chapter 10 of the TRB 1985 Highway Capacity Manual shall be used. The report shall include a discussion of assumptions made in the above calculations, such as saturation flow rates, peak hour factors, and lane configurations for each intersection.

Intersection level of service "C" shall be the peak hour design objective. A LOS worse than "C" shall not be acceptable unless the intersection is operating worse than LOS "C" prior to project construction or the City's General Plan identifies a LOS worse than "C" as being acceptable. If either case applies then the report shall discuss whatever plans the City has

MINIMUM REQUIRED THROAT DEPTH (MRTD)





* NOTE: IF THIS DRIVE AISLE IS "ONE-WAY ONLY" TOWARDS THE DRIVEWAY THROAT, THEN A MRTD OF 25' IS ACCEPTABLE.

** NOTE: IF THIS DRIVE AISLE IS "ONE-WAY ONLY" AWAY FROM THE DRIVEWAY THROAT, THEN A MRTD OF 25' IS ACCEPTABLE.

FIGURE 4-2

for intersection improvements and shall include a LOS analysis for the "improved" scenario. The consultant shall inquire with the Public Works Department as to planned roadway and intersection improvements.

If the proposed project is shown to cause degradation of intersection LOS to worse than "C" (or whichever LOS is identified in the General Plan for the particular intersection) after considering any improvements already planned by the City, then the traffic study shall recommend feasible mitigation measures to bring the intersection level of service within acceptable standards (in accordance with the General Plan).

H. **Site Access** - A short term traffic study shall discuss how the proposed site access compares with the City's access standards as described in this section and in Section 5 of this manual entitled "Site Access." Some of the topics that may be included in the traffic study are: Number of driveways serving a parcel or site, right turn deceleration lane or right turn curb flares for driveways, left turn deceleration lane for driveways, storage requirements for turn lanes, minimum offset for opposing driveways, restricted turning movements for driveways, and sight distance. Each site access point shall be discussed separately. If the proposed site access does not meet the City's standards, then the traffic study shall identify what modifications to the proposed site access would be necessary to meet City standards and explain why these modifications are not proposed.

The traffic study shall evaluate the minimum required throat depth (MRTD) needed on-site for each access point for the proposed development. The MRTD, as illustrated in Figure 4-2 entitled "MINIMUM REQUIRED THROAT DEPTH," is measured from the back of sidewalk to the first drive aisle. The purpose of the MRTD is to allow enough stacking distance for egressing vehicles so that the first drive aisle is not blocked. This minimizes the possibility of incoming vehicles queuing out into the traveled way of the main street thereby creating a safety concern as shown in Figure 4-2. The MRTD shall be measured in car length increments of 25 feet. In no case will the City allow a MRTD of less than 25 feet for any project. Throat depths greater than the calculated MRTD are encouraged. On-site parking shall not be permitted within the MRTD area. The MRTD requirement does not apply to single family residential or duplex land uses.

Figure 4-2 illustrates that the MRTD is a function of the length of the queue of vehicles waiting to exit the driveway. The length of this queue is a function of two variables: the number of vehicles desiring to egress during a given time period versus the number of vehicles that can enter the traffic stream of the main road during that same time period. The first variable, the number of vehicles desiring to egress, is called the EGRESSING DEMAND VOLUME. The second variable, the number of vehicles that can enter the traffic stream of the main road, is called the MOVEMENT CAPACITY. The egressing demand volume will have already been calculated as an earlier part of the traffic study under projected driveway turning movement volumes. The movement capacity can be calculated using methods discussed in the 1985 Highway Capacity Manual (HCM), and concepts discussed by the Institute of Transportation Engineers (I.T.E.).

If the proposed project represents only a portion of a larger overall site, or if it is expected that vehicles generated by other than the project will use the access under study, then the <u>total</u> expected turning movement volumes at the subject access location shall be used in determining the MRTD.

As shown in Figure 4-2, there are cases when an MRTD of 25 feet is acceptable. This is

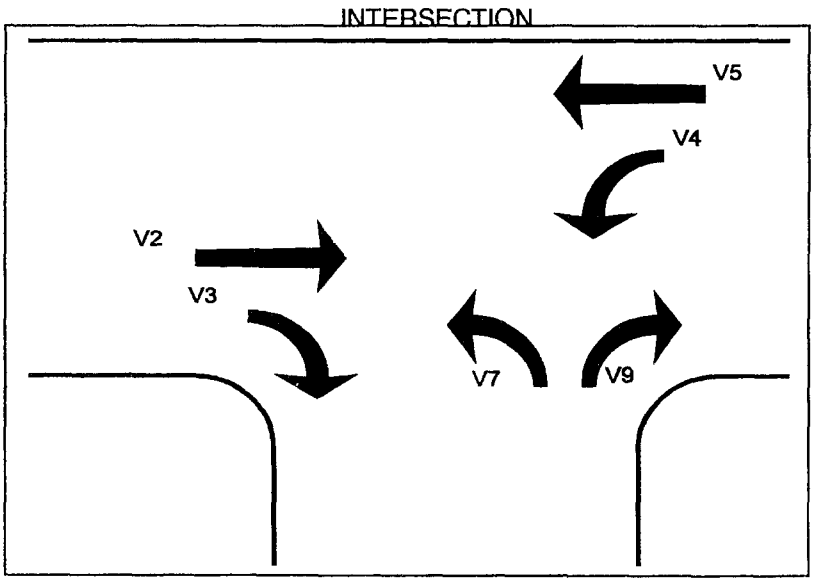
when the first drive isle is "one way only" to the right in the figure. Another scenario where a MRTD of 25 feet is acceptable is when a raised center median is constructed in the driveway throat from the back of sidewalk to the calculated MRTD distance. In this case, the nearest drive aisle can be two-way, but turning movements into and out of the drive aisle are restricted by the raised median, thereby mitigating the concern as shown in Figure 4-2.

If the calculated MRTD is physically or unreasonably too long for the proposed development, then the traffic study shall suggest ways to reduce the MRTD by either reducing the egressing demand volume, or by increasing the movement capacity. Examples of reducing the egressing demand volume at an access location would be to suggest additional egress locations, cause a different distribution of vehicles egressing the site by modifying the on-site design, or somehow reduce the site's trip generation. Examples of increasing the movement capacity at an access location would be to suggest additional egress lanes or, in the case of an unsignalized access location, suggest fewer allowed turning movements onto the roadway. In any case, the traffic study shall fully evaluate the impacts of any such modifications.

There are two types of access locations: unsignalized and signalized. Both are discussed below in reference to calculating the MRTD.

1. **MRTD for Unsignalized Access Locations** - At unsignalized access locations, the movement capacity is calculated using Chapter 10 of the HCM. It is based on the availability of critical gaps on the main street to allow vehicles to safely egress from the driveway (i.e., the minor street as it is called in the HCM), which is a function of conflicting traffic streams. Below is an example of how to use this method to calculate the MRTD at an unsignalized access location. Table numbers, Figure numbers, and terminology used below refer to those in the HCM unless otherwise indicated.

EXAMPLE - A driveway has 60 right turning vehicles in, 150 right out, 30 lefts in and 700 vehicles going through. The average speed on the major road is 55 mph. The driveway has a yield sign.



A. Volume Adjustments

MOVEMENT NUMBER	2	3	4	5	7	9
VOLUME (VPH)	700	60	30			150
VOL (PCPH) TABLE 10-1	N/A	N/A	33	N/A		165

Through and right-turning volumes on the major streets are not converted to passenger cars per hour (pcph) because they are only used in the computation of conflicting traffic volumes which is done in terms of vph.

B. Conflicting Flow - (Figure 4-3) Conflicting flow for right turn from major streets = 700 + 60/2 = 730.

C. Critical Gap - (Table 4-3) Tc = 5.5

D. Potential Capacity - (Figure 4-4) $C_p i = 470$

E. Compute movement capacity by reducing the potential capacity using impedance factors. In the example the reduction is zero because there are no movements which impede the minor street right-turn. Therefore the movement capacity is 470.

F. Calculate shared lane capacity. In the example all vehicles in the egressing lane are turning right so this is not applicable.

TABLE 4-2
PASSENGER-CAR EQUIVALENTS - UNSIGNALIZED INTERSECTIONS

	GRADE (%)				
TYPE OF VEHICLE	-4	-2	0%	+2	+4
Motorcycles	0.3	0.4	0.5	0.6	0.7
Passenger Cars	0.8	0.9	1.0	1.2	1.4
SU/RV's [a]	1.0	1.2	1.5	2.0	3.0
Combination Vehicle	1.2	1.5	2.0	3.0	6.0
All Vehicles [b]	0.9	1.0	1.1	1.4	1.7

[a] Single unit trucks and recreational vehicles
[b] If vehicle composition is unknown, these values may be used as an approximation

There are now two key pieces of data that are needed in the example: the egressing demand volume of 165 and the movement capacity of 425. With this data, we can calculate the MRTD with the use of probability. The goal is to have no more than a 5% probability that the exiting queue would block the first drive aisle. In I.T.E.'s book entitled *Transportation and Traffic Engineering Handbook, Second Edition, 1982*, queuing models are discussed on pages 460 and 461. Using formula

numbers 15.111 and 15.112 on page 461 and shown below, calculate the probability of *n* units, i.e., exiting vehicles, in the system.

$P(0)$	= 1 - (rho)	(formula 15.11)
$P(n)$	= $(\text{rho})^n P(0)$	(formula 15.12)
	= service rate or movement capacity	
	= arrival rate	
rho	=	

Use these two formulas, and the assumption a vehicles is 25 feet long to calculate the MRTD. Continuing the example the following steps are taken:

	= 165 vehicles/hour
	= 425 vehicles/hour
rho	= 165/425 = 0.388

1. The probability of no cars in the queue are 1 - 0.388 = 0.612.

2. The probability of n vehicles will be in the queue is as follows:

	P(x=n)	P(x n)
P(0)	O.612	O.612
P(1)	0.237	0.849
P(2)	0.0921	0.9411
P(3)	0.0357	0.9768

3. There is a 0.98 probability that there will be 3 vehicles or less. The MRTD should be 3 car lengths or 75 feet.

Please note that the example access location did not allow throughs or lefts out. In the event that throughs and/or lefts are permitted at the proposed access location, the traffic study shall evaluate this according to the HCM. If there is more than one lane available for egress, then the lane with the longer queue shall determine the MRTD.

The traffic study shall include all assumptions and computations used to calculate the MRTD.

2. **MRTD for Signalized Access Locations** - At signalized access locations, the movement capacity for egressing vehicles is controlled by signal timing. On page 467 of the above referenced I.T.E. book, there is a formula for calculating what the maximum length of the egressing queue will be. It is formula number 15.144 which says that the maximum queue is equal to the average arrival rate of traffic (i.e., the egressing demand volume) multiplied by the effective red time in seconds.

TABLE 4-3

CRITICAL GAP CRITERIA FOR UNSIGNALIZED INTERSECTIONS

BASIC CRITICAL GAP FOR PASSENGER CARS, SECONDS

VEHICLE MANEUVER AND TYPE OF CONTROL	AVERAGE RUNNING SPEED, MAJOR ROAD 30 MPH		55 MPH	
	NUMBER OF LANES ON MAJOR ROAD 2	4	2	4
RIGHT FROM MINOR ROAD				
STOP	5.5	5.5	6.5	6.5
YIELD	5.0	5.0	5.5	5.5
LEFT FROM MAJOR ROAD	5.5	5.5	5.5	6.0
CROSS MAJOR ROAD				
STOP	6.0	6.5	7.5	8.0
YIELD	5.5	6.0	6.5	7.0
LEFT FROM MINOR ROAD				
STOP	6.5	7.0	8.0	8.5
YIELD	6.0	6.5	7.0	7.5

ADJUSTMENTS AND MODIFICATIONS TO CRITICAL GAP, SECONDS

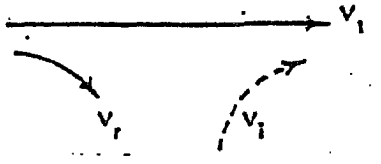
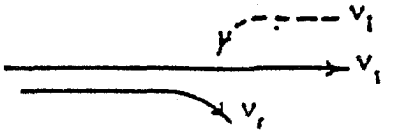
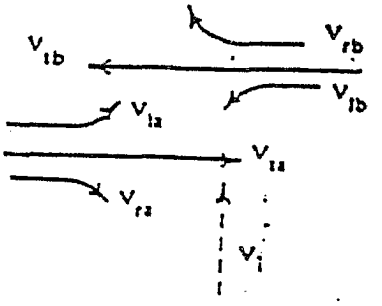
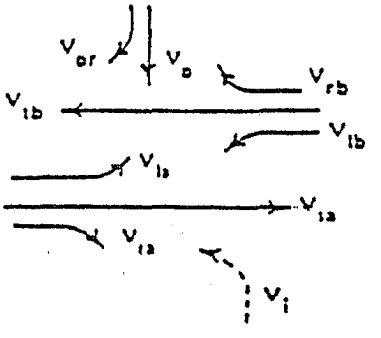
CONDITION		ADJUSTMENT
RIGHT TURN FROM MINOR STREET:	CURB RADIUS > 50 FT OR TURN ANGLE < 60°	-0.5
RIGHT TURN FROM MINOR STREET: ACCELERATION LANE PROVIDED		-1.0
ALL MOVEMENTS: POPULATION ≥ 250,000		-0.5
RESTRICTED SIGHT DISTANCE *		UP TO +1.0

NOTES:

Maximum total decrease in critical gap = 1.0 seconds
Maximum critical gap = 8.5 seconds
Interpolate for values of average running speed between 30 and 55 mph
* This adjustment is made for the specific movement impacted by the restricted sight distance

FIGURE 4-3

DEFINITION AND COMPUTATION OF CONFLICTING TRAFFIC VOLUMES

SUBJECT MOVEMENT	CONFLICTING TRAFFIC, Vci	ILLUSTRATION
1. RIGHT TURN from minor street	$1/2(V_l) + V_t$ see note 1,2	
2. LEFT TURN from major street	$V_r + V_t$ see note 3	
3. THROUGH MOVEMENT from minor street	$1/2(V_{ra}) + V_{la} + V_{la} + V_{rb} + V_{lb} + V_{lb}$ see note 2,3	
4. LEFT TURN from minor street	$1/2(V_{ra}) + V_{la} + V_{la} + V_{rb} + V_{lb} + V_{lb} + V_o + V_{or}$ see note 2,3	

NOTE 1: Vt includes only the volume in the right lane.

NOTE 2: Where a right turn lane is provided on the major street, eliminate V_r or V_{ra}.

NOTE 3: Where the right turn radius into the minor street is large and/or where these movements are STOP/YIELD control, eliminate V_r (Case 2), and V_{ra} and/or V_{rb} (Case 4). V_{rb} may also be eliminated on multilane major streets.

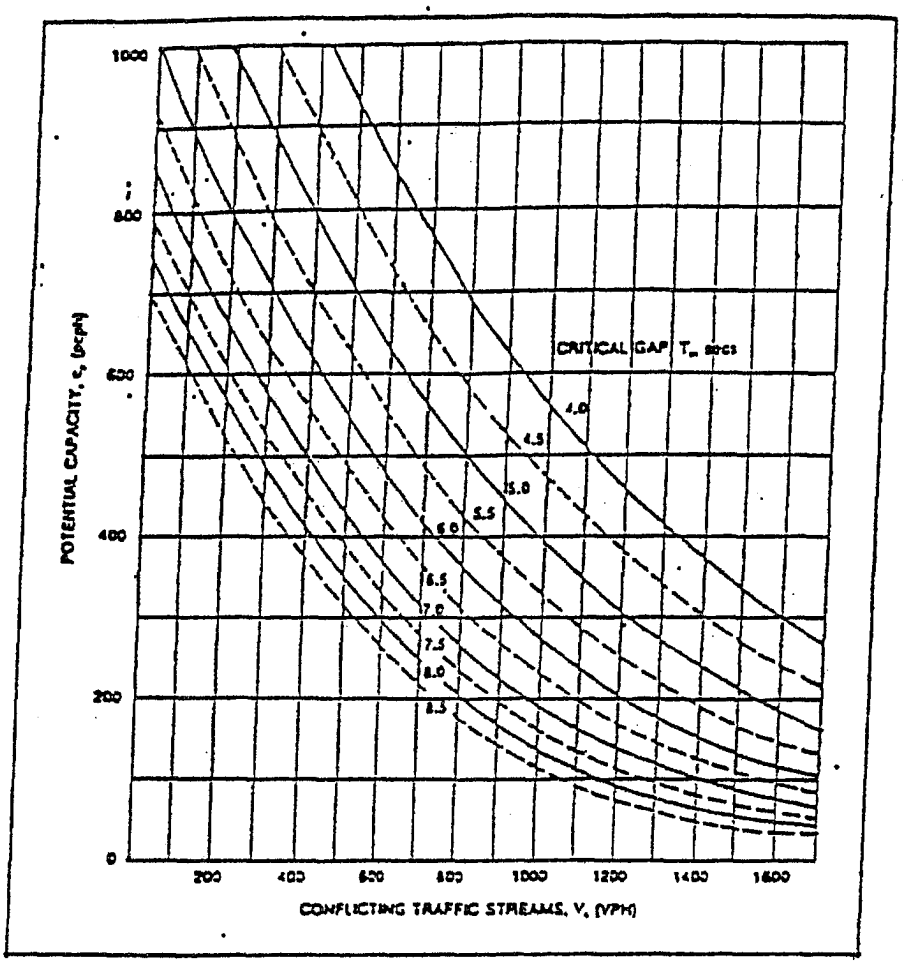


FIGURE 4-4

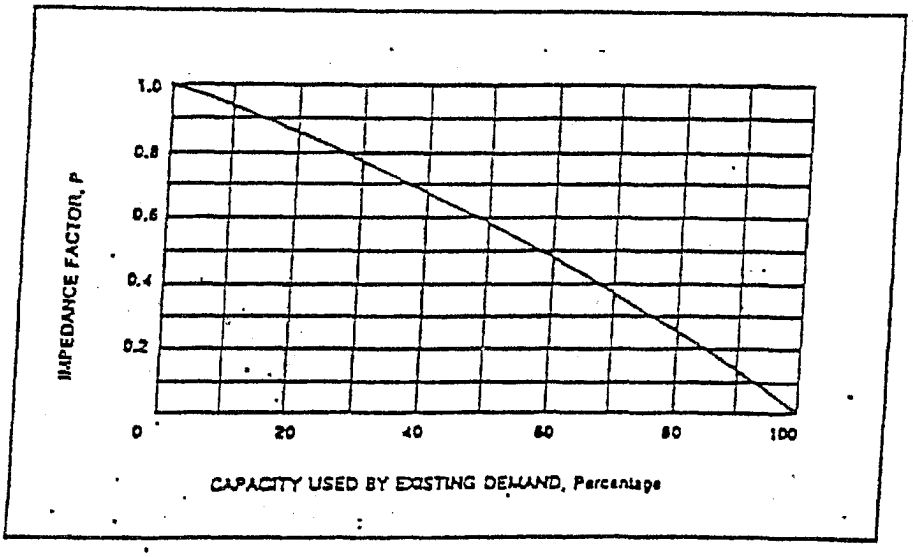


FIGURE 4-5

Obviously, signal timing parameters such as cycle length and split will directly affect the length of the egressing queue. This is where Chapter 9 of the HCM comes into play. The consultant can use the Operational Analysis methodology to determine reasonable signal timing parameters. The goal of the calculations will be to maintain LOS "C" for all movements on the main road. For main road traffic volumes, the consultant shall use projected future traffic volumes as calculated by the latest citywide traffic model. For existing traffic signals, the consultant is recommended to discuss likely signal timing parameters with City staff. There may be some restrictions to signal timing parameters for existing signals due to progression, etc. Once an effective red time is calculated for the egressing traffic, the maximum length of the egressing queue can be calculated. The MRTD shall be this length rounded up to the nearest division of 25 feet.

Typically, signalized access locations will have more than one approach lane for egressing vehicles. As in the case with unsignalized access locations, the lane with the longer queue will determine the MRTD. In addition, the traffic study shall include all assumptions and computations used to calculate the MRTD.

In addition to MRTD requirements, the traffic study shall evaluate vehicle storage requirements for "drive-thru" type services. The goal here is to provide enough vehicle stacking distance to ensure vehicles will not queue out into the public right-of-way. Listed in Table 4-4 are various types of drive-thru facilities and their respective stacking requirements. The distance is measured from the back of sidewalk at the street driveway to the service point. One space equals 25 feet.

TABLE 4-4

TYPE OF FACILITY	VEHICLE STORAGE
Drive-thru bank window[1]	10 spaces
Drive-thru restaurant[2]	10 spaces
Drive-thru pharmacy[2]	3 spaces
Automatic car wash	10 spaces
Self-service car wash	3 spaces
Drive-in theater	15% of parking capacity
Hospital[3]	1% of parking capacity
Service station	4 spaces
Drive-thru liquor store[2]	3 spaces
Drive-thru dry cleaners[2]	3 spaces
Self-storage mini warehouse[4]	2 spaces

1 Reduce to 3 spaces for savings and loan institutions and credit unions.
2 Measured to pick-up window.
3 At the main entrance to the hospital.
4 Measured to gate.

I. **Traffic Signals/Stop Signs** - The need for new traffic signals and stop signs shall be based on warrants contained in the latest edition of the State Traffic Manual.

If a new traffic signal is being proposed which is not already a part of the City's Capital

Improvement Program, and the signal installation would result in less than 1320 feet between signals, then the study shall include a signal progression analysis. The section of roadway to be analyzed for signal progression shall be determined by the Public Works Department and will include all existing and possible future signalized intersections.

The progression pattern calculations shall use a cycle consistent with current signal timing policies of the City. A desirable bandwidth of 50 percent of the signal cycle shall be used where existing conditions allow. Where intersections have no signals presently, but are expected to have signals, typically a 60 percent mainline, 40 percent cross street cycle split should be assumed. Cycle split assumptions shall relate to volume assumptions in the capacity analysis of individual intersections, and, where computerized progression analysis techniques are used, they shall be of the type which utilize turning movement volume data and pedestrian clearance times in the development of time/space diagrams.

The green time allocated to the cross street will be considered no less than the time which is required for a pedestrian to clear the main street using the Federal Highway Administration (FHWA) Manual on Uniform Traffic Control Devices standards.

Those intersections which would reduce the optimum bandwidth if a traffic signal were installed may be required to remain unsignalized and have turning movements limited by access design or median islands.

All site access driveways not controlled by traffic signals shall have a stop sign installed on the driveway.

J. **Traffic Accidents** - Traffic accident data for affected street corridors may be required in the study as required by the City. The study period will normally be three years. The locations shall be specified by the Public Works Department. Accident data is on file in the Public Works Department. It shall be the consultant's responsibility to make copies of this data.

Estimates of increased or decreased accident potential shall be evaluated for the development, particularly if the proposed development might impact existing traffic safety problems in the study area. Safety improvements shall be recommended where necessary.

K. **Executive Summary** - The Executive Summary of the report shall be a clear, concise description of the study findings. It shall include a general description of all data, project scope and purpose, findings, conclusions, and mitigation measures and recommendations. Technical publications and calculations, documentation, data reporting and detail design shall not be included in the executive summary. The executive summary should be short, complete in itself and not dependent on supplementary data included by reference. The applicant shall satisfy any mitigation measures and/or design elements identified in the traffic study as being needed or recommended for the project.

SECTION 5

SITE ACCESS

This section establishes requirements for site access and driveway locations.

5-1 **GENERAL** – Driveways shall meet sight distance requirements as discussed in Section 7-12 of this manual for both ingressing and egressing movements. Driveway width, type and design shall conform to Section 7-14 of this manual.

Backing of vehicles out of driveways onto the roadway shall only be permitted for single family residential or duplex land uses. Other land uses shall be designed so both ingressing and egressing vehicles are traveling forward.

Driveways shall be located to provide at least 5 feet between the driveway's traveled way and appurtenances such as fire hydrants, poles, and drop inlets.

The City recognizes that infill projects (projects within older, previously developed areas) may have certain constraints such as lot size, existing driveways near the property line on adjacent parcels, etc. which may deem it impractical to achieve the requirements contained in this manual for site access. Infill projects such as these will be evaluated on a case-by-case basis by the City. However, the goal will be to achieve the requirements contained herein to the extent practicable.

NOTE: Distances discussed below are measured to driveway centerlines. Where distances refer to an intersection, the intersection's point of reference is the near curb return nearest to the driveway.

5-2 **DRIVEWAY LOCATIONS ON MINOR AND PRIMARY RESIDENTIAL STREETS** – For single family residential or duplex, the following shall apply:

A. Driveways shall be at least 10 feet apart as measured edge to edge, except in cul-de-sac bulbs and the outside portion of elbows, where the minimum shall be 5 feet. For corner parcels, the driveway shall front whichever street is projected to have a lower traffic volume, and the driveway shall be located as far from the curb return as possible, i.e., at the far side of the lot.

Where the residential street intersects a collector or arterial street, the roadways shall be designed such that no driveways occur within 100 feet of said intersection. This may be accomplished by designing a minor residential street parallel to the collector or arterial street and providing access to the lots via said minor residential street. In cases where this is not possible, there shall be no driveways on the residential street within 50 feet of said intersection.

For land uses other than single family residential or duplex, the following shall apply:

B. Driveways shall be at least 100 feet apart. There shall be no driveways within 100 feet of an intersection. Where residential streets intersect collector or arterial streets, there shall be no driveways on the residential street within 150 feet of said intersection unless otherwise approved by the City Engineer.

5-3 **DRIVEWAY LOCATIONS ON COLLECTOR OR ARTERIAL STREETS** – There shall be no driveways along collector or arterial streets serving single family residential or duplex land uses.

Driveways fronting roadways which have been classified in the General Plan as expressways shall be at least 500 feet apart, shall be right-turn-in, right-turn-out only, and shall have a standard right turn deceleration lane. No portion of a driveway shall be allowed within the straight portion of an acceleration or deceleration lane; however, driveways are permitted within acceleration and deceleration lane tapers. No portion of a driveway shall be allowed within a separate bus turnout, including its tapers.

Driveways shall be at least 200 feet apart on collector streets and at least 250 feet apart on arterial streets. Driveways shall be at least 150 feet from an intersection on collector streets.

5-4 **NUMBER OF DRIVEWAYS SERVING A PARCEL OR SITE** – For single family residential or duplex land uses, only one driveway per parcel will be permitted, except where circular drives are proposed and approved by the City Engineer.

For other land uses, the number of driveways shall be minimized, but not to a point that could cause local congestion within the public right-of-way. Consolidation of driveways with adjacent parcels shall occur whenever possible. Where driveway location standards cannot be met for a parcel, the City may require the only access to that parcel be achieved via cross access over an adjacent parcel. This shall satisfy legal requirements for access to a parcel, and the City, therefore, shall not be required to permit direct access to any parcel via a driveway along the parcel's frontage.

Where land uses other than single family residential or duplex are adjacent, the City typically requires cross access to minimize motorists having to use the street to get from one development to another.

For projects requiring a traffic study, the study shall evaluate the proposed site access for the project (see Section 4-2 (H), "Site Access"). The study shall discuss balancing the number of driveways for the project so the number of driveways is minimized, while still providing a sufficient number of access points to minimize congestion and delay.

5-5 **RIGHT TURN DECELERATION/ACCELERATION LANES FOR DRIVEWAYS** – A right turn deceleration lane shall be provided for a driveway if all of the following conditions are met:

A. The driveway is located on an arterial or expressway.

B. Right turn ingress volume is expected to exceed fifty vehicles during peak hour flows on the roadway. For right turn ingress volumes between ten and fifty vehicles, a right turn curb taper shall be constructed in conformance with the Standard Drawings.

C. There is ample room and frontage to fit a deceleration lane as determined by the City Engineer.

D. The travel speed of the roadway, as determined by the City Engineer, equals or exceeds 45 mph.

There may be cases where some of the above criteria are not met, but City staff may still require a deceleration lane in the interest of safety.

There may be cases where it will be necessary to merge a deceleration lane with an existing acceleration lane. Where the beginning of a deceleration taper will be within 100 feet of the end of an acceleration taper, then the deceleration and acceleration shall be merged to form a continuous auxiliary lane.

There may be cases where it is desirable to provide room for right turn deceleration, but an entirely separate deceleration lane is either too difficult to install, due to design constraints, or is

not reasonable. In these cases, a right turn curb taper shall be provided in accordance with the Standard Drawings.

Right turn acceleration lanes for driveways shall not be provided.

5-6 **LEFT TURN DECELERATION/ACCELERATION LANES FOR DRIVEWAYS** – Left turn deceleration lanes (left turn pockets) are not required on collector or residential streets.

On arterials and expressways and where left turns will be permitted, a left turn deceleration lane shall be provided. This may be in the form of a separate left turn pocket on a six-lane road, or a continuous two-way-left-turn-lane on a four-lane road. The minimum left turn pocket length shall be 200 feet plus a 120 foot entry taper. Longer left turn pockets may be required if a traffic study demonstrates the need.

Separate left turn acceleration lanes may be required by the City Engineer for traffic safety.

5-7 **MINIMUM OFFSET FOR OPPOSING DRIVEWAYS** – For land uses other than single family residential or residential duplex, the centerline of driveways on opposite sides of the street shall either be direct line or have a minimum offset distance as listed below (measured from the centerline of the driveways):

A. For driveways on minor and primary residential streets, the minimum offset shall be 150 feet.

B. For driveways on collectors, the minimum offset shall be 250 feet.

C. For driveways on arterials and expressways, the minimum offset shall be as approved by the City Engineer.

Where a raised median is provided along the center of the street separating conflicting turning movements, the offset requirements as stated above will not apply.

5-8 **RESTRICTED TURNING MOVEMENTS FOR DRIVEWAYS** – Turning movement restrictions shall apply to unsignalized driveways on arterial and expressway streets as listed below:

A. Left turns out of driveways onto six-lane roads shall be prohibited.

B. On six-lane roads, driveways within 400 feet of an intersection containing left turn pockets shall be right turn in, right turn out only. No driveways will be permitted in the bus turnout or deceleration/right turn lane without consent of City Engineer.

C. On six-lane roads, left turns into driveways may be allowed if all of the following conditions are met:

1. The standard left turn lane length and bay taper can be achieved.

2. Opposing traffic will not queue to the point of blocking the left turn in movement. Such a queuing calculation shall be provided by the consultant preparing the traffic study for the project, and the analysis shall use the City's projected modeled traffic volumes for the model's horizon year.

3. The driveway is at least 400 feet downstream and 600 feet upstream of an intersection containing left turn pockets.

D. Turning movements may be restricted for any driveway where deemed necessary by the City Engineer because of safety concerns.

5-9 **SIGNALIZED DRIVEWAYS** – The need for traffic signals at driveways shall be based on warrants contained in the latest edition of the Caltrans Traffic Manual. Any such evaluation shall be performed by the consultant as a part of the traffic study for the project.

For a more detailed description of a traffic signal needs assessment, refer to Section 4-2(I) in that section. The City will typically deny a request for a new signal if spacing requirements cannot be met.

Attention is also directed to Section 4-2(H) for minimum required throat depth (MRTD) for signalized access locations.

The City does not share in the cost of design and construction of traffic signals which solely serve private property (i.e. a "tee" intersection where the driveway is situated as the "stem" of the "tee"). The developer shall bear all costs of providing signalization at the private access point, including design and construction. In the case where a private access point comprises the fourth leg of an intersection where the other three legs are public streets, the developer shall ultimately be 100% financially responsible for the private leg (or approximately one-fourth the cost of signalizing the intersection). This obligation is in addition to sharing in the cost of the remaining signal via payment of the City's Traffic Mitigation Fee (if applicable).

See Section 6 of this manual for more information on traffic signals.

5-10 **MINIMUM REQUIRED THROAT DEPTH** – Driveway shall meet the minimum required throat depth (MRTD) requirements as discussed in Section 4-2(H) of this manual. In the case of "drive-thru" facilities, attention is directed to the latter part of Section 4-2(H) for minimum on-site storage distances for ingressing vehicles.

On-site parking shall not be permitted within the MRTD area. The MRTD requirement does not apply to single family residential or duplex land uses.

In cases where a traffic study is not required, or in cases where there is insufficient data available to calculate the MRTD in accordance with Section 4-2(H), Table 5-1 shall be used to determine minimum required throat depth for access points for a site. In cases where a traffic study will be provided, but the access points have not yet been determined for a site, Table 5-1 shall be used to estimate the MRTD during the site design process. In these cases, the final MRTD requirements shall be determined by the traffic study via the methodology in Section 4-2(H). The distances shown in Table 5-1 chart represent vehicle storage equivalents, which means the total required distance may be achieved by summing the throat depths for several access points if more than one access point is to serve the site. In these cases, the distance shown in Table 5-1 shall be prorated to each access point to the nearest 25 feet based on the estimated relative percent usage of each access point.

TABLE 5-1
MINIMUM THROAT DEPTH

LAND USE	SIZE			STREET RIGHT-OF-WAY <60'	60'	>60'
Apartment, Condos,	0	-	80 units	25'	50'	50'
Mobile Homes,	81	-	160 units	50'	50'	50'
Planned Unit Development		>	160 units	50'	50'	100'
Quality Restaurant	0	-	15,000 SF	25'	25'	25'
		>	15,000	25'	25'	50'
High Turnover/Sit Down Restaurant	0	-	8,000 SF	25'	25'	25'
Drive-Thru Restaurant	0	-	2,000 SF	25'	25'	25'
	2,001	-	3,000	25'	50'	100'
	3,001	-	5,000	50'	75'	150'
		>	5,000	75'	100'	225'
Motel	0	-	150 rooms	25'	25'	25'
	151	-	400	25'	75'	125'
		>	400	25'	125'	175'
Convention Hotel	0	-	150 rooms	50'	50'	100'
	151	-	400	50'	150'	250'
		>	400	50'	250'	350'
Office Park	0	-	20,000 SF	25'	25'	25'
	20,001	-	50,000	25'	50'	75'
	50,001	-	100,000	25'	75'	175'
	100,001	-	150,000	75'	125'	250'
	150,001	-	300,000	125'	250'	500'
		>	300,000	200'	400'	825'
General Office	0	-	50,000 SF	25'	25'	50'
	50,001	-	100,000	25'	50'	100'
	100,001	-	150,000	50'	75'	175'
	150,001	-	200,000	50'	100'	225'
	200,001	-	300,000	75'	175'	350'
	300,001	-	400,000	125'	225'	450'
		>	400,000	150'	275'	575'

TABLE 5-1 (continued)
MINIMUM THROAT DEPTH

LAND USE	SIZE			STREET RIGHT-OF-WAY <60'	60'	>60'
Light Industrial	0	-	100,000 SF	25'	25'	50'
	100,001	-	200,000	25'	50'	100'
	200,001	-	300,000	50'	75'	150'
	300,001	-	400,000	50'	100'	200'
		>	400,000	75'	125'	250'
Industrial Park	0	-	500,000 SF	25'	25'	50'
Discount Store	0	-	30,000 SF	25'	25'	25'
	30,001	-	50,000	25'	50'	75'
	50,001	-	75,000	25'	50'	125'
		>	75,000	50'	75'	175'
Shopping Center	0	-	10,000 SF	25'	25'	50'
	10,001	-	20,000	25'	50'	125'
	20,001	-	30,000	50'	100'	175'
	30,001	-	40,000	75'	125'	225'
	40,001	-	100,000	75'	150'	250'
	100,001	-	150,000	100'	175'	375'
	150,001	-	200,000	125'	250'	500'
	200,001	-	250,000	150'	300'	625'
	250,001	-	600,000	175'	375'	750'
	600,001	-	700,000	200'	375'	750'
	700,001	-	800,000	225'	425'	875'
	800,001	-	900,000	250'	500'	975'
	900,001	-	1 million	275'	550'	1075'
		>	1 million	425'	825'	1625'
Drive-In Bank	0	-	10,000 SF	25'	25'	50'
	10,001	-	20,000	50'	50'	200'
	20,001	-	30,000	75'	150'	300'
	30,001	-	40,000	100'	200'	400'
		>	40,000	150'	250'	500'
Supermarket	0	-	20,000 SF	25'	25'	50'
	20,001	-	30,000	25'	50'	75'
	30,001	-	40,000	25'	50'	100'
		>	40,000	25'	75'	150'
Medical Clinic	0	-	100 employees	25'	25'	50'

SECTION 6

TRAFFIC SIGNALS

6-1 **TRAFFIC SIGNAL NEEDS ASSESSMENT** - The need for new traffic signals shall be based on warrants contained in the latest edition of the State Traffic Manual. For a more detailed description of a traffic signal needs assessment, refer to Section 4-2I of this manual.

6-2 **DESIGN STANDARDS** - Traffic signals shall be designed in accordance with this manual and the latest editions of the following:

* State Standard Specifications and State Standard Plans, including all standard symbols contained therein.

* Manual on Uniform Traffic Control Devices.

* State Traffic Manual, Chapter 9. Attention is directed to the following:

  1. Table 9-1 for advanced loop detector setbacks.

  2. Section 9-10.3 for luminaire illumination requirements (minimum .15 footcandles for crosswalks, minimum .6 footcandles for middle of intersection).

  3. Tables 9-8 and 9-9 for conduit sizing. The 26% fill limit shall apply.

A. **Signal Standard Types** - Traffic signal standards, posts, and mast arms shall be of the types listed in Table 6-1:

TABLE 6-1

STANDARD/POST	MAST ARM	LUMINAIRE ARM
Ped. Push Button	none	none
7 foot 1-B	none	none
10 foot 1-B	none	none
Type 15	none	6-15 foot
16-2-70	20 foot	none
17-3-70	20 foot	6-15 foot
18-4-70	25-30 foot	none
19-4-70	25-30 foot	6-15 foot
23-4-70	35 foot	none
24-4-70	35 foot	6-15 foot
26-4-70	40-45 foot	6-15 foot
27-4-70	40-45 foot	none
28-5-70	50-55 foot	none
29-5-70	50-55 foot	6-15 foot

The typical luminaire arm length used is 15 feet.

B. **Vehicle and Pedestrian Signal Types** - Vehicle signals and pedestrian signals shall be of the following types:

MAT (3 section only)
MAS
SV-1-T
SV-2-TA
SV-3-TA
TV-1-T
TV-2-T
TV-3-T
SP-1-CS
SP-2-CS
TP-1
TP-2-T

The MAT mounting shall only be used for 3 section vehicle signals for protected left turn movements. All other mast arm mounted vehicle signals shall be MAS mounted.

All left turn lanes shall be provided with a protected left turn phase.

Protected left turn signals shall be all arrow.

Programmed visibility vehicle signals shall not be used without prior approval of the City Engineer.

C. **Vehicle Signal Alignment** - The following signal head alignments are typical. Variations may be required on a case by case basis.

1. For single left turn lanes, 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, the left turn signal shall line up with 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 State Standard Plans.

4. For one through lane with permissive left turn (no left turn lane), 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 (no left turn lane), the MAS signal shall line up with the center of the #1 through 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.

D. **Number of Vehicle Signal Indications** - Typical indications are as follows:

1. For protected left turn movements: one 3-section all arrow MAT and one 3-section all arrow far left side pole-mounted signal.

2. 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.

3. 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.

4. For split phased situations: one 4-section MAS (w/GA), one 4-section far left side pole-mounted signal (w/GA), one 3-section far right side pole-mounted signal, and one 3-section near right side pole-mounted signal.

5. 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. Right turn arrow overlaps shall not be provided without prior approval of the City Engineer.

E. **Vehicle Detector Layout and Inputs -** Typical vehicle detector layout and inputs shall be as follows:

1. For permissive left turn situations, the left most through lane shall have four loops spaced 10 feet apart. The loop farthest from the stop bar shall have counting ability. The other three loops can share one input.

2. For protected left turn situations, each left turn lane shall have three loops spaced 10 feet apart and one intermediate loop with counting ability placed the same distance from the stop bar as the intermediate loops for the through lanes.

3. Each through lane shall have two call loops spaced 10 feet apart, one intermediate loop with counting ability placed 40% of the distance from the stop bar to the advanced loop, and one advanced loop placed per State Traffic Manual Table 9-1.

4. Each right turn only lane shall have two loops spaced 10 feet apart. The loop farthest from the stop bar shall have counting ability. Detection in the right turn only lane shall have a 20 second delay.

5. For the geometric minor leg of a "tee" intersection where approaching vehicles must turn left or right, each left turn lane shall have four loops spaced 10 feet apart. The loop farthest from the stop bar shall have counting ability. The other three loops can share one input. No intermediate or advanced loops will be required.

The loop nearest the stop bar shall be Type Q and shall be placed 1 foot from the stop bar. Where a loop is designated to have counting ability as discussed above, the loop shall not share an input with any other loop.

Detector handholes shall be provided. Handholes shall be placed so they line up with roadway stripes to minimize the frequency of vehicle tires driving over the handhole covers.

F. **Protected vs. Permissive Left Turn Phasing -** Protected left turn phasing should be provided under the following conditions:

1. 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 9-01.3 of the State Traffic Manual (e.g., accidents, delay, volume, and misc.).

2. Where left turn lanes 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 the left turn lane cannot be extended.

Protected/Permissive phasing, as discussed in Section 9-03.8 of the Traffic Manual, is not used in Lincoln.

G. **Traffic Signal Interconnect** - 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 not share conduit with service conductors, but may share conduit with signal conductors and lead-in cable.

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.

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.

H. **Traffic Signs for Signals** - Pertinent traffic signs shall be specified with the signal design. Typical signs include mast arm mounted street name signs, R-73 mast arm mounted signs, R34-2 mast arm mounted signs, R-49 signs (where crossing the street is permitted at only one location via crosswalk), R-96 signs (where crossing the street is completely prohibited), W41 roadside signs (and pavement markings) where visibility of the signal is limited or where the signal may be unexpected by motorists, and R61 roadside signs on the geometric minor leg approach of a "tee" intersection.

All mast arm mounted or signal standard mounted G-7 signs shall have a white border per Caltrans Standard Specifications.

In the case of R73 mast arm mounted signs, a common question is whether or not to allow u-turns. This determination is a function of whether or not there is sufficient room for turning radius. The guideline the City uses to allow u-turns is there needs to be at least 36 feet between the left side of the vehicle in the left turn lane and the curb to the far left of said vehicle.

6-3 **PREPARATION OF PLANS** - Traffic signal plan sheets shall conform to the provisions of Sections 2 and 3 of this manual, including submittal requirements, Autocad files, etc. Traffic signal plans shall have a title sheet followed by a signal and lighting 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 of readability.

A. **Title Sheet** - The title sheet shall include the following:

1. Title of project, which shall include the location.

2. A vicinity map with north arrow. The location map is not required to be to scale.

3. Pertinent signature blocks, and revision block.

4. A legend for symbols not found in the Standard Plans (e.g., utility lines, etc.). Below the legend, place the following note: NOTE: SEE STATE STANDARD PLANS ES-1A AND ES-1B FOR EXPLANATION OF OTHER SYMBOLS.

5. A service equipment schedule and wiring diagram with legend.

The following General Notes:

1. All work shall conform to the Lincoln Public Facilities Improvement Standards and State Standard Specifications.

2. No lane closures are permitted between 3:30 pm and 9:00 am. Traffic control shall be per State Manual of Traffic Controls for Construction and Maintenance Work Zones.

3. The Contractor shall be responsible for verification of all existing underground utilities, whether or not they are shown on these plans. The contractor shall contact U.S.A. and have utilities marked at least 48 hours before beginning work. Where markings are near proposed foundations, the contractor shall locate underground utilities by pot holing prior to excavating.

4. Locations of signal standards, controller, and service pedestal as shown on these plans are approximate. Actual location shall be determined by the Consulting Engineer in the field, with approval of the City Engineer.

5. The contractor shall provide and install all equipment and materials necessary for the signal to operate as shown in the phase diagram.

B. **Signal and Lighting Sheet** - The signal and lighting sheet shall be drawn at a scale of 1 inch equals 20 feet, and shall include the following:

1. A north arrow.

2. 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, P.U.E.'s, 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.

3. Pole and equipment schedule.

4. Conductor and conduit schedule. The schedule shall include rows showing "percent fill" values, and conduit quantity/size.

5. Complete traffic signal design, including but not limited to, the following: conduit runs, detector loops (with input designations), detector handholes, vehicle and pedestrian signals (with phase designation), luminaires, pedestrian pushbuttons (with phase designation), controller, service pedestal, service point, emergency vehicle detectors, signing, striping, and interconnect.

6. Phasing diagram. Designate type of flashing operation below the phasing diagram.

7. Phasing for emergency vehicle preemption. Typically, protected left turn phases are combined with the concurrent through movement during EV preemption.

SECTION 7

STREETS

7-1 <u>STREET CLASSES AND DESIGN WIDTHS</u> - For purposes of geometric and structural design, streets shall be classified according to the following requirements, the appropriate Standard Drawings, and Table 7-1.

A. **20-Foot Street (Alley)** - A street depressed in the center with a right of way and surface width of 20 feet. Alleys are not permitted unless specifically approved by the City Council. *STD DWG H-26*

B. **Minor Residential** - A street with known beginning and ending points servicing 100 or fewer lots shall be classified as a minor residential street. Minor residential streets shall have a right of way width of 44 feet and a back-of-curb to back-of-curb width of 36 feet unless approved otherwise by Planning Commission or Council action. *STD DWG H-10*

C. **Primary Residential** - A residential street servicing more than 100 lots, but no more than 500 lots, or along which schools or parks are proposed to front shall be classified as a primary residential street. Primary residential streets shall have a right of way width of 50 feet and a back-of-curb to back-of-curb width of 42 feet. *STD DWG H-10*

D. **Collector/Industrial** - A street servicing an industrial/commercial subdivision or a residential subdivision along which no home frontage is allowed shall be classified as a collector/industrial street. Collector/industrial streets shall have a right of way width of 56 feet for residential and 60 feet for commercial/industrial and back-of-curb to back-of-curb width of 48 feet. Additional right of way and pavement shall be provided at intersections for acceleration, deceleration, bus turnouts, and turn lanes, as specified by the City Engineer. *STD DWG H-11*

E. **Minor Arterial** - Those roads specified in the City's Capital Improvement Program as requiring a four lane roadway shall be classified as minor arterials. Minor arterials shall have a right of way width of 82 feet with right of way at back of curb. Additional right of way and pavement may be required for bus turnouts and at intersections and driveways for acceleration lanes, deceleration lanes, and dual left turn lanes, as specified by the City Engineer. Additional right of way shall also be provided if sidewalks are not included in a landscape/pedestrian easement adjacent to the back of curb. *STD DWG H-11*

F. **Major Arterial** - Those roads specified in the City's Capital Improvement Program as requiring a six lane roadway shall be classified as major arterials. Major arterials shall have a right of way width of 106 feet with right of way at back of curb. Additional right of way and pavement may be required for bus turnouts and at intersections and driveways for acceleration lanes, deceleration lanes, and dual left turn lanes, as specified by the City Engineer. Additional right of way shall also be provided if sidewalks are not included in a landscape/pedestrian easement adjacent to the back of curb. *STD DWG H-12*

G. **Special Thoroughfare** – Those roads specified in the City's Capital Improvement Program requiring eight lanes shall be classified as Special thoroughfares. Special thoroughfares shall have a right of way width of 130 feet with right of way at the back of curb. Additional right of way and pavement may be required for bus turnouts and at intersections and driveways for acceleration lanes, deceleration lanes, and dual left turn lanes, as specified by the City Engineer. Additional right of way shall also be provided if sidewalks are included in a landscape/pedestrian easement adjacent to the back of curb. *STD DWG H-12*

TABLE 7-1
STREET GEOMETRIC REQUIREMENTS

CLASS	RIGHT OF WAY WIDTH	BACK TO BACK OF CURB WIDTH	RADIUS OF CURB RETURN @ RIGHT OF WAY	RADIUS OF CURB RETURN @ BACK OF CURB	NUMBER OF TRAVEL LANES	MINIMUM CENTERLINE RADIUS FOR HORIZONTAL CURVE
Minor Residential	44 feet	36 feet	Residential 22 feet	26 feet	2	250 feet
Primary Residential	50 feet	42 feet	Residential 22 feet	26 feet	2	300 feet
Collector/ Industrial	56*/60 feet	48 feet	Collector/Industrial 26 feet	31 feet	2	500 feet
Minor Arterial	82 feet**	82 feet**	Residential 31 feet Collector/Industrial 31 feet	31 feet 31 feet	4***	1,000 feet
Major Arterial	106 feet**	106 feet**	Arterial w/o Accel Lane 50 feet Arterial w/Accel Lane 62 feet	50 feet 62 feet	6***	2,000 feet
Special Thoroughfare	130 feet**	130 feet**			8***	2,500 feet

Note* 60 feet for commercial/industrial to allow for 6 foot sidewalk.
Note** At intersections, additional right of way and pavement may be required. See the Standard Drawings for requirements at intersections.
Note*** Where fewer than the ultimate number of lanes are to be initially constructed and additional lanes are to be constructed with Traffic Mitigation Fees at some future date; curb and gutter shall be placed at its ultimate location and an extra wide raised median provided.

H. **Cul-de-Sac** - The length of cul-de-sac streets shall not exceed 500 feet, measured from the center of the bulb to the centerline of the intersecting street, unless a secondary emergency vehicle access is provided to the rear of the cul-de-sac bulb area, in which case the length of the cul-de-sac may be increased to 1000 feet with the approval of the City Engineer. In the case of stub streets associated with phased development, the combined street lengths as measured from the dead end to the nearest through street shall be in accordance with the requirements for cul-de-sacs. The street shall be terminated with a bulb conforming to the Standard Drawing unless the street is proposed for future extension as determined by the City Engineer. A barricade conforming to the Standard Drawings shall be installed at the end of all streets that are proposed for future extension. *STD DWG H-7, H9, H-17*

I. **Partial Streets** - At the discretion of the City Engineer, partial streets may be permitted along the boundary of a subdivision or other private development where the full right of way width cannot be dedicated. For collector and arterial streets, the developer shall, as a minimum, dedicate sufficient right of way and construct 32 feet width of pavement with full frontage improvements along the developing property and a two foot wide gravel shoulder on the opposite side. Street centerline shall be placed at the ultimate location if possible. Partial streets will not be permitted for residential streets.

J. **Private Streets** - Private streets shall be designed to the same structural and geometric requirements as those for public streets except that street widths may be decreased by eliminating on street parking if sufficient off-street parking is provided and sidewalks eliminated if alternative pedestrian walkways are provided, subject to approval of the City Council.

7-2 **RIGHT-OF-WAY WIDTH** - Right of way widths shall be in accordance with these standards for the street classification under consideration (see Table 7-1) or as determined by the City Engineer. In no instance, without approval of the City Engineer, shall a street have a right of way width that is less than the street of which it is a continuation. Right of way requirements for widening at intersections shall be as specified by the City Engineer.

Building setbacks, landscaping requirements, and parking requirements shall be based on the ultimate right of way regardless of the location of existing public street improvements.

A minimum 12.5-foot public utility easement (P.U.E.) shall be dedicated adjacent to all public and private streets. Additional easements for sewer, water, storm drainage, signage, sidewalks, landscaping, fencing and all other public utilities shall be provided as required by the utility companies, this manual, and as specified by the City Engineer.

7-3 **BLOCK SIZE** - Blocks shall be designed to allow for adequate building sites for the type of uses proposed. Blocks shall allow for convenient pedestrian and vehicular circulation, access, traffic control, and safety. Block length shall not exceed 1400 feet nor be less than 500 feet.

7-4 **STRUCTURAL SECTION** - All roads, both public and private, to be constructed within the City shall be asphalt concrete (AC) over aggregate base (AB) and, if necessary, aggregate sub-base (AS). Asphalt concrete shall be Type B as specified in Caltrans Standard Specifications.

All pavement sections shall be designed on the basis of the resistance R-value as determined in accordance with the State of California, Department of Transportation, design method and appropriate traffic indices (TI). If the subgrade has an "R" value of 15 or less, a geotextile fabric shall be installed on subgrade prior to placement of AB or AS material. In addition, the City Engineer may require the installation of edge drains in soils where the "R" value of the subgrade is 10 or less.

Minimum TI values shall be as specified in Table 7-2 or as approved by the City Engineer. The minimum structural section is based on an R value of 50 for the given TI values. Design TI and structural section shall be based on project specific information.

TABLE 7-2

STREET CLASSIFICATION	MINIMUM TRAFFIC INDEX	MINIMUM STRUCTURAL SECTION (assumes R=50)		
		AC	AB	AS
MINOR RESIDENTIAL	6.0	3"	6"	
PRIMARY RESIDENTIAL	6.5	3"	6"	
COLLECTOR	7.5	3"	8"	
INDUSTRIAL/COMMERCIAL	8.0	3"	6"	6"
MINOR ARTERIAL	9.0	4"	6"	6"
MAJOR ARTERIAL	10.0	4"	6"	8"
ARTERIAL (TRUCK ROUTE)	11.0	6"	6	10"

A. **On-site Structural Sections** - On-site pavement sections shall be designed by a registered Geotechnical Engineer. The minimum longitudinal slope shall be 1 percent. Written certification of pavement grade by a licensed Civil Engineer or Surveyor and certification of the structural section and compaction by a Geotechnical Engineer shall be required prior to the issuance of a Certificate of Occupancy. The Geotechnical Engineer shall be on-site to monitor parking lot grading and to certify compaction, thickness of the base, and placement of the asphalt. The minimum structural section shall be 3" AC on 6" AB.

7-5 **CURB AND GUTTER REQUIREMENTS** - Curb and/or gutter are required adjacent to all public streets. All curb and gutter shall be portland cement concrete, Class "A", six sack and shall conform to the Standard Drawings.

A. **Type 1 Curb and Gutter** - Type 1 curb and gutter shall be installed adjacent to all single family residential and duplex developments. A minimum of 4-inches of aggregate base shall be placed under the curb and gutter. *STD DWG H-2*

B. **Type 2 Curb and Gutter** - Type 2 curb and gutter shall be installed adjacent to all multiple residential, industrial/commercial developments, school and park sites, all arterials, or as specified by the City Engineer. A minimum of 4 inches of aggregate base shall be placed under the curb and gutter.

C. **Valley Gutter** – Valley gutter may be used for alleys and parking lots. Valley gutter shall not be used in either public or private streets.

D. **Cross Gutters** - Cross gutters shall not be installed unless the intersection cannot be drained by an underground system. Installation of cross gutters shall be subject to the approval of the City Engineer.

7-6 **SIDEWALK REQUIREMENTS** - Sidewalks shall be constructed adjacent to all public streets. All sidewalks shall be portland cement concrete, Class "A", six sack. Sidewalk adjacent to Type 1 and 2 curb and gutter shall have a minimum thickness of six inches or shall be constructed with 4 inches

concrete and 4 inches aggregate base.

A. **Width** - The required width of sidewalks shall be as listed in Table 7-3 unless the project is located within a Specific Plan area. In such case, the sidewalk width shall conform to the appropriate Specific Plan Landscaping Guideline which may be obtained from the City of Lincoln Public Works Department. The width of the curb shall not be considered as included in the width of the sidewalk.

TABLE 7-3

STREET CLASSIFICATION	MINIMUM SIDEWALK WIDTH
Minor Residential Primary Residential	4.0 feet
Collector/Industrial	5.0 feet
Commercial Minor Arterial Major Arterial	6.0 feet

B. **Slopes** – Sidewalks not adjacent to back of curb shall have a maximum slope in the direction of travel of 5.0 percent unless otherwise approved by the City Engineer. Cross slope shall be a minimum of 1.0 percent or maximum 2.0 percent towards the gutter.

C. **Sidewalk Ramps** - Sidewalk ramps shall be provided at all intersections and commercial/industrial driveways. All ramps shall conform to the requirements of Title 24 of the Office of the State Architect and to the Standard Drawings. It is the design engineers responsibility to ensure that the intersection slopes designated on the improvement plans will allow for the construction of sidewalk ramps that meet the above criteria.

D. **Sidewalk Barricades** - Sidewalk barricades shall be required where satisfactory provisions cannot be made for pedestrians to safely continue beyond the terminus of the sidewalk. Where sidewalks end in fill areas, the fill shall be extended beyond the end of the sidewalk for a minimum distance of six feet.

7-7 **PEDESTRIAN WALKS AND BIKE PATHS** - Pedestrian walks within a development shall have a minimum sidewalk width of 4 feet. All walks shall conform to the requirements of Title 24.

Bike paths within a development shall have a minimum width of 8 feet. Combined pedestrian/bike paths shall be a minimum of 10 feet wide.

Pedestrian walks and bike paths, if situated between lots, shall be fenced with chain link fencing or other material as approved by the City of Lincoln Parks and Planning Departments and shall extend from the street right of way to the back lot line. These fences shall be 6 feet high from the building setback line to the back lot line and 3 feet high from the building setback line to the street right of way line. Collapsible bollards shall be placed at both ends of all these pedestrian walks / bike paths. (STD DWG H33)

7-8 **PROFILE STANDARDS** - The following standards shall apply to the design of profiles. Also refer to Section 3 of this manual.

A. **Grades** - The minimum centerline (longitudinal) grades on new streets and gutter flow lines shall be 0.4 percent. The maximum street slope shall be 5.0 percent except where a steeper street is determined necessary by the City Engineer due to existing topographical

features. The minimum grade of gutter sections constructed along existing streets shall be 0.25 percent.

B. **Cross Slopes** - Standard cross slopes on new streets shall be 2.0 percent. Certain roadways may require super elevations as directed by the City Engineer. Cross slopes on widened existing streets shall be a minimum of 1.5 percent and maximum of 3.4 percent. Where a street constructed with a super elevation is to be widened, the cross slope shall be as specified by the City Engineer.

C. **Intersections** - Where two streets intersect, the centerline grade of the major street shall have a maximum centerline (longitudinal) grade of 3.0 percent for a minimum distance of 40 feet measured from the curb line of the intersecting street, except in unusually rough terrain, as determined by the City Engineer. The centerline of the minor street shall meet the crown slope at the projected lip of gutter. Crown slope may be reduced to 1.0 percent within the intersection if necessary. Drainage to the gutter shall be maintained at all points in the intersection.

D. **Vertical Curves** - The minimum allowable vertical curve length at the intersection of two grades shall be 50 feet; however, vertical curves may be omitted where the algebraic difference in grades does not exceed 2.0 percent. When vertical curves are required, they shall provide for adequate sight distance based on the minimum design speeds specified in Table 7-4. The vertical curve data shall be computed and shown on the plans and shall call out the tangent gradients, length of curve, the elevations and stationing points of the beginning of vertical curve (BVC), end of vertical curve (EVC), PI, high and low points, and along 25 foot intervals.

E. **Stopping Sight Distance** - The minimum sight stopping distance over any segment of roadway shall be designed for the vehicle speeds listed in Table 7-4 unless specific approval for a lesser design speed is received from the City Engineer. Minimum stopping sight distance shall be consistent with that specified in the latest edition of the State Highway Design Manual.

TABLE 7-4

STREET CLASSIFICATION	DESIGN SPEED*
Minor Residential	25 mph
Primary Residential	30 mph
Industrial/Collector	40 mph
Minor Arterial	50 mph
Major Arterial	60 mph

* These values represent minimum design speeds. At the discretion of the City Engineer, these design speeds may be increased for individual streets depending on circumstance.

7-9 **INTERSECTIONS** - Street centerlines shall intersect one another at an angle within 3 degrees of a right angle by tangents not less than 100 feet in length. In unusual circumstances the City Engineer may waive this requirement. Refer to the Standard Drawings for required rights of way, pavement, taper lengths, etc. for intersections involving minor and major arterials.

7-10 **OFFSET INTERSECTIONS** - The following requirements apply to all offset intersections. Any variation to these requirements shall be subject to the approval of the City Engineer. ***Distances are measured from centerline to centerline.***

A. Residential streets intersecting another residential street from opposite sides shall have their centerlines meet, or the offset between intersections shall be a minimum of 150 feet.

B. Minor and primary residential streets intersecting collector streets from opposite sides shall have their centerlines meet or the offset between the intersections shall be a minimum of 200 feet.

C. Minor and primary residential streets, and collector industrial streets intersecting minor or major arterial streets from opposite sides shall have their centerlines meet or the offset between the intersections shall be 400 feet minimum for a left hand offset and 600 feet for a right hand offset. This condition shall not apply where a raised center median is provided on the major street separating conflicting turning movements.

D. Intersections between two arterials shall have their centerlines meet, or the offset between the intersections shall be a minimum of 1320 feet.

7-11 **ELBOW INTERSECTIONS** - Use of expanded corners shall be limited to projected low volume residential, commercial and industrial streets and conditions where conformance to minimum horizontal length of centerline radius is not practical, and shall be subject to approval of the City Engineer.

7-12 **SIGHT DISTANCE AT INTERSECTIONS AND DRIVEWAYS** - The design of all public streets, private streets, and driveways other than for single family residential or duplex shall provide minimum sight distance in accordance with Caltrans Corner Sight Distance criteria as outlined in Section 405 of the Highway Design Manual (HDM). For convenience, the applicable portion of Section 405 is shown below. Design speeds shall be as specified in Table 7-4 or as specified by the City Engineer.

TABLE 7-5

DESIGN SPEED (mph)	CORNER SIGHT DISTANCE (ft)
25	250
30	330
40	440
50	550
60	660
70	770

The above values assume the set back for the driver on the cross street or driveway is 15 feet from edge of the traveled way. Set back assumes six feet to stop bar, one foot for the width of the stop bar, and 8 feet from front bumper to driver. If the stop bar is more than six feet from the traveled way, additional allowance should be considered.

For right turns out, the above values are measured from the egressing motorist to the vehicle approaching from the left traveling in the outside (curb) lane. For left turns out, the above values are measured from the egressing motorist to the vehicle approaching from the right traveling in the inside (fast) lane.

Where special circumstances preclude meeting corner sight distance as described above, a lesser

value for corner sight distance may be used with the approval of the City Engineer, but the minimum value shall be the stopping sight distance given in Table 201.1 of the HDM measured from a 3.5-foot eye height on the minor road to a 4.25-foot object height on the major road.

7-13 **CENTERLINE RADII** - The curve data (delta angle, length and radius) for all centerline curves shall be computed and shown on the plans. The minimum centerline curve radii shall be as specified in Table 7-1. Special consideration may be given by the City Engineer for unusually difficult alignment problems.

7-14 **DRIVEWAYS** - When driveways are abandoned or relocated, the driveway section shall be removed and replaced with curb, gutter, and sidewalk conforming to these standards. All new driveways shall conform to the following requirements.

A. Types, Widths, and Grades

1. Single Family Residential and Duplex Driveways shall have a minimum throat width of 16 feet and maximum throat width of 32 feet.

   Residential driveways should not exceed a maximum slope of 14 percent from back of right of way. Unusual terrain conditions may warrant waiver of this requirement subject to the approval of the City Engineer.

2. Multiple Family and Commercial/Industrial Driveways shall have a minimum throat width of 35 feet and a maximum throat width of 40 feet. The minimum throat width may be reduced to 25 feet if the driveway is restricted to one-way traffic either entering or exiting the site. If a raised median is provided in the driveway throat, the driveway width may be widened to provide two 20-foot aisles. The minimum driveway median width shall be 4 feet. The nose of the median shall be no less than 7 feet and no more than 15 feet from the gutter flow line.

   Driveways located on collector streets shall be standard commercial driveways per the Standard Drawings unless the City Engineer deems a commercial frontage (*STD DWG H-4*) driveway appropriate for a particular project. Driveways on arterial streets shall be *STD DWG H-4* per the Standard Drawings.

   For driveways on arterial streets where both left turns out and right turns out will be permitted as well as ingress, the driveway throat shall be forty feet wide and shall be striped to provide one 16 foot wide egress lane, one 11 foot wide left out lane (and throughs if applicable), and one 13 foot wide right out lane. Said striping and lane widths shall be continued into the site at least as far as the calculated MRTD per Section 4-2 of these standards.

   Driveway slopes shall have a maximum grade of 10 percent except between the edge of pavement and a distance 15 feet within the project. This area shall have a maximum slope of 2 percent. Unusual terrain conditions may warrant waiver of this requirement subject to the approval of the City Engineer.

B. Location - All aspects of site access (location of driveways, number of driveways allowed, spacing of driveways, etc.) are addressed in Section 5 of this manual.

C. Sight Distance - Sight distance at driveways shall be as specified in Section 7-12.

7-15 **BUS TURNOUTS** - Bus turnouts and shelter pads shall be required at locations specified by the City

Engineer and shall conform to the Standard Drawings. The size and location of bus shelter pads, whether existing or proposed, shall be shown at all bus turnouts. The pad shall 7' x 14' and shall be located within the last 60 feet of the bus turnout or as required by the City Engineer. Typically, bus turnouts shall be provided on the downstream side of intersections of arterial roadways.

All bus turnout aprons not located within a standard acceleration or deceleration lane shall be reinforced concrete conforming to the Standard Drawings.

7-16 **DEVELOPER RESPONSIBILITY FOR IMPROVEMENTS TO STREETS** - The following requirements apply to private development projects adjacent to existing and proposed streets.

A. The Developer shall be responsible for upgrading streets within and adjacent to the developer's project where the pavement section of an existing street does not meet the structural section and/or the centerline grade and alignment requirements specified in this manual for those streets.

Where the design centerline grade is to be higher than the existing, the Developer shall extend an overlay beyond the centerline of the street and shall neatly conform to the existing surface grade on the other side. The Developer shall also be responsible for overlaying any low areas where the new pavement is proposed to meet the existing pavement to maintain a uniform cross slope.

B. When making a connection to an existing stub street, the Developer shall be responsible for removing and reconstructing up to a maximum of twenty feet of the existing roadway to make a satisfactory connection as required by the City Engineer.

C. When widening to complete an existing partial street along a development project, the Developer shall be responsible for saw cutting and removing a narrow strip along the outside portion of the pavement to provide a clean and stable pavement section for constructing against. The width to be removed shall be determined by the City Engineer.

D. All temporary approaches to existing roadways required as a result of the development shall be at the Developer's expense. The temporary approaches shall be paved with the structural section to be determined individually for each situation.

E. The Developer shall be responsible for relocating existing traffic signals and street lights, and installing new traffic signals and street lights as necessary for new street and driveway locations. The Developer shall also be responsible for relocating existing traffic signals and street lights as necessary for the installation of new curbs or new curbs and sidewalks at locations where there are no existing curbs or curbs and sidewalks.

F. The Developer shall be responsible for constructing or modifying median island curbs where required by these standards, or when required for traffic control as a result of the development, as determined by the City Engineer.

G. The Developer shall be responsible for frontage improvements as described in Section 7-22.

H. The Developer shall be responsible for all drainage facilities (bridges, pipes, culverts, and appurtenances) crossing new streets within or adjacent to the project.

I. The Developer shall be responsible for all necessary modifications within the public right of way and the project site to comply with state and federal standards for access for the disabled, including but not limited to sidewalk ramps.

7-17 **TRENCHING IN EXISTING PAVED ROADWAYS** - All trenching in existing roadways shall conform to the Standard Drawings. The Developer may be required to coordinate trenching work schedules to avoid cutting pavement where repaving is planned by the City. In no case will trenching be permitted on any street that has been constructed or overlayed within the last five years. Special consideration may be given by the City Engineer under unusual circumstances.

7-18 **STREET NAMES AND STREET NAME SIGNS** - Street names shall be proposed by the Developer and shall be shown on the tentative map when submitted. These names shall be subject to approval by the City Council. No duplication of names already in use or previously proposed or sound alike names will be permitted. Street name signs shall be furnished and installed by the Developer. The requirements for location of signs does not apply to signalized intersections since signals will have their own street name signs. Street name signs shall conform to City of Lincoln Public Facilities Improvement Standards.

7-19 **SURVEY MONUMENTS** - The consulting engineer shall place survey monuments at the following locations:

A. At the intersection of all street centerlines.

B. At the beginning and end of curves on the street centerline.

C. At the center of all cul-de-sacs and elbow points.

D. At all subdivision boundary corners and at such other locations so as to enable any lot or portion of the improvement to be retraced or located, as directed by the City Engineer.

The above prescribed monuments shall be as follows:

E. Subdivision boundary monuments except those in street pavement shall be not less than 1-inch solid steel or 1-1/4 inch galvanized iron pipe 18 inches in length, capped or tagged.

F. Subdivision monuments in street pavement shall be not less than a 3/4 inch galvanized iron pipe, 18 inches in length. Top of pipe shall be driven flush with surface pavement.

G. Monument wells, conforming to the Standard Drawings, shall be placed at all public street intersections and centers of public street cul-de-sacs. In addition, monument wells shall be required on public street centerlines and located such that there will be sight distance between the two monuments within the street right of way. These will normally be located at points of curvature not to exceed 1000 feet.

H. Lot corners shall have at a minimum a 1/2 inch rebar at rear corners. Front corner and side lot lines shall be projected and marked on back of sidewalk with chisel mark.

I. Permanent survey monuments shall be placed by the Consulting Engineer at all section and quarter corners within the development. The section corner monuments shall be Class "B" concrete, poured in place, with minimum dimensions of 6" diameter x 24", with a brass cap in accordance with Bureau of Land Management Standards (STD DWG H30)

All such monuments shall be referenced to permanent objects located nearby and all ties shall be furnished to the City Engineer for general public use. Final acceptance of the public improvements will not be made until such ties have been furnished to the City Engineer.

The consulting Engineer shall also place a note on all construction plans stating that the Contractor

is responsible for the protection of all existing monuments and other survey markers.

7-20 **BENCHMARKS** - In locations where a new benchmark will be required, as determined by the City Engineer, the developer's engineer will set in concrete a 3 1/4 inch brass cap, provided by the Public Works Department, shall then run a second order, class two survey from an approved City of Lincoln benchmark to establish the elevation of the cap. The level notes will be submitted to the Public Works Department for approval. After approval of the notes, the developer's engineer will mark on the brass cap the City of Lincoln benchmark number, the date, and the R.C.E. or L.S. number of the person certifying the level notes.

Benchmarks shall be provided at all culvert or bridge crossings conveying a 100 year flow of 250 cfs or greater and elsewhere as specified by the City Engineer.

7-21 **COMPACTION** - Compaction tests shall be provided as required by the City inspector at the developer's expense. All aggregate sub-base and aggregate base material shall be compacted to a minimum 95 percent relative compaction.

7-22 **FRONTAGE IMPROVEMENTS** - The developer is required to provide frontage improvements along existing and proposed roadways at the developer's expense. Frontage improvements include, but are not limited to, sidewalk, curb and gutter, 18-feet of pavement width, additional pavement width beyond 18-feet for intersection widening (including acceleration and deceleration lanes, bus turnouts, widening for dual left turns, etc), drainage system, landscaping, soundwalls, street lighting, roadway signing and striping, and all utilities (including traffic signal interconnect if applicable). For minor residential, primary residential, collector and industrial streets, the developer shall provide the full pavement width (lip of gutter to lip of gutter) at the developer's expense.

7-23 **EXISTING FACILITIES** - Any facility of any type which requires modification or relocation to accommodate improvements associated with a development project shall be modified or relocated by the developer at the developer's expense. Any existing public facilities damaged during construction of a development project shall be repaired by the developer to the satisfaction of the City at the developer's expense.

SECTION 8

DOMESTIC WATER SUPPLY SYSTEM

8-1 **INTRODUCTION** - This manual shall govern the engineering design of all domestic water systems intended for operation and maintenance by the City of Lincoln.

8-2 **INTENT OF CRITERIA** - The intent of these criteria is to provide a water system that will dependably and safely convey the required amount of high quality water throughout the distribution system with the least cost. In establishing the required amount of water, periods of peak domestic demand occurring in conjunction with an emergency fire flow demand shall be considered.

8-3 **CURRENT STANDARDS** - Pertinent and current requirements of the following agencies or standards shall be complied with. In case of conflict the design criteria of the City of Lincoln, as established herein, shall govern.

A. Environmental Protection Agency Drinking Water Regulations.

B. Laws and Standards of the State of California, Department of Public Health Services relating to Domestic Water Supply.

C. Public Facilities Improvement Standards of the City of Lincoln, Department of Public Works.

D. City of Lincoln Industrial Waste Regulations

E. City of Lincoln rules for installation of individual water services

F. City Code for taps to water system.

G. Title 17, Chapter V, Sections 7583-7622, California Administrative Code regarding cross-connections and backflow prevention.

H. Uniform Fire Code.

I. Latest edition of American Water Works Association (AWWA) standards.

J. Current City Water Model

8-4 **WATER SUPPLY QUALITY** - The quality of the water shall conform to the Environmental Protection Agency Drinking Water Act, and the State Department of Health Services Drinking Water Standards.

8-5 **WATER SUPPLY PRESSURE** - Normal operating pressures of not less than 50 psi nor more than 120 psi shall be maintained at service connections to the distribution system, except that during periods of peak domestic demand, the pressure shall not be less than 40 psi. The pressure shall not be less than 20 psi anywhere in the system during conditions of fire flow on the maximum day demand.

8-6 **RATE OF DOMESTIC USE** - For design of the distribution system, a maximum day demand rate of fifteen gallons per minute per gross acre or 1,150 gallons per day per dwelling unit, whichever is greater, shall be assumed. For extension of existing systems consisting of more than 500 services, the design shall be 1,150 gallons per day. Special consideration shall be given to schools, commercial, or industrial development.

8-7 **REQUIRED FIRE FLOWS** - For areas of the general type noted below, the indicated fire flows are to be provided with the initial development. Expansion or change in zoning of the development shall be subject to requirements of the Uniform Fire Code.

A. **Residential Area** - For residential areas having primarily one-story single-family dwellings, on average size lots, provide a minimum of 1000 gallons per minute per single hydrant or any two hydrants shall provide a minimum of 1500 gallons combined at the same time.

B. **Commercial and Multiple Dwelling Areas** - For closely built areas containing apartments and light commercial structures, provide 3,000 gallons per minute.

C. **Principal Business District** - Consult the "Standard Schedule for Grading Cities and Towns of the United States" by the National Board of Fire Underwriters. This requirement shall not be less than that required for commercial areas.

D. **Schools** – 4000 gpm.

E. **Other** - For industrial and other individual high value buildings, fire flow requirements shall be established as prescribed in Bulletin No. 266, "Water Works Requirements for Fire Protection" of the I.S.O. This requirement shall not be less than that required for commercial areas.

8-8 **LOCATION IN EXISTING STREETS** - Where water mains or services are to be located in an existing street, factors such as curbs, gutters, sidewalks, traffic conditions, traffic lane conditions, pavement conditions, future street improvement plans, and existing utilities shall all be considered. The approval of the City Engineer shall be obtained in every instance.

8-9 **TRANSMISSION SYSTEM DESIGN** - Transmission mains are mains 18 inches and larger. Sizing and layout of transmission mains shall conform to the Master Water Supply Plans of the City of Lincoln Public Works Department. Technical specifications for water transmission mains shall be a requirement of the proposed improvement plans. Under no circumstances shall fire hydrants or water services be directly connected to a transmission main, with the exception of hydrants that are acting as blow offs.

A. **Transmission Main Location** - All transmission mains shall be installed within public rights-of-way or easements.

1. Mains shall be located three (3) feet from the curb and gutter on the northerly and westerly side of the street. If conflicts exist at this location, then the main may be installed within an easement immediately adjacent to and behind the property line fronting the public right-of-way, subject to approval of the City Engineer.

2. A minimum horizontal separation of ten (10) feet shall be maintained between water mains and sanitary sewer mains.

3. A minimum cover of 42" below adjacent gutter flow line shall be maintained at all locations.

4. Transmission mains shall maintain a minimum vertical clearance of one (1) foot when crossing all other utilities.

8-10 **DISTRIBUTION SYSTEM** - Sizes of mains shall be such that the stated normal pressures, as specified in Section 8-5, and the minimum requirements for main spacing, specified below, are maintained.

The Hazen-Williams formula shall be used in the hydraulic study of the system, using a "C" value of 130 for cement-lined pipe, PVC C900, Class 200, and ductile iron pipes.

A Hardy-Cross hydraulic analysis of any proposed distribution system shall be supplied to the City Engineer.

A. **Location of Mains** - All water mains shall be installed within public rights-of-way or easements. In every instance where a water main is to be installed in public rights-of-way or easements, the City Engineer shall be contacted for preferred location.

1. Mains shall be located three (3) feet from the curb and gutter on the northerly or westerly side of the street. If conflicts exist at this location, then the mains may be installed within an easement immediately adjacent to and behind the property line fronting on the public right-of-way, subject to the approval of the City Engineer.

2. If it is necessary to install a water main outside of the public right of way, an easement dedication to the City shall be required. Easements for water lines shall meet all of the following width criteria:

   a. Minimum width of easement shall be 15 feet. Final easement width subject to approval of City Engineer.

   b. All easements shall have a minimum width equal to the required trench width according to the standard detail for trench backfill plus 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 easement.

   c. All valves shall be accessible for maintenance vehicles by way of a paved access road at least 12 feet wide. Any access road longer than 250 feet or with turns shall have a paved turnaround.

3. The minimum horizontal distance between parallel water and sanitary sewer lines shall be ten (10) feet, and the water main shall be higher than the sewer. On crossings, the water line shall be at least 12" above the sewer line. In cases where the water main must cross under the sewer main or service, and with permission of the City Engineer, the water line shall be ductile iron five feet either side of crossing and be concrete encased in accordance with State Department of Health Safety Standards.

4. When crossing a sanitary sewer force main, the water main shall be installed a minimum of three (3) feet above the sewer line and be of ductile iron a minimum of five (5) feet on each side of the force main.

5. No parallel utilities shall be placed within five feet of either side of a water main.

B. **Sizes of Mains and System Layout** - The distribution system, whenever possible, shall be in grid form so that pressures throughout the system tend to become equalized under varying rates and locations of maximum demand. The minimum pressures and flows, as specified in this manual, shall govern design of the system. The following conditions are to be considered for the distribution system design:

1. The minimum pipe size shall be six inches in diameter.

2. Where water mains are installed in arterials, dual mains (one pipeline on each side of the street) may be required by the City Engineer. The minimum size of each pipe shall be six (6) inches in diameter on each side in residential areas. In commercial districts, the size shall not be less than eight (8) inches in diameter. The size shall be designed for the fire demand requirements.

3. The distribution system shall be gridironed with twelve inch or larger cross-connecting mains at intervals of approximately 1,300 feet, with intermediate eight inch or larger lines as required.

4. Larger mains shall be provided at one mile intervals or to serve multiple housing, commercial, or industrial areas as determined by an engineering evaluation of the anticipated demand.

5. Mains shall maintain a minimum cover of 36" and a maximum depth of 60" as measured from adjacent gutter flow-line, unless otherwise specified by the City Engineer.

6. Mains shall maintain a vertical clearance of one (1) foot when crossing all other utilities.

C. **Valves, Hydrants, and Blow-offs** - The distribution system shall be equipped with a sufficient number of valves so that no single shut-down will result in shutting down a transmission main. Valves shall also be spaced no greater than 500 feet in schools, commercial, industrial, or multiple-family dwelling areas. In other residential areas, valves shall be spaced such that no single shut-down will result in shutting down more than 20 services or 800 feet of main, whichever occurs first. In no case shall more than two fire hydrants be removed from service. Valves shall be located such that any section of main can be shut down without going to more than three locations to close valves. All tees shall have at least two (2) valves and all crosses shall have at least three (3) valves. Valves stems shall be set at a depth not to exceed 40-inches. A valve shall be installed on services greater than four (4) inches in diameter immediately off the main.

Fire hydrants and blow-off assemblies shall be located as follows:

1. Fire hydrants, conforming to the Standard Drawings, shall be placed at street intersections wherever possible, and located to minimize the hazard of damage by traffic. They shall have a maximum spacing of 500 feet measured along the street frontage in residential areas and a maximum spacing of 300 feet in all other areas. Hydrants located at intersections shall be installed at the curb return. All others shall be located on property lines between lots, 12 inches back of the sidewalk. Each hydrant shall be marked with a blue reflective pavement marker placed one foot off of street centerline.

2. Not more than two hydrants shall be placed on a six-inch main between intersecting lines and not more than three hydrants on an 8-inch main between intersecting lines. Not more than one hydrant may be placed on a non-looped main. The pipeline connecting the hydrant and the main shall be a minimum of 6-inches, with a gate valve flange connected to the main.

3. A blow off assembly, conforming to the Standard Drawings, shall be installed on all permanent and temporary dead end runs. Wherever possible, the blow-off shall be installed in the street right-of-way a minimum of 3-feet from the curb and gutter. In

no case shall the location be such that there is a possibility of back-siphonage into the distribution system.

D. **Service Lines** - Service lines from the water main to the property line or edge of easement shall normally be installed at the time the main is constructed. Services from mains installed in private roads shall extend one foot beyond the edge of the pavement. Service line criteria shall be as follows:

1. In all new subdivisions, the service line shall conform to the Standard Drawings (Detail W-5). The curb shall be stamped with a "W" at all service locations. If it is preferred to have the service located other than that specified, it shall be brought in no closer than nine inches to a side property line. The service line to existing buildings shall be located so as to make the most direct connection to the existing main.

2. The standard size of a single family residential service line shall be 3/4 inches in diameter. Schools, commercial, industrial, or multiple-family units with higher demand shall be provided with larger service lines, subject to approval of the City Engineer. Service lines in sizes up to 2-inches in diameter shall be copper water tubing, Type K, wrapped in polyethylene and wrapped in sand. Materials for lines larger than 2-inches shall be subject to approval by the Public Works Department. All services shall be installed with a corporation stop at the main and a curb stop at the property line. Services shall be one piece continuous with no couplings from corp stop to curb stop. The gate valve shall be used only when the service is larger than 2-inches.

3. Service taps shall be pursuant to Public Facilities Improvement Standards. Any deviation from these materials must be reviewed and approved by the City Engineer in writing. Galvanic corrosion shall be considered and discussed in any request from deviation from brass and copper.

4. The Public Works Department reserves the right to make all water service taps into existing mains upon application for a permit and payment of the required fees. A note to this effect shall be placed on the plan sheet which details the area that requires such tapping. Application shall be made to the Public Works Department and the required fees paid at least two weeks in advance of the time the tap is desired. All excavation and backfill and the installation of the remainder of the water service shall be done by the Contractor. (Note: The above applies only when the service is constructed as a part of an improvement contract. For rules regarding the installation of an individual water service, contact the City of Lincoln Public Works Department).

5. The Department of Public Works reserves the right to revise type of service line pipe based on ongoing water quality test results. An approved pipe substitute to be Kytec pipe or equal.

E. **Water Meters** - Water meters shall be installed on all services. City forces shall install all meters after all fees and permits are processed.

F. **Main Line Pipe, Fittings, and Connections** - Mains 12-inches in diameter and smaller shall be American Water Works Association C900 Class 200 or AWWA C-151/A21.51 ductile iron pipe. Pipe diameters larger than 12-inches shall be AWWA C-151/A21.51 ductile iron. All ductile iron pipe shall have an interior mortar coating in accordance with AWWA standards C-104/A21.4. Class of pipe shall be determined using AWWA

C-0150/A21.50. Consulting engineer shall submit calculations justifying pipe class. Cathodic protection shall be designed by a qualified corrosion protection engineer. All mains shall have a 12-inch wide, blue, plastic non-metallic backfill tape marked "BURIED WATER MAIN BELOW" placed in the trench within 12 to 24-inches of the surface. Mains in unpaved areas shall be marked every 150-feet minimum with a blue 5'-6" composite utility marker. This marker will have a detail stating " CAUTION WATER PIPELINE". Marker shall be carsonite or equal with anchor barb kit. If necessary for cathodic protection, at a minimum, all ductile iron pipe, valves, fittings, and under ground brass shall be wrapped with 8 mil or thicker polyethylene and sealed. All poly wrapped pipe shall be backfilled with pea gravel. Large valves and fittings shall be mortar coated.

Main line fittings shall be mortar lined ductile iron only. All fittings shall be of mechanical type. No push on fittings will be allowed. The beveled end of all pipe will be cut off before being placed in a mechanical joint. All fittings shall maintain a minimum of 18-feet of restrained pipe into the fitting in all directions. Thrust blocks shall be used where required by City Engineer. If straight runs of PVC are to be restrained, CertainTeed Certa-Lock or approved equal shall be used. All restrained systems shall be shown in plan. "Sap seal" caps shall be placed on all nuts and bolts. Ductile iron pipe shall use standard boltless connections either TR Flex, Mega Lug, or U.S. Pipe Filed Lock Gasket. Design of restrained systems shall follow standard engineering practice. The City Engineer shall approve the design. An acceptable method of design is "Thrust Restraint Design Program" by EBAA Iron. Any deviation from these requirements will not be permitted without approval of the City Engineer.

G. **Tracing Wire** - 10 gauge, insulated tracing wire shall be applied to mains and service lines. Wire shall be continuous between main line valve boxes and fire hydrants. Tracing wire through valve boxes shall be placed outside of riser but inside box.

H. **Valves** - Gate valves shall be used in 10 inch and smaller lines. Butterfly valves will be used on 12 inch and larger lines. All gate valves shall be centered in a one piece PVC riser stock, 6-inch minimum diameter, with the use of a riser liner or equal. Operator nut shall be within 40-inches of surface.

All valve boxes in the street and other traffic areas shall be of an H-20 loading capacity.

I. **Detector-Check Valves** - A detector-check valve and bypass meter is required on each fire service line into a building.

J. **Back-Flow Devices** - Back flow devices are required in accordance with Title 17, Chapter V, Sections 7583-7622 of the California Administrative Code. All devices must be approved by the City Engineer.

The list of acceptable devices is updated regularly by the Public Works Department. It is the Consulting Engineers responsibility to ensure that the proposed backflow device is currently acceptable.

SECTION 9

SANITARY SEWER DESIGN

9-1 **DESIGN CRITERIA** - These criteria shall apply to the engineering design of any sanitary sewer system to be maintained by the City of Lincoln or, with those exceptions as noted, to that within private multiple ownership residential or multi-parcel commercial and industrial developments.

9-2 **AVERAGE FLOW DETERMINATION** - The determination of average flows for design purposes shall be based upon the best available information concerning land use and density as determined by the City Engineer. This information may include approved land use and density in accordance with current zoning, in the absence of more specific information pertaining to expected development.

A. **Single Family Detached Units** - Flow shall be based on 250 gallons per residential unit (lot) per day and a minimum of four lots per acre. However, if the number of lots per acre is known, and is greater than four, the actual number shall be used.

B. **Single Family Planned Unit Development** - Flow per unit shall be 250 gallons per residential unit per day and the actual number of approved units per acre shall be considered. However, in the absence of known data, the density shall be assumed to be 12 units per acre or the number of units per acre specified in the current zoning, whichever is greater. If characteristics of the individual dwelling units are similar in characteristics to the single family detached units (area, number of rooms) the City Engineer may assign the same design flow values as shown from single family detached residential flows.

C. **Multiple Residential** - Flows shall be determined from the curve on Figure SS-1. However, if the type of improvements planned are known and estimated discharges are available, they shall be used in the design, subject to approval of the City Engineer. Multiple residential is differentiated from planned unit development in that the latter contains individually owned residences with the adjacent land owned in common and with maintenance performed by a Homeowner's Association. Multiple residential is designed to be owned by one party with the individual residences rented or leased. The average flow from single bedroom or two bedroom units shall be 250 gallons per day; and from three or more bedroom units, 250 gallons per day. Mobile home flow shall be 250 gallons per day per unit.

D. **Schools** - The larger flow, as determined from one of the two following methods, shall be used:

1. The entire school area shall be assumed to contribute an average flow equivalent to that of an equal area of single-family, detached residential units: i.e., 1,000 gallons per acre per day.

2. Average daily flow per school shall be based on the type of school as follows, with the indicated capita limits including ultimate student population plus administration, teaching, and operating personnel.

TYPE OF SCHOOL	AVERAGE DAILY FLOW	CAPITA LIMIT
Elementary (K-5, K-6 or K-8)	0.025 MG	1000
Upper Elementary (6-8, 7-8 or 8-9)	0.060 MG	1500
High School (9-12 or 10-12)	0.080 MG	2000

For enrollments and personnel in excess of that indicated, there shall be added 25 gallons per day per additional capita in elementary schools and 40 gallons per day per additional capita in upper elementary schools and high schools.

E. **Industrial and Commercial** - Every attempt shall be made to base design flow on specific quantities for the type of development expected. In the absence of specific knowledge of the type of development expected, the flows shall be determined from the curves shown on Figure SS-1 unless some other value is deemed appropriate and based on surrounding development. The consulting engineer is directed to publications by the American Society of Civil Engineers (ASCE), California Water Environment Association (CWEA), and other organizations of similar nature and expertise. The minimum diameter of sanitary sewer laterals for a commercial or industrial development shall be six inches, or as directed and approved by the City Engineer.

Special attention shall be given to any facility with a magnitude of type of discharge that could be detrimental to the public system. The City's Industrial Waste regulations concerning discharges to the sanitary sewer system shall be adhered to.

F. **Infiltration** - A normal amount of infiltration was considered in establishing the above discharge rates. However, in areas with high ground water, it may be necessary to increase these rates to reflect a greater amount of infiltration.

9-3 **DESIGN FLOW** - Design flow shall be calculated by multiplying the average flow for the upstream service area, as determined above, by the peaking factor obtained from the curve shown on Figure SS-2. Pumping stations shall assume a peaking factor between 2.5 and 3.5 times average daily flow, depending on quantity of flow.

9-4 **PIPE CAPACITY, SLOPE, VELOCITY, SIZE, DEPTH AND MATERIAL** - Design criteria for the pipe system are as follows:

A. **Size** - The minimum size of laterals which serve single-family developments shall be four inches in diameter. The minimum size public sewer main shall be eight inches except when the main serves less than 20 homes or a cul-de-sac no greater than 300 feet in length in which case the minimum sewer main size may be reduced to six inches. Schools, commercial, industrial and multiple residential shall be served by lines a minimum of eight inches in diameter. Special approval (in writing) from the City Engineer for deviation from this design criteria.

B. **Slope and Velocity** - Manning's formula shall be used to determine the relation of slope, design flow, velocity, diameter, and "n" value. The "n" value shall not be less than 0.013 for all pipe materials.

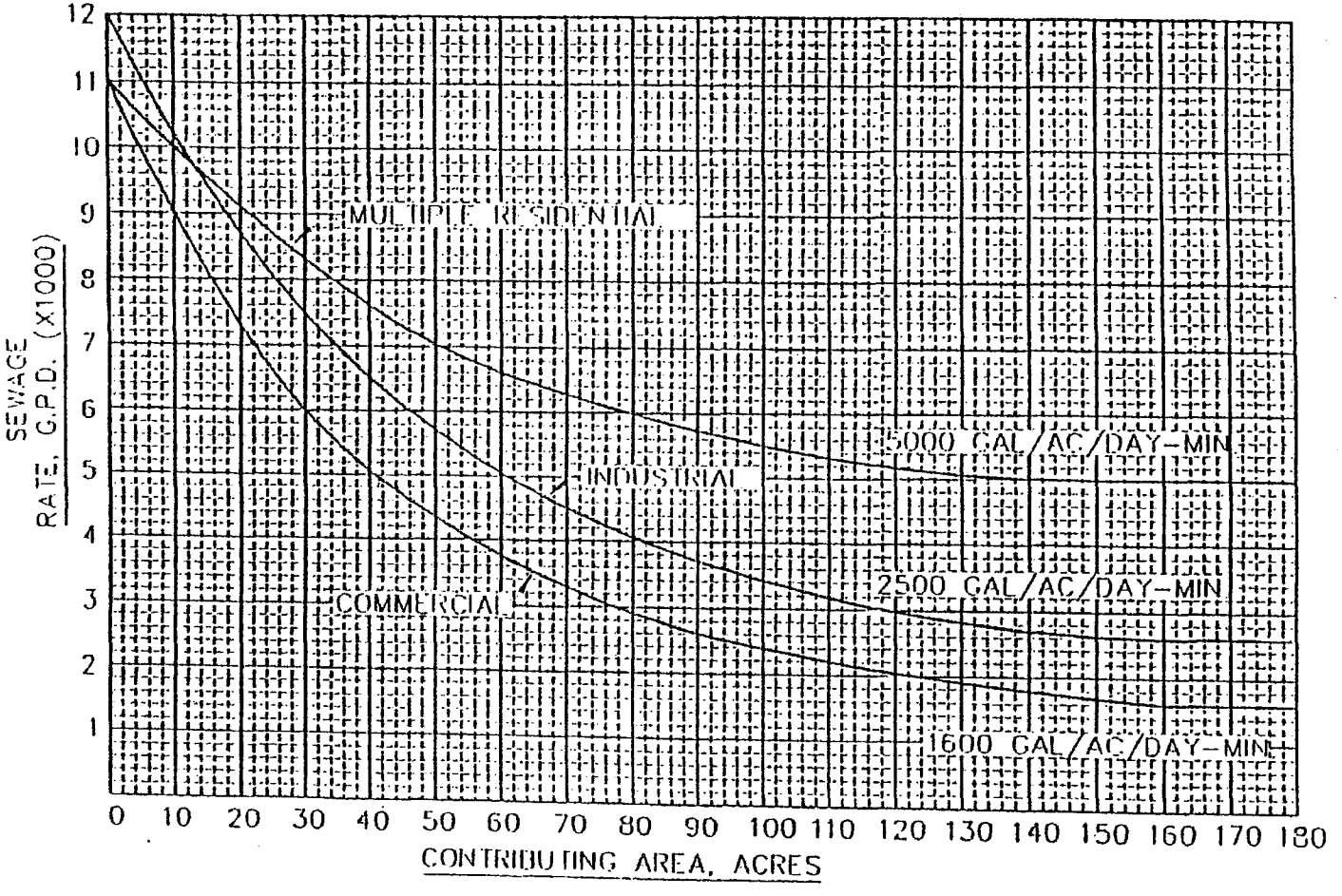

SEWAGE RATE, G.P.D. (X1000)
12
11
10
9
8
7
6
5
4
3
2
1
MULTIPLE RESIDENTIAL
INDUSTRIAL
COMMERCIAL
5000 GAL/AC/DAY-MIN
2500 GAL/AC/DAY-MIN
1600 GAL/AC/DAY-MIN
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180
CONTRIBUTING AREA, ACRES

FIGURE SS-1

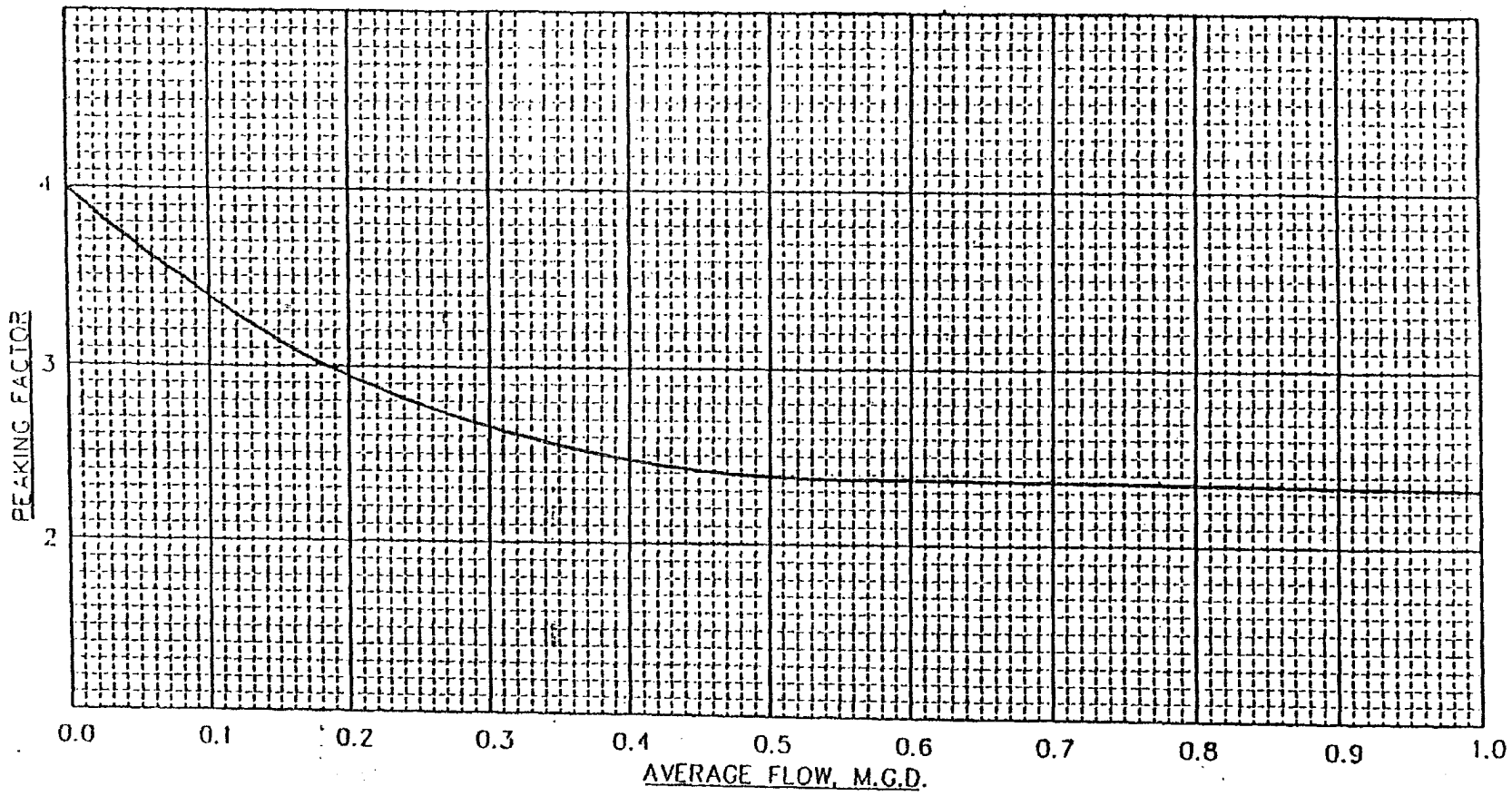

PEAKING FACTOR
4
3
2
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
AVERAGE FLOW, M.G.D.

FIGURE SS-2

1. The following is a table of slopes and design flow capacities for various pipe diameters. Pipe slopes less than those listed in this table shall not be used without the approval of the City Engineer. The slopes indicated are based on a velocity of two feet per second with the pipe flowing full.

PIPE DIAMETER (IN)	MINIMUM SLOPE (ft/ft)	CAPACITY AT 0.7 DEPTH	CAPACITY FLOWING FULL
6	0.0050	0.22 MGD	
8	0.0035	0.38 MGD	
10	0.0025	O.58 MGD	0.72 MGD
12	0.0020	O.85 MGD	1.00 MGD
15	0.0015	1.32 MGD	1.60 MGD
18	0.0012	1.95 MGD	2.35 MGD

2. The maximum depth of flow at design conditions in any lateral (10-inch diameter or less) shall be 0.7 diameter. Lines 12-inches in diameter or larger may be designed to flow full unless direct sewer connections are planned, in which case the 0.7 diameter maximum depth shall govern.

3. All sanitary sewer pipe shall be designed for a minimum scour velocity of two feet per second at peak flows. The volume of wastewater within the pipe system as determined above shall be used when designing pipe slopes.

4. Maximum design velocity shall not exceed ten feet per second.

C. **Capacity** - Pipe capacity, in all cases, shall be adequate to carry the design flow from the entire tributary area, even though said area may not be within the project boundaries.

D. **Hydraulic Grade Line** - The hydraulic grade line shall be determined from the design flows, based upon 100 percent development of the tributary area. Hydraulic grade line calculations must be submitted for the design of all lines 12-inches in diameter or larger.

E. **Depth** - No sewer service shall be more than fifteen feet deep. In the design of a system, one of the controlling conditions shall be that the lateral system is to be at a sufficient depth to provide a minimum slope for the sewer service of 1/4 inch per foot, at the same time maintaining a minimum cover of 12-inches at any buildable location within the properties to be served. Proposed building floor elevations shall be designed to be at least three inches higher than the lowest upstream manhole rim (12" minimum from finished floor to manhole rim). Additional manholes may be required even though the manhole spacing may be adequate. In cases where the above design is not possible and with approval of the City Engineer, a backwater valve shall be required at the time of structure construction and shall be noted on the improvement plans. Deed restrictions shall hold the City harmless for failure of backwater valves on such lots.

F. **Material** - Pipe material shall be as approved by the City Engineer, and shall conform to the requirements of the Standard Specifications. Pipe materials which will normally be

considered acceptable are as follows:

1. Vitrified Clay Pipe – extra strength
2. Ductile Iron Pipe - with polyethylene lining and encasement.
4. Reinforced Concrete Pipe with T-lock (36" and larger).

The following materials will be considered on a case by case basis:

1. Cement Mortar Lined and Tape Coated Steel Pipe - may be approved for force mains or where justified by special conditions.

9-5 **SEWER LOCATION AND ALIGNMENT REQUIREMENTS** - Location and alignment criteria are as follows:

A. **General** - All sanitary sewers shall be placed in rights-of-way dedicated for public streets unless the use of easements is specifically approved by the City Engineer. In some streets, dual mains may be required. There shall be a minimum horizontal clearance of ten feet between parallel water and sanitary sewer mains and the water main shall be higher than the sewer. On crossings, the water line shall be at least 12-inches above the sewer line. If a sanitary sewer force main must cross a water main, the requirements of sections 8-9 shall apply.

B. **Location in New Subdivision** - In new subdivisions, sewers shall be located five feet south or east of street centerlines within minor and primary residential streets, unless approved otherwise by the City Engineer.

C. **Location in Existing Streets** - When sanitary sewers are to be installed in an existing street, factors such as curbs, gutters, sidewalks, traffic conditions, traffic lane conditions, pavement conditions, future street improvement plans, and existing utilities shall all be considered. The approval of the City Engineer shall be obtained in every instance.

D. **Location in Unpaved Areas** – See Section 5-9 (I) of Improvement Standards. All manholes shall be accessible for maintenance vehicles by way of a paved access road at least 12 feet wide. A flat area 10 feet in diameter shall also be paved around each manhole. Any access road longer than 250 feet or with turns shall have a paved turnaround.

E. **Easements** - If it is necessary to install a sewer main outside of the public right of way, or within a narrow right of way, an easement dedication to the City shall be required. Temporary working easements of adequate dimensions shall be provided to allow the construction within the permanent easement to be completed in a safe and reasonable manner. Easements shall be totally on one side of the property line or fence. Easements for sewer lines shall meet both of the following width criteria:

1. Minimum width of easement shall be 15 feet.

2. All easements shall have a minimum width equal to the required trench width according to the standard detail for trench backfill plus two additional feet of width for every foot of depth of the pipe as measured from the bottom of the pipe to finished grade. All sewer lines shall be centered within their easement. Final easement width shall be approved by the City Engineer.

3. Easements adjacent to property lines shall be located entirely on one parcel.

F. **Water Well Clearance** - No sanitary sewer interceptor, trunk line, lateral, or service shall be

placed nearer than 100 feet to any water well, public or private, unless the well has been abandoned in full accord with the County Public Health Department Standards, or the location otherwise approved, in writing, by the appropriate health agencies. If a clearance of less than 100 feet is approved, all pipe within that distance from the well shall be of material approved by the City Engineer. In no case shall a clearance of less than 50 feet be allowed.

G. **Lines in Drainage Swales** - No sewer line, public or private, shall be located within a drainage swale except to cross. The horizontal distance between the sewer line and the top of the bank shall be sufficient to maintain the integrity of the drainage swale and provide access for maintenance to the sewer line. Material shall be ductile iron within engineered concrete slopes.

H. **Alignment** - Alignment of all sewer pipe and structures shall be designed to provide a minimum six foot clearance from all other utilities and/or improvements and ten feet from water mains, unless otherwise approved by the City Engineer.

1. Horizontal alignment shall be parallel to the street centerline whenever possible. Minimum radius for sanitary sewers six-inches through twelve-inches in diameter shall be 200 feet. A larger radius shall be used wherever practicable or where necessary to avoid joint deflection in excess of the pipe manufacturer's recommended maximum. For pipe 27 inches in diameter or larger, mitered joints, fittings, or other methods as specified in the Public Facilities Improvement Standards may be utilized to accomplish alignment changes.

2. Vertical alignment shall provide a constant slope between manholes. If a change in grade is necessary, construction of a manhole shall be required unless the use of a vertical curve is approved by the City Engineer. In such case, elevations shall be shown at ten-foot intervals throughout the length of the vertical curve. This maximum deflection shall be two percent at each ten-foot interval.

9-6 <u>TRENCH LOADING CONDITIONS AND PIPE DESIGN</u> - The loading condition and pipe design criteria for conduits are as follows:

A. **Rigid Conduit Loading** - On rigid conduits, Marston's formula shall be used to determine the load placed on the pipe by backfill. The procedure for rigid pipe is described in the ASCE Manual and Report of Engineering Practice No. 60, the Clay Pipe Engineering Manual, and in similar handbooks. In the absence of specific soils data, as determined by the soils engineer, a soil weight of 120 p.c.f. and a Ku factor of 0.110 shall be used. In all cases extra strength VCP shall be used.

B. **Safety Factor** - On rigid conduits, a safety factor of 1.25 shall be used for reinforced concrete pipe and 1.5 for all other pipe. Only the three edge bearing strength of the pipe shall be used in the computation for rigid pipe.

C. **Bedding and Initial Backfill** - Unless otherwise noted on the plans, bedding and initial backfill shall be per the Standard Drawings with an unlimited trench width. The minimum trench width shall be the outside diameter plus 12-inches. Initial backfill shall be shovel sliced or mechanically consolidated underneath the haunches of the pipe. Any special backfill requirements shall be noted on the plans. (STD DWG SS-1)

Type III, and IV bedding and initial backfill are intended primarily for emergency field conditions. Their use shall normally not be specified on the plans and shall require specific written approval of the City Engineer before use.

D. **Special Pipe Strength Requirements** - Polyethylene encased and lined Pacific States Cast Iron Pipe Company, Permaline Pipe, or other high strength pipe approved by the City Engineer shall be used whenever cover is greater than 25 feet or extra support strength is required. Polylined ductile iron shall be used whenever cover is less than three feet or insufficient clearance exists between the sewer pipe and the rigid load transmitting structures. Permaline pipe shall run continuously from manhole to manhole. No services shall enter Permaline pipe runs outside of a manhole.

9-7 **MANHOLE CRITERIA** - The design criteria for manholes are as follows:

A. **General** - Manholes shall be placed at the intersection of all sanitary sewer lines and at the end of any temporary line more than 200 feet in length. All manholes from which sewer line extensions are anticipated shall have a ten foot stub installed and plugged at the grade and in the direction of the anticipated extension. No more than three lines may enter a manhole with one line exiting. Summit manholes connecting two sewer laterals are not acceptable.

B. **Spacing** - Maximum spacing of manholes shall be 400 feet for all straight lines of ten-inch diameter or less and 600 feet for sewer lines 12 inches or more. A line with a radius greater than 400 feet shall be considered as straight for purposes of this section. Manhole spacing on lines which are on a continuous curve of 200 foot radius (min. allowable) shall be 200 feet. Manhole spacing on curved lines of radius between 200 and 400 feet, or where only a portion of the line is curved, shall be adjusted proportionately. Reverse curves require a manhole at the point of tangency of the curves. A manhole shall be required at any change in vertical alignment unless use of a vertical curve is approved by the City Engineer. A manhole shall be placed at any abrupt change in horizontal alignment. Lids will be bolted whenever manhole is outside of paved areas or where specified on plans. Manhole lids shall be sealed with a cretex manhole lid gasket or approved equal. Manholes outside of paved areas shall be placed 12 inches above grade.

C. **Hydraulic Grade Line** - The hydraulic grade line of any pipe which flows into a manhole shall be 0.10 foot (minimum) above the hydraulic grade line of the exit pipe. The hydraulic grade lines shall be determined from the design flow, based upon 100 percent development of the tributary areas. Hydraulic grade line calculations must be submitted for the design of all lines 12-inches in diameter and larger.

In the absence of calculations which establish the hydraulic grade lines and when the flow must change direction by more than 20 degrees, the invert of an incoming side pipe shall be located no lower than the spring line nor higher than the crown of the exit pipe. The crown of the exit pipe shall never be higher than the crown of any pipe entering the manhole. Drop connections are discouraged but are not governed by the above elevation requirements.

Service sewers and laterals with ten or fewer services shall enter manholes at an invert to crown match with the exit pipe.

D. **Construction Requirements** - Manhole construction shall conform with the provisions of the Standard Drawings. Where manhole depth is less than four feet, an 18 inch high cone may be used. The plans shall note that the frame on manholes located in unimproved areas shall be set 6 inches above existing ground level. The flex joint on lines intersecting a manhole shall be located at the manhole and between 12" and 24" from the outside of the manhole. Pipe material which does not provide adequate bonding between pipe and manhole may similarly require special designs. Epoxy coating of manholes may be required in areas determined to cause sulfide generation.

E. **Manhole Access** - Provisions must be made to prevent vegetation from overgrowing the manholes. An all weather access shall be provided to each manhole as approved by the City Engineer. Spacing of manhole rings shall consider installation of ladder rungs, if required.

F. **Connection to Interceptor System** - Improvement plans which require a connection to a City of Lincoln interceptor or interceptor structure shall include a note specifying that the City Engineer be notified at least two weeks in advance of the intended construction and an encroachment permit obtained. This is necessary to allow for special inspection procedures that will apply to such construction. Work may be done by City forces at discretion of City Engineer.

9-8 **DROP CONNECTION CRITERIA** - Drop connections require specific approval of the City Engineer and may only be used when other solutions are unavailable.

9-9 **FLUSHING BRANCH CRITERIA** - A flushing branch may be used in lieu of a manhole at the end of any line less than 200 feet in length if the line extends to a subdivision boundary and if there are definite plans for its extension. If a line extends to a subdivision boundary, is planned for definite extension, and has no service sewer connections, it may be capped.

9-10 **SERVICE SEWER DESIGN** - The design criteria for service sewers are as follows:

A. **General** - Service sewers shall conform to the Standard Drawings and shall be constructed normal to the lateral unless otherwise approved by the City Engineer. The service sewer shall extend from the lateral sewer to the edge of the public right-of-way or easement. The cleanout to grade is to remain within two feet of back of sidewalk. Service sewers shall extend one foot beyond edge of pavement of any private road and easements of adequate width to accommodate the services shall be obtained. A plan and profile of any service sewer shall be supplied to the City Engineer on request.

The clean out to grade that is required at the termination of service sewers shall be constructed with subdivision improvements or at the time connection is made to the building sewer. Unless otherwise noted on the plans, construction of the cleanout to grade is the responsibility of the contractor for the subdivision improvements. If installation of the cleanout is deferred, the consulting engineer shall indicate on the plans that a 4" by 4" post shall be placed at the end of the service sewer, extending from the flow line to not less than 12 inches above ground surface.

B. **Sizing** - Normal residential sewer service size shall be a minimum of four inches from the main to the house cleanout. Schools and other developments expected to contribute high sewage flows shall be served by six inch or larger service sewer. In addition, service sewers shall be sized according to requirements of this manual. A six inch service shall enter a six inch lateral by means of a manhole. A six inch service entering an 8 inch or larger lateral must either be connected with a manhole or by means of a factory fitting with a manhole placed at property line. Eight inch diameter and larger services shall be connected to the lateral by use of a manhole. Connection to trunk lines, where permitted, shall be as directed by the City Engineer. In no case shall a connection be made with the use of a tee. A backwater valve may be required per 9-4(E).

C. **Connection to Service Sewer Line** - The Public Works Department, upon application for encroachment permit and payment of required fees, will construct all sewer taps for individual residential lots and commercial, multiple residential, and industrial developments. If existing laterals and manholes are to be utilized, the City shall install the service sewer under encroachment permit. A note to this effect shall be placed on any plan sheet which

indicates a connection to the existing system. City will provide inspection service under the encroachment permit for contractor installation of service sewer from tap to property line.

D. **Connection Limitations** - Service sewers shall not directly connect to 12-inch diameter or larger pipe or to lines more than 15-feet in depth without the approval of the City Engineer. Any connection to trunkline shall be by manhole only.

E. **Material** - If the service has less than three feet of cover measured from gutter flow line, Polyethylene Encased Pacific States Cast Iron Pipe Company Permaline Pipe, or other high strength pipe approved by the City Engineer, shall be used. In all other cases, the service shall be of the same material as the lateral to which it connects.

F. **Location** - When sanitary sewers are constructed as part of new subdivision improvements, a service sewer shall be constructed to each lot. In new subdivisions or developed areas, unless specifically requested otherwise in writing by the property owner or Consulting Engineer, sewer services shall be placed on the low side of any typical subdivision lot or similar parcel with two percent or greater slope across the front or shall be placed in the center of lots of lesser slope. Consideration shall be given to trees, improvements, etc., so as to minimize interference when the service sewer is extended to service the house.

If the property is located such that service is available both to a line located in an easement and also in right-of-way, service shall be at the latter location unless otherwise approved by the City Engineer. No service sewer shall be located such that future on-site construction will result in the line being in such proximity to a water well or water main or service that applicable health standards will be violated.

G. **Depth** - The Consulting Engineer shall verify the adequacy of the normal service sewer depth at the edge of easement or right-of-way to service the intended parcel. A depth of four feet to crown of pipe, measured from existing ground surface or edge of adjacent roadway, whichever is lower, shall be considered normal service sewer depth, except where the water main is to be installed at back of sidewalk as part of the subdivision improvements. In such cases, service shall have a minimum depth of cover at 4'-6" at property line (STD DWG SS-6). Whenever greater depth is required, the Consulting Engineer shall designate the invert elevation of the service sewer at the edge of the right-of-way or easement on the construction plans. If a joint trench is being utilized for other utilities, the Consulting Engineer shall indicate on the plans that a joint trench will exist and shall adjust service elevations as necessary. It shall be the responsibility of the Consulting Engineer to arrange for coordination of the grade of utilities located in the joint trench and the service sewers. The depth of the connection shall not exceed 14 feet.

H. **Special Requirements in Developed Areas** – In developed areas, if the project is installing sewer, a sewer service shall be provided for each non-project parcel which is within 200 feet of a project sewer lateral. The parcel owner's request for service location shall be honored whenever practicable. Parcels which have two or more sources of sewage must have an independent service sewer provided for each sewage source which can be separated from the rest of the parcel and sold. A service sewer shall be provide to each subdivision lot or lot similar as to size and possible development. At an early stage of design, the Consulting Engineer shall send every property owner affected by the proposed work a questionnaire requesting, in writing, the owner's preferred service sewer location. In absence of a response to this questionnaire, the Consulting Engineer shall provide a service sewer as required by this section. In addition, when service sewers are staked immediately prior to construction, each property owner shall be given notice that he should give consideration to the staked location of his service sewer and, if not satisfactory, immediately notify the Consulting Engineer. The date of notification, method of notification, nature of change, and

other pertinent information shall be recorded. Compilation of this information shall be the responsibility of the Consulting Engineer and the information shall be furnished to the City Engineer.

9-11 <u>CREEK CROSSING DESIGN</u> - Advance approval of the City Engineer and of other appropriate agencies is necessary to initiate design. The criteria for creek crossings are as follows:

A. **General** - In all cases, the proposed future creek bed elevation shall be used for design purposes. Crossing details of pipe, piers, anchorage, transition couplings, etc., shall be shown upon a detail sheet of the plans in large scale.

B. **Construction and Material** - For line sizes ten inches and smaller, ductile iron pipe, or other pipe material as approved by the City Engineer, shall be used under the full creek width, plus ten feet each side, unless the pipe is four feet or more below the creek bed elevation. For line sizes twelve inches and larger, pipe material shall be as directed by the City Engineer. Special care shall be taken to provide a firm base for the pipe bedding. The plans shall specify that all soft or organic material within the creek banks shall be replaced with select imported backfill. In addition, a layer of four inch to eight inch cobbles shall be placed and compacted on the top surface of the trench area for the full width of the creek. Unless otherwise directed, a clay or concrete plug shall be required at the top of the pipe at the downstream side of the crossing. The plug shall be a minimum of four feet in length, shall extend the full width of the trench, and shall extend twelve inches above and below the pipe.

C. **Design** - Calculations shall be submitted with the first plan check which clearly indicate the design of the pipe and supports regarding impact, horizontal and vertical forces, overturning, pier and anchorage reactions.

9-12 <u>BORING AND JACKING REQUIREMENTS</u> - Where use of a conductor casing is specified, the casing shall be welded steel pipe. The casing shall be of sufficient diameter to allow dry sand to be blown into the void between the carrier and the conductor and to allow adjustment of the carrier pipe to grade. Normally, an inside diameter six inches greater than the outside diameter of the couplings of the carrier pipe is sufficient. Welded steel conductor pipe shall have a minimum wall thickness of 1/4 inch for sizes up to and including 24 inches in diameter and 5/16 inches for sizes 27 inches to 36 inches in diameter.

Backfill in bore pits shall be given special attention with respect to preventing structural failure of the pipe entering or exiting the conductor, and adequate bedding and initial backfill shall be specified.

9-13 <u>PUMP STATION AND FORCE MAIN REQUIREMENTS</u> - Sewer pump station and force mains shall require preparation of a predesign report subject to review and approval of City Engineer. No sewer system shall rely on a pumping station without prior approval of the City Engineer. The plan sheets shall show the general layout and control system required for a typical acceptable sewage pump station. The plans shall show the testing required prior to acceptance of the pump station.

A. **Location/Access** - The minimum distance from the station to any existing or future home or other structure shall be 100 feet. Waiver of this requirement may be granted by the City Engineer if special circumstances warrant deviation. Adequate paved access must be furnished for vehicles of such size as may be necessary to deliver chlorine cylinders or to remove station equipment.

B. **Capacity** - Depending on the size of the service area and the extent of the development at the time of station design, the station's initial pumping capacity may be less than ultimate. In such an installation, allowances for larger or additional pumping equipment must be made

for future requirements. If the initial design capacity is in excess of anticipated initial flow, the effects of the minimum flow condition must be estimated to be sure that the retention of sewerage in the wet well will not create a nuisance and that the pumping equipment will operate with reasonable frequency. Peaking factor to be 3.5 times average dry weather flow (see Section 9-3).

C. **Wet Well** - The shape of the wet well and the detention time should be such that the deposition of solids is minimized and the sewerage does not become septic. The wet well may be required to be epoxy coated. The wet well shall be sized to provide 2 hours detention time for peak wet weather flow in case of power failure.

D. **Type** - For a permanent station, a factory-built unit or concrete structure with submersible pumps shall be used, depending upon station capacity. Temporary stations, if of limited size, may utilize manhole-installed submersible pumps, subject to approval of the City Engineer. Pump stations over 450 gpm shall be of wetwell/drywell type. In all stations, applicable safety codes shall be complied with, including but not limited to those pertaining to electrical installation, ventilation, and the location of railings and equipment guards.

E. **Pumps** - The pumping equipment shall consist of Flyght centrifugal sewage pumps or approved equal. Pump suction and discharge size shall be a minimum of 4-inch diameter. Maximum suction velocity shall be 5 ft/sec. Pumps shall be capable of passing 3 inch solids. Pump drive units shall normally be electric. A sufficient number of pumping units shall be installed such that station capacity can be maintained with any one unit out of service. Telemetry shall be included in the station control system as directed by the City Engineer. Pumps and wet well shall be sized to limit the number of pump starts to no more than eight in any hour period. If design flows exceed 450 gpm, 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.

F. **Controls** – Controls shall be solid state programmable controller such as Tesco Liquitronix or equal with level sensors, pump alternating, standby battery and charger. The battery shall be able to operate the controller for two weeks with the external power source removed. Bubbler type controls will not be accepted. An onsite alarm system with exterior light and horn with battery backup shall be provided. The alarm system shall include an automatic telephone dialer and alarm status display. Alarms shall be sent for low water, high water and power failure. The control system and electrical controls shall be contained within an above ground building compatible with the surrounding structures.

G. **Site Improvements** – Each pump station shall have paved access, parking, and work area around the wetwell, valve vaults, and control building to allow access for maintenance vehicles. The pump station shall be lighted. The pump station site, including wetwell rim shall be a minimum of 3 feet above any adjacent 100 year flood elevation. The pump station site shall be enclosed with a 6 foot chain link fence with vehicle access gate capable of being locked. Access to all underground vaults and manholes shall comply with the requirements of the California Occupational Safety and Health Administration (Cal-OSHA).

H. **Electrical** – All electrical installations shall comply with the National Electric Code and City of Lincoln Building and Electrical Codes. Electrical controls shall be enclosed in prefabricated cabinets and shall include running time meters (reset type) switches for hand/automatic/off operation. Pump stations shall have a permanent engine generator set installed with an automatic transfer switch.

I. **Station Piping** - Suction, discharge, and header piping within the station shall be sized to adequately handle flows. Piping less than 4-inches in diameter should not be used for

conveying sewage. Valves shall be located to allow proper equipment maintenance and operation and in such locations that they are readily accessible for maintenance.

J. **Odor Control** - If required, the station shall have equipment and/or space provided for the purpose of chlorinating the upstream gravity line and/or force main. Adequate provisions shall be made for the safe handling and storage of sodium hypochlorite containers. As an alternate for force main odor control, provisions shall be made, if directed, for introducing air into the main. To facilitate this, the force main shall be designed to maintain a continuous uphill grade, or, as a minimum, to be level. All force mains shall have a tap for introduction of either air or sodium hypochlorite whether or not the odor equipment is initially installed. Carbon filters or odor scrubbers may be necessary for control of odorous gases.

K. **Force Mains** - Force mains shall be designed such that velocities normally fall within a range from 3 to 5 feet per second. If initial capacity of the station is considerably less than ultimate, consideration should be given to the undesirable effect of extensive detention time within the force main. The feasibility of installing dual force mains to accommodate initial and ultimate flows should be investigated in such situations. Provisions should be made for introducing a cleaning pig into all force mains and for dewatering.

9-14 **SEWER IMPROVEMENT PLAN REQUIREMENTS** - Plans for the construction of sanitary sewers, whether in conjunction with other improvements or for a sewer project only, shall conform to the following standards as well as other standards contained in the General and Plan Sheet Requirements of the Improvement Standards.

A. **Study Map** - A study map may be required prior to review of the sewer design if there is a possibility that upstream or adjacent areas might require service through the subject property. The map should show the entire area including upstream tributary and adjacent areas, and all other data necessary to determine anticipated sewage flows. The method of sewering the entire service area, including pipe sizes and slopes, shall be shown to the extent necessary to determine the requirements within the subject property.

B. **General Requirements** - Plans for sewer improvement projects should include a layout sheet, plan and profile of each sewer line, and any necessary detail drawings. The plans must be clearly legible and conform to accepted practice with respect to drafting standards. All information which, in the opinion of the City Engineer, is necessary for the satisfactory design, review, construction, and maintenance of a project shall be provided and, where applicable, shall be shown on the plans.

C. **Layout Sheet** - All sewer improvement plans shall include an overall map which shows the project boundaries, sewer lines, manholes, flushing branches, and other important items of the work. Where pavement is to be cut in several locations, the pavement requirements shall be shown on the layout sheet.

A parcel of area which benefits from and financially participates in a sewer construction project, but is not included within the project boundaries, shall have a note to this effect placed on the layout map and on the plan and profile sheet if the parcel appears thereon. Parcels which make use of those facilities may be subject to additional fees at the time of connection, if the participation has not been so noted.

D. **Plan and Profile Sheets** - Sewers which are to be maintained by the City of Lincoln shall be shown on both plan and profile views on approved plan and profile paper. The following standards, with respect to drafting and the information to be included on the plan and profile sheets, generally apply to projects in developed areas. In new subdivisions, only the requirements which are applicable shall apply.

1. Sewer lines to be constructed shall be indicated on the profile by parallel lines spaced the pipe diameter. Manholes shall also be indicated by parallel lines spaced according to scale. Slope shall be printed 1/8 inch above, and preferably parallel to, the pipe line, or between the parallel lines. the length, size, and type of pipe material between each manhole shall be printed parallel to the horizontal grid lines and approximately halfway between the ground surface and pipe line. All pipe inverts at manholes and other structures shall be indicated on the profile. The invert elevations shall be printed parallel to the horizontal grid lines and shall be under scored by a line which then runs at a 45-degree angle to the corresponding pipe invert. When manholes, manholes with drop connections, flushing branches, or other appurtenances are to be constructed, the profile shall be so noted. Existing facilities shown on the profile shall be cross hatched. Manhole identification on the plan view may be oblique. Stationing shall appear at the lower edge of the profile grid directly under the manhole. Each manhole is to be assigned a number that will appear in both plan/profile and the cover sheet.

2. In developed areas, the location of each service sewer proposed to be constructed shall be indicated on the plans by stationing, or by reference to a permanent, well-defined structure, if available. In new subdivisions, the service sewers shall be located by stationing unless the situation exists, such as at the end of a cul-de-sac, where stationing is not an adequate description of location. In such cases a dimension to a lot line may be used. The invert elevation of the service sewer at its upstream end shall be shown on the plans whenever the standard depth is inadequate to serve the property. Standard depth shall conform to the conditions set forth in the Standard Drawings.

3. Both permanent and working easements shall be shown to scale on the plans and dimensioned.

4. The limiting maximum trench width, as measured at the top of the pipe, shall be shown on the plans between well-defined points of application; the pipe material and class, if more than one class is available; and the bedding-backfill type. If more than one combination of pipe material or class, maximum limiting trench width, or bedding type is available, a practical range of such combinations shall be shown on the plans.

5. Proposed sewer lines shall be adequately dimensioned from street centerline. If the sewer is to be located in an easement, sufficient dimensions and bearings from physical features to locate the line in the field shall be shown on the plans.

6. Gas, water, storm sewers, and all other main utility lines above or below ground shall be determined and shown on the plans with accuracy as great as practicable. The location of any utility line which is parallel to and within five feet of the sewer line or which crosses the sewer line at an angle of 30 degrees or less shall be determined with an accuracy of ± 1.0 foot and the clearance shown on the plans. Service lines such as water and gas normally need not be shown.

7. Trees and other objects within 10 feet of construction centerline shall have their correct location shown on the plans and the clearance from construction centerline shown. The diameter of tree trunks and interfering heavy tree branches shall be noted. Removal of a tree or object, or other special handling shall be noted on the plans. the Consulting Engineer shall assume full responsibility for such notes as it is assumed that he has made all necessary arrangements with the owner of the

object to be handled. Written documentation of any special arrangements regarding preservation of property made between property owners and the Consulting Engineer shall be supplied to the City Engineer if no easement document is involved. If an easement is negotiated, all special arrangements are to be included in the easement document. Tree removal must be approved by the Planning Department.

8. Culverts shall be shown on both plan and profile when crossed by the construction or when parallel and within 20 feet of the construction line. The size and type of all such culverts shall be indicated and when the culvert crosses or is perpendicular or nearly so and within 20 feet of the construction line, the invert of the culvert end nearest the construction line shall be shown.

E. **Detail Drawings** - Items of a special nature should be shown with detail drawings, either on the plan sheets, or on a separate detail sheet.

F. **Connection to Existing Facilities Where Bypassing or Stoppage of Existing Flow Will be Required** - When improvement plans require connection to an existing facility which will require bypassing or stoppage of existing flows, a note shall be placed on the plans which provides an estimate of the existing flow to be bypassed (gpm), and the times between which the flow may be stopped. Coordination with the Public Works Department is required in developing these numbers. The note shall also require the contractor to contact the City Engineer at least 72 hours prior to initiating the bypass/stoppage operation so the temporary facilities and equipment can be evaluated for adequacy. Where the passing/stoppage operation will be accomplished on a major trunk or interceptor, a work plan shall be submitted to the City Engineer at least 72 hours prior to the proposed initiation of the operation. The City Engineer's approval of the work plan is required for the operation to proceed. All equipment shall be onsite and operational prior to bypass work.

9-15 **MULTI-PARCEL COMMERCIAL AND INDUSTRIAL DEVELOPMENTS** - The "on-site" sanitary sewers for all new commercial and industrial developments containing more than one parcel, shall be designed in accordance with the requirements contained in these standards unless otherwise specified by the City Engineer. Each separate parcel within a multi-parcel commercial or industrial development shall have its own separate connection to the public sewer system.

This section shall be applied to all commercial/ industrial developments which are initially approved as a single parcel development and are subdivided after the date of adoption of this manual.

SECTION 10

DRAINAGE

10-1 **GENERAL** - This section is formulated to clearly define acceptable drainage analysis and design criteria for development in the City of Lincoln. Drainage facets not covered in this section shall conform to the Placer County Flood Control and Water Conservation District "Stormwater Management Manual", latest edition, and good engineering practice.

10-2 **CITY POLICY AND REQUIREMENTS** - All residential lots shall have minimum pad elevations of 1 foot above the 100 year water surface elevation and all commercial sites have shall their finished floor elevation a minimum of 1 foot above the 100 year water surface elevation assuming failure of the drainage system. This requires the Consulting Engineer to provide an overland release for all projects or provide storage for the 100 year event.

The overland release path shall be constructed in a manner to transport the peak rate of runoff from the 100 year frequency storm through the site assuming all storm drains are inoperative, all upstream areas are fully developed, and that antecedent rainfall has saturated the tributary watershed. Streets, parking lots, playgrounds, pedestrian areas, pedestrian walkways, utility easements, and other open space areas may be considered compatible uses within the overland release path.

Residential lots developed in or adjacent to a designated flood plain shall have pad elevations a minimum of two feet above the City's 100 year flood plain. Non-residential projects shall have finished floor elevations a minimum of two feet above the City's 100 year flood plain. Elevation Certificates are required for all such lots. In the case of no-grade or contour grade lots, pad elevations as described above do not apply as these lots will not be padded out. In such cases, a Minimum Finished Floor Elevation Guarantee letter shall be submitted to the City Engineer prior to plan approval for those lots which may become inundated. Said floor elevations shall meet the minimum requirements for pad elevations as described above.

If a tentative project is submitted which shows fill or other significant improvements within the 100-year floodplain based upon the best available information, a hydraulic study shall be required to determine the effect of the encroachment on the floodplain. The developer should contact the City Engineer to ascertain what existing studies, if available should be used as a base model for the proposed development. The developer's engineer is responsible for assembling the necessary data and presenting the completed study to the City for review and evaluation. The study should reflect ultimate conditions of the watershed. See Section 2 for submittal requirements.

Except for single family or duplex residential lots, site drainage shall be collected on-site and conveyed via an underground storm drain system to an approved storm drainage system without flowing into existing street gutters or existing roadside ditches. In the event an oil/grit separator for the storm drain system is required as a mitigation measure in an environmental document appurtenant to the project, the separator shall be located on-site and the maintenance of the separator shall be the landowner's responsibility.

10-3 **FEDERAL FLOOD PROGRAM** - The City of Lincoln is a participant on the National Flood Insurance Program and all development in the City shall comply with the regulations of the City of Lincoln Flood Damage Prevention Ordinance and the Federal Emergency Management Agency (FEMA).

TABLE 10-1
ALLOWABLE STREET ENCROACHMENTS

TYPE	PROFILE	10 YEAR STORM	25 YEAR STORM	100 YEAR STORM
LOCAL	Continuous grade, uphill and downhill.	Traveled way is open to travel and does not carry storm water.	Storm water elevation does not exceed top back of sidewalk. Maximum depth in traveled way – 6".	Maximum storm water elevation is 4" above the top back of curb.
	Sag Points	Storm water elevation does not exceed top back of curb or sidewalk.	Storm water elevation does not exceed 4" above the top back of curb. Maximum depth in traveled way – 6".	Storm water is a minimum of one foot below building pads. Ponding does not exceed more than 120' from inlet along any street segment or more than 6" above centerline.
COLLECTOR	Continuous grade, uphill and downhill	Traveled way is open to travel and does not carry storm water.	Storm water elevation does not exceed top back of sidewalk. Maximum depth in traveled way – 6".	Storm water flow is contained within the right of way. The center 12 feet of roadway shall remain clear of storm water.
	Sag Points	Storm water elevation does not exceed top back of curb or sidewalk. Traveled way shall be dry.	Storm water elevation does not exceed 4" above the top back of curb. Maximum depth in traveled way – 6".	Storm water flow is contained within the right of way. The center 12' of roadway shall remain clear of storm water. Maximum depth over sidewalk or curb – 6".
ARTERIAL & EXPRESSWAY	Continuous grade, uphill and downhill.	All travel lanes clear of storm water. Storm water does not exceed top back of curb or sidewalk.		Center travel lanes are clear of storm water flow. Storm flow contained within the right of way. Maximum depth over sidewalk – 6".

Amendments of the FEMA flood maps will be required of all new developments located in a FEMA flood zone. Petitions for a Letter of Map Amendment, including any fee required by FEMA, shall be submitted to the Public Works Department prior to approval of improvement or site plans.

10-4 **DRAINAGE DIVERSIONS** - The diversion of natural drainage is allowable only within the limits of the proposed improvement. All drainage must enter and leave the improved area at its original horizontal and vertical condition unless an agreement, approved by the City Attorney, has been executed with the adjoining property owners. Temporary drainage diversions during construction shall be approved by the City Engineer and shall be located and constructed in such a fashion as to permit their removal when necessary for the prevention of damage to adjoining properties.

10-5 **STORM DRAIN LOCATION AND ALIGNMENT REQUIREMENTS** - Location and alignment criteria are as follows:

A. **General** - All storm drains shall be placed in rights-of-way dedicated for public streets unless the use of easements is specifically approved by the City Engineer. On crossing, water lines shall be at least 12 inches above the storm drain line.

B. **Location in New Subdivision** – In new subdivisions, storm drains shall be located five feet north or west of street centerlines within minor and primary residential streets, unless approved otherwise by the City Engineer.

C. **Location in Existing Streets** – When storm drains are to be installed in an existing street, factors such as curbs, gutters, sidewalks, traffic conditions, traffic lane conditions, pavement conditions, future street improvement plans, and existing utilities shall all be considered. The approval of the City Engineer shall be obtained in every instance.

D. **Location in Unpaved Areas** – See Section 5-9 (I) of Improvement Standards. All manholes shall be accessible for maintenance vehicles by way of a paved access road at least 12 feet wide. A flat area 10 feet in diameter shall also be paved around each manhole. Any access road longer than 250 feet or with turns shall have a paved turnaround.

E. **Easements** - If it is necessary to install a storm drain outside of the public right of way, or within a narrow right of way, an easement dedication to the City shall be required. Temporary working easements of adequate dimensions shall be provided to allow the construction within the permanent easement to be completed in a safe and reasonable manner. Easements shall be totally on one side of the property line or fence. Easements for drain lines shall meet both of the following width criteria:

1. Minimum width of easement shall be 15 feet.

2. All easements shall have a minimum width equal to the required trench width according to the standard detail for trench backfill plus two additional feet of width for every foot of depth of the pipe as measured from the bottom of the pipe to finished grade. All sewer lines shall be centered within their easement. Final easement width shall be approved by the City Engineer.

3. Easements adjacent to property lines shall be located entirely on one parcel.

4. Drainage easements for open channels shall have a sufficient width to contain the channel, fencing where required, and a 12-foot wide service road. A service road may not be required where the channel bottom is lined and a suitable access ramp is provided.

5. Where minor improvement of a channel falls on adjacent property (such as day lighting a ditch profile) a notarized right-of-entry from the adjacent property owner(s) for such construction shall be required. A copy of the document which grants such approval shall be submitted to the City Engineer prior to the approval of the improvement plans.

10-6 **DRAINAGE CAPACITY/DESIGN** - All drainage systems shall be designed to accommodate the ultimate development of the entire upstream watershed. The ten year frequency storm shall be used in the design of the underground drainage system. In addition, the allowable street encroachments specified in Table 10-1 shall be maintained unless a different criteria is permitted by the City Engineer.

The Consulting Engineer shall design a grading plan which ensures that storm waters flow through a development in a manner that will not flood structures in the event of failure or overloading of the drainage system. All projects shall provide an overland release assuming a non-functioning storm drain system during a 100-year event, and all building pad or floors shall have at least one foot of freeboard.

10-7 **DESIGN RUNOFF** - The determination of runoff quantities and methods used shall be as specified in the most recent edition of the Placer County Flood Control and Water Conservation District's "Stormwater Management Manual". This method is based on a relationship between the characteristic watershed response time and peak flow per unit area from precipitational patterns typical for the region and provides a rapid evaluation of the peak flow rate from small watersheds (less than 200 acres). For watersheds larger than 200 acres, a HEC-1 analysis shall be provided conforming to the requirements of the most recent edition of the Placer County Flood Control and Water Conservation District "Stormwater Management Manual".

A. **Criteria** - Peak flow is a product of watershed area and peak discharge per unit area which, in turn, is a function of a computed response time.

$$Q_p = qA \qquad \text{[Equation 10-1]}$$

Where:

Q_p = peak discharge (cfs)
q = unit peak discharge (cfs/acre)
A = area (acres)

B. **Response Time** - Response time (t_r) is an indication of the response time of the watershed to intense precipitation. It is determined as the sum of separate response times for a path consisting of the initial, overland sheet flow and succeeding collector flows from the most hydraulically remote location in the watershed to the watershed outlet.

1. Overland Flow - Overland flow includes flow over planar surfaces such as roofs, streets, lawns, parking lots and fields. The overland flow length is not always well defined in natural areas, but usually becomes concentrated in shallow rivulets or swales within no more than 300 feet. In areas with development, the point at which the overland flow is concentrated in a collector, such as a gutter or pipe, is usually identifiable. Acceptable overland flow response times for various land uses are as follows. These times should be reduced to 0.90 * t_{ro} in 25 year events and 0.70 in 100 year events.

LAND USE	OVERLAND RESPONSE TIME
Single-Family Residential	15 minutes maximum
Multiple Family w/ Landscaping	10 minutes maximum
Commercial	10 minutes maximum

Equation 10-2 is used to estimate the overland flow component of response time.

$$t_{ro} = \frac{.355(nL)^{0.6}}{s^{0.3}} \qquad \text{[Equation 10-2]}$$

Where:

t_{ro} = overland response time (minutes)
n = Manning's roughness coefficient (Table 10-2)
L = flow length (feet)
s = slope of surface (feet/feet)

TABLE 10-2

SURFACE		n
Smooth surfaces (concrete, asphalt, or bare soil)		0.11
Grass:	Short Grass Prairie	0.15
	Dense Grasses	0.24
	Bermuda Grass	0.40
Poor grass cover on moderately rough surface		0.40
Woods with underbrush		0.40 - 0.80

2. Collector Flow - Manning's equation shall be used for estimating collector response time (t_{rc}). The velocity computed for open channel flows using Manning's equation shall be increased by an adjustment factor as follows to account for celerity:

CHANNEL SECTION	CELERITY FACTOR
Triangular	1.33
Wide Rectangular	1.67

In natural watersheds, it may be appropriate to use higher values of Manning's n for the initial collector where the flow is shallow.

C. **Unit Peak Discharge** - Unit peak discharge is computed from the response time, t_r , and equation 10-3 as follows:

$$q = c_0 t_r^{c_1} \qquad \text{[Equation 10-3]}$$

Where:

q = peak unit discharge (cfs/acre)
t_r = $t_{ro} + t_{rc}$ = response time (minutes)
C_0 , C_1 = coefficient from Table 10-3

TABLE 10-3
COEFFICIENT FOR UNIT PEAK DISCHARGE

RETURN PERIOD (yrs)	t_r < 20 minutes C_0	C_1	t_r > 20 minutes C_0	C_1
10	5.80	-0.50	17.80	-0.87
25	7.54	-0.50	23.14	-0.87
100	9.28	-0.50	28.48	-0.87

D. **Infiltration Factor** - The effect of infiltration is reflected in the infiltration factor F_i. F_i is found from the infiltration rate and Equation 10-4 as follows:

$$F_i = 1.7I \qquad \text{[Equation 10-4]}$$

Where:

F_i = infiltration factor (cfs/acre)
I = infiltration rate (inches/hour, Table 10-4)

TABLE 10-4
INFILTRATION RATES FOR URBAN COVERS

COVER TYPE	QUALITY OF COVER	SOIL GROUP A	B	C	D
Residential or Commercial Landscaping	Good	.48	.25	.16	.12
Open Space	Poor	.26	.09	.06	.04
	Fair	.31	.16	.09	.07
	Good	.41	.22	.12	.09
Streets and Roads:					
Paved with open ditches	Poor	.07	.06	.03	.02
Gravel	Fair	.11	.06	.04	.03
Dirt	Good	.14	.08	.05	.04

Most soils within the City of Lincoln are of Soil Group D. If the Consulting Engineer feels that the soil group in the area of development is of a different group, he must supply additional information to substantiate his assumption.

1. Soil Groups - The Soil Conservation Service (SCS) classifies soil into four hydrologic soils groups. Soils maps and soil surveys of the City are available for inspection at the Placer County Resource Conservation District and the Flood Control District.

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

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

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

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

E. **Connecting Separately Connected Areas** - When both pervious and connected, impervious overland flow areas are present, the estimate of combined flow is computed as a weighted adjustment to the peak unit runoff as follows in Equation 10-5:

$$Q_p = qA - A_p F_i \qquad \text{[Equation 10-5]}$$

Where:

Q_p = peak flow (cfs)
A = total watershed area (acres)
q = unit peak runoff (cfs/acre)
F_i = infiltration factor (cfs/acre)
A_p = pervious area (acres)

F. **Procedure** - The following procedures shall be used in determination of design runoff.

1. Determine the typical pervious and connected impervious flow paths with the longest response time.

2. Determine the total response time for the shed being analyzed combining the overland flow elements and their common collector.

3. Determine unit peak discharge for the shed area using Equation 10-3.

4. Determine the pervious infiltration factor using equation 10-4.

5. Compute the total peak flow using equation 10-5.

10-8 **<u>EXAMPLE USING PLACER COUNTY STORM DRAINAGE METHOD</u>** - For this example, the following assumptions were made:

A. Lots have constant slope of one percent.
B. Lots have bermuda grass ground cover.
C. Average elevation of subdivision is 200 feet.
D. Class D soils

E. Area = 65% impervious, 35% pervious.

Step 1 Determine overland response time t_{ro} as follows:

Overland flow length = 160'
Bermuda grass cover, n = 0.24
Slope = 1%

Equation 10-2 gives:

t_{ro} = 12.6 minutes

Step 2 Determine collector flow, t_{rc}, as follows:

Collector flow to inlet is assumed to be gutter flow. Gutter flow velocity = 2.0 fps.

t_{rc} = 420 ft / 2 fps = 3.5 minutes.

Step 3 Response time $t_r = t_{ro} + t_{rc}$ = 16.1 minutes

Determine the unit peak discharge for ten year storm from equation 10-3:

t_r = 16.1 minutes
C_0 = 5.8
C_1 = -0.50
q = 1.45 cfs/acre

Step 4 Determine infiltration factor:

Elevation = 200 feet
Class D soils, residential landscaping with good cover, Infiltration factor = .12 (Table 10-5)

From equation 10-4, F_i = .21

Step 5 Compute total peak flow:

Pervious area = (0.35)(1.4) = .49 acres
Q_p = 1.4(1.45) - .49(.21) = 1.93 cfs

This establishes flow into the drainage system. From this point, the time within the conduit is added to both the impervious and pervious response times and conduits are sized appropriately.

10-9 **HYDRAULICS** - All storm drain pipelines and open channels shall be designed to convey the design runoff calculated per Section 10-7 and shall conform to the following requirements:

A. **Hydraulic Grade Line** - For the 10 year frequency storm, the hydraulic grade line shall be a minimum of one foot below all inlet grates and manhole covers of all structure of the upstream system. The hydraulic grade line shall be shown on the plans when it is above the top of the pipe.

B. **Manning's Formula** - The "n" value used in Manning's formula shall conform to the following:

1. Manning's formula shall be used to compute capacities of all open and closed conduits other than culverts.

2. A minimum "n" value of 0.015 shall be used for sizing conduits.

3. Minimum velocity in closed conduits shall be 2 feet per second. Maximum velocity shall be 12 feet per second. Velocities shall be based on full flow conditions.

10-10 **CLOSED CONDUITS** - The specific type of pipe or alternate pipe to be used in any development shall be shown on the plans. If the developer proposes to use any type of pipe not shown on the approved plans, the plans shall be resubmitted to the City Engineer for approval.

A. **Size and Material** - Drainage systems to be maintained by the City of Lincoln shall be constructed of the following materials for the specific purposes specified:

1. Precast Reinforced Concrete Pipe (RCP) - will be allowed in all cases. Class of pipe shall be based upon depth as detailed in the Standard Drawings. Class 4 RCP shall be used unless indicated otherwise on the plans.

2. Cast-in-Place Concrete Pipe - will be allowed in all cases.

3. Corrugated Steel Pipe - Culverts 60 inches in diameter and larger and located outside of the traveled way may be corrugated steel pipe, subject to approval of the City Engineer. Aluminum pipe is not allowed. When steel pipe is to be constructed, it shall be designed for a service life of 100 years in accordance with the methods specified in Section 7-851.3 of the California Department of Transportation Highway Design Manual. The Consulting Engineer shall provide certified copies of the laboratory report giving the results of pH and resistivity tests. The report shall also include a map showing the location of each site where samples are taken.

   Unless otherwise specified by the City Engineer, a minimum of two soil samples shall be taken for the first 100 lineal feet of pipe or fraction thereof on a project with a minimum of one additional sample being required for each additional 1000 feet of pipe or fraction thereof. The samples shall be taken along the approximate alignment and at the approximate depth of the pipe to be installed.

4. Acrylonitrile-Butadiene-Sturene (ABS) - For pipe 15" in diameter and smaller, ABS pipe, conforming to and meeting the requirements of ASTM Designation D2680, may be used. The City Engineer may require certification by the manufacturer that the test results comply with the specification requirements.

5. Polyvinyl Chloride Pipe - may be used conforming to one of the following specifications:

DIAMETER	ASTM DESIGNATION
10 inches thru 15 inches	D 3034 , SDR 35
18 inches thru 27 inches	F794 , F2241 , SDR 51
30 inches thru 48 inches	F794

6. High Density Polyethylene Pipe (HDPE) – May be used with written permission by the City Engineer.

The minimum allowable pipe diameter for any storm drain in the public right of way shall be 12 inches. Onsite (private) drainage systems may use a minimum size of 8 inches.

B. **Cover Requirements** - All cover requirements are as shown in the Standard Drawings or per the manufacturer's specifications. At locations where the standard minimum cover requirements cannot be obtained, the conduit shall be either encased in concrete or provided with a concrete cover or another method as approved by the City Engineer.

In fill areas, or in areas with poor soil conditions where it is anticipated that a good, firm, vertical-walled trench cannot be constructed the Consulting Engineer shall design the pipe structural requirements in accordance with good engineering practice. If trench conditions are uncertain, a note shall be placed on the plans making it the contractor's responsibility to place the proper strength pipe if poor trench conditions are encountered.

C. **Alignment** - Pipelines for storm drainage shall have a constant slope between manholes, junction boxes, and or catch basins. Minimum radius of curvature shall be 200 feet. In no case shall the radius of curvature be less than the manufacturer's recommendations for the particular pipe size under consideration.

Drainage pipelines shall be located in the street whenever possible. The location of storm drainage pipelines in new streets shall be 5 feet north or west of and parallel with the street centerline of the street. Meandering and unnecessary angular changes of pipeline shall be avoided. Angular changes in alignment shall not be less than 90 degrees with the downstream section of the storm drain main. All laterals intersecting with the mainline shall have an alignment that provides an intersection with the downstream section of the storm drain main of no less than 90 degrees.

When storm drainage lines are to be placed in existing streets, factors such as curbs, gutters, sidewalks, traffic conditions, pavement conditions, future street improvement plans, and existing utilities shall be considered.

Open ditches, lined channels, swales, and flood plain areas shall be maintained as nearly as possible in their existing alignment. When an open ditch is to be constructed parallel to an existing roadway, the ditch shall be constructed outside the proposed right of way of the ultimate street development.

10-11 **MANHOLES** - Standard precast concrete manholes shall be constructed as required. Where special manholes or junction boxes are required, the design must be approved by the City Engineer. In no case will junction boxes or manholes be allowed which are smaller than 48 inches inside diameter. Manholes shall be located at junction points, changes in gradient and changes in conduit size. Manholes or junction boxes will not be required for a reach of pipe (18 inch diameter or less) not greater than 80 feet in length that is to be connected to a 36 inch or larger diameter pipe, subject to approval of the City Engineer. The spacing of manholes shall not exceed 500 feet. The spacing of manholes shall be nearly equal whenever possible.

A. **Saddle Manholes** - Saddle manholes may be constructed on storm drain conduit 36 inches or greater in diameter provided that no junction exists with any other storm drain conduit.

B. **Covers** - All manholes and junction boxes, other than inlets, shall have standard manhole covers per the Standard Drawings. No pipe will be allowed to enter a manhole in the transition portion of the manhole cone. Manholes will not be allowed in gutter flow line

except where approved by the City Engineer. Slotted manhole covers may be used to pick up minor drainage in non-traffic areas.

10-12 **INLETS** - Drop inlets in streets shall be located at lot lines in residential subdivisions except at intersections, where they shall be placed at curb returns. Inlets shall be placed such that the length of flow in the gutter does not exceed 500 feet unless approved by City Engineer. The depth of flow in the gutter at the inlet shall not exceed 0.35 feet based on inlet capacity in a ten year storm and shall not encroach into the traveled ways as specified in Table 10-1 for other design storms. The runoff volume shall include any flow that by-passes upstream grates.

All inlets located within the City right of way or easements shall be Type "B" unless indicated otherwise on the plans. Inlets may be modified for use without curb sections for on-site drainage. Where an inlet is proposed in public streets and sidewalk is not constructed adjacent to the back of curb, a concrete collar shall be placed behind the inlet. Type C inlets may be used as junction inlets if the flow line is 4 feet or less below the grate elevation. A one-foot sump shall be constructed in a drop inlet discharging to an open space or waterway.

Drop inlets draining public streets may be connected directly to a trunk line 36-inches in diameter or larger by means of a lateral not exceeding 18-inches in diameter and 80 feet in length.

10-13 **JUNCTION BOXES** - The requirements for junction boxes are as follows:

A. Junction boxes shall be constructed of reinforced concrete or fabricated from reinforced concrete pipe section where size limitations permit. Structural calculations shall be provided for all junction boxes.

B. Minimum wall thickness for reinforced concrete junction boxes shall be 6 inches.

C. The inside dimension of junction boxes shall be such as to provide a minimum of three inches clearance on the outside diameter of the largest pipe in each face. All junction boxes shall be rectangular in shape unless otherwise approved by the City Engineer. Junction boxes deeper than 4 feet shall have a minimum dimension of 48 inches.

10-14 **INLET AND OUTLET STRUCTURES** - The requirement for these facilities are as follows:

A. **Headwalls, Wingwalls, and Endwalls** - All headwalls, wingwalls, endwalls, preformed end sections, guard rails and bank protection shall be considered individually and shall be, in general, designed in accordance with the Standard Specifications and Standard Plans of the California Department of Transportation.

Metal beam guard rails or chain link fencing may be required by the City Engineer at culverts, headwalls, box culverts, and on steep side slopes.

B. **Trash Racks and Access Control Racks** - Trash racks will be provided where they are necessary to prevent clogging of culverts, storm drains, and to eliminate hazards.

Access control racks shall be required on all pipes 24 inches or larger in diameter.

10-15 **DRAINAGE PUMPS** - Drainage pumps shall be avoided whenever possible, and used only with specific approval of the City Engineer. If the use of drainage pumps is permitted, the drainage system shall be designed so as 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 may be used provided specific approval is granted by the City Engineer.

A. **Design Requirements** - Pumping installations shall be designed to accommodate a design storm as specified by the City Engineer. When a station contains a gravity discharge, pumping capacity must be equal to the design inflow. When the station does not have a gravity discharge, pumping units must be designed to furnish 100 percent capacity with any one pump out. Any deviation from this criteria must receive the specific approval of the City Engineer.

Pumping stations shall be designed so that gravity flow does not pass through the pump pit. No motor overload condition shall exist at any sump or flow condition. This does not preclude high sump design if low sump condition does not create an overload.
Each pumping stations shall receive separate approval for the electrical system, piping system, housing installation and other miscellaneous design features. The electrical system for drainage pumps shall conform to the electrical code and the State Department of Transportation Standards.

B. **Maintenance Requirements** - Adequate access shall be provided for cleaning the pump sump. Trash racks shall be provided upstream from the pumping plant. Provisions shall be made for easy cleaning of the trash racks. Hatch covers, where used, shall be of raised pattern aluminum floor plate, or other approved lightweight cover. Dissimilar metals shall be insulated from each other when necessary. Ladder rungs, where used, shall be of a non-slip variety. All drainage pumping plant sites shall be fenced with 6 foot chain link fence with barbed wire extension arms.

10-16 **CHANNELS AND OUTFALL DESIGN** - Drainage shall be conveyed in an open channel if the volume of flow exceeds 200 cfs in a 10-year event or if the drainage area exceeds 300 acres. Residential lots adjacent to open channels shall have minimum pad elevations of 2.5-feet above the 100-year water surface elevation. Non-residential lots shall have their finished floor elevation 2.5-feet above the 100-year water surface elevation.

A. **Design Requirements** - Channels shall be constructed to a typical cross section. Fully lined channels shall be designed with maximum side slopes of 1:1. Channels with unlined sides shall be designed with maximum side slopes of 2:1 or as specified by the Geotechnical Engineer based on existing soil conditions. Lined channels shall have a minimum bottom width of 6 feet. Channel lining shall be either finished concrete, sacked concrete, or doweled and sacked concrete. The minimum weight of sacked concrete shall be 60 pounds per bag. Natural channels shall be designed with an n value of 0.055.

All open channels shall be designed to carry the 100 year frequency design storm. The hydraulic grade line of the 10 and 100 year storms shall be calculated and plotted on all channel profiles. Freeboard shall be a minimum of 2.5 feet for the 100 year event and shall comply with the latest FEMA regulations. The velocity range shall be 2.5 to 6.0 feet per second in unlined open channels and 3.0 to 12.0 feet per second in lined open channels. All computations shall be clearly documented and submitted to the City Engineer for approval.

For all channels, either realigned or natural, the following shall be shown on the improvement plans in addition to the information heretofore required:

1. The profile of existing channels shall be shown for a minimum of 1000 feet at each end of the development on the construction plan to establish a minimum profile grade.

2. Typical sections and cross sections.

B. **Interceptor Ditches** - Interceptor ditches or approved alternates shall be placed at the top of the cut or bank where deemed necessary by the City Engineer to prevent erosion of the channel bank. Runoff shall not be allowed to sheet flow over the top of banks.

C. **Outfall Profiles** - All drainage outfalls shall be shown both in plan and profile on the improvement plans for a distance of 1000 feet or until a definite "daylight" condition is established. All drainage ditches upstream of the improvement shall be shown on the plan and profile sheets for a distance of at least 500 feet or until an average profile grade through the improvement is established. The profiles shall include ditch flow line and top of bank elevations.

When improvements have more than one unit, the drainage outfall shall be shown as extending to the property boundary, and beyond if required, although it may not be constructed with the current unit development. All temporary outfalls shall be shown both in plan and profile on the improvement plans.

D. **Fencing** - Channels exceeding three feet in depth and with side slopes steeper than 3:1 shall be fenced with a six foot high chain link fence per Section 80-4 of the Caltrans Standard Specifications. In all other areas fencing shall be placed as specified by the City Engineer. Fences shall be located 6 inches inside the drainage easement lines and a minimum of 12 inches from the top of bank. No fencing shall be allowed within the floodway of an open watercourse without the approval of the City Engineer. Special requirements shall be specified by the City Engineer for fencing within the 100 year floodplain of any open watercourse.

Drive gates shall be provided with a minimum width of 12 feet. A minimum 4 foot wide walk gate shall also be provided.

E. **Access Roads** - An all weather access road consisting of six inches of compacted AB shall be provided adjacent to all channels and outfall ditches to the satisfaction of the City Engineer. Access roads shall have a minimum width of 12 feet and shall provide bulb at end for turning movements.

10-17 **CROSS CULVERTS** - This section states the criteria for relatively short circular or box culverts for transverse crossings: typically road or railroad embankments. Cross culverts shall be of reinforced concrete or corrugated steel pipe as specified in Section 10-9.

Cross culvert profiles will be determined on an examination of the channel for a minimum distance of 1000 feet each side of the installation.

Driveway culverts shall be approved by the city for size, grade, alignment and type. Driveway culverts will not be allowed unless the City has agreed to defer the construction of curb and gutter except for temporary construction access.

A. **DESIGN STORM** - Cross culvert size shall be determined on the basis of runoff as specified in the hydrology portion of this section. Cross culverts, in general, shall be designed for a 25 year storm with no head on the inlets. They shall also be sized such that no serious damage will be incurred due to ponding as a result of a 100 year event. A flood easement shall be provided for all areas impacted due to upstream ponding. Culverts across arterials shall be sized for the 100 year storm with a minimum of 1 foot of freeboard. Minimum size of cross culvert shall be 18-inches.

B. **COMPUTATION OF FLOW** - Inlet or outlet conditions control flow in transverse culverts. In culverts operating under inlet control, the cross-sectional area of the culvert barrel, the inlet

geometry and the amount of headwater at the entrance are of primary importance. Outlet control involves the additional consideration of the elevation of the tailwater in the outlet channel and the slope, roughness and length of the culvert barrel.

Anticipated downstream flow depth and allowable headwater depth govern the available head on culverts. The type of flow under which a culvert will operate may be determined from a given set of conditions. This may be avoided by computing headwater depths from the charts in this section for both inlet and outlet control and then using the higher value to indicate the type of control and to determine the headwater depth. This method of determining the type of control Is accurate except for a few cases where the headwater depth is approximately the same for both type of control. The nomographs provided in this section shall be used for culvert design with uniform barrels. Where barrel sizes or entrance configurations differ between barrels, written calculations shall be provided to the satisfaction of the City Engineer.

The roughness coefficient, n, can be adjusted for the nomographs by use of the following equation:

$$L_1 = L * [\frac{n_1}{n}]^2 \qquad \text{[Equation 10-6]}$$

10-18 **STORM WATER QUALITY** – All developments are required to provide both during construction and ongoing basis. Storm water treatment during construction is discussed in Section 11-15(F) Grading, Erosion and Sedimentation Control. Ongoing treatment requirements are addressed in this section.

A. **Criteria** – Storm water treatment must be provided for a volume equal to 2 inches of rainfall over the entire watershed, prior to discharge into a natural stream channel. This is approximately equal to a 2 year frequency 6 hour storm.

B. **Treatment Control Measures** – These are several measures being used around the country that have been found to be effective. Choosing the best method will depend on factors such as quantity of storm water to be treated, maintenance requirements, hydraulic characteristics of the system, and type of pollutants to remove. The consulting engineer is referred to the "California Storm Water Best Management Practices Handbooks" for municipal, commercial/industrial, and construction activities prepared for the Storm Water Quality Task Force, and the "Guidance Manual for On Site Storm Water Quality Control Measures" by the City and County of Sacramento.

C. **Design** – The Consulting Engineer shall prepare a water quality master plan showing location and approximately size of facilities. Calculations shall accompany the design review submittal which justify the design of the treatment control measure. Design of the storm drain system and treatment control measure shall include a bypass capability so that only the flow to be treated is diverted to the treatment control measure.

D. **Construction** – The treatment control measure must be completed and functioning prior to acceptance of project improvements.

SECTION 11

GRADING

11-1 **INTRODUCTION** - The City's authority to regulate grading on private property varies depending on the property's location. For properties located within Specific Plan areas of the City, the authority is provided by the zoning ordinance for the Specific Plan area. For properties which are not located within a Specific Plan area, the City's authority for regulating grading is provided by Chapter 70 of the Uniform Building Code (UBC). The UBC requires that a grading permit be obtained from the City prior to beginning any grading work unless the work meets certain exemptions specified in the UBC. This is necessary to ensure that on-site drainage is adequately accommodated, off-site drainage is conveyed through the project, the proposed grading is compatible with adjacent property topography, and adequate erosion and sedimentation control measures are addressed.

This Section specifies design and plan submittal requirements of grading plans for private developments. It includes items pertinent for the City's review and reflects established professional engineering practice for preparation of grading plans. Questions and clarifications regarding this Section should be directed to the City Engineer. For grading plan submittal requirements see Section 2-7.

Two types of grading plans are reviewed by the City: finished grading plans and rough grading plans. Finished grading plans shall be submitted as part of the improvement plans for a project. Finished grading requirements shall be as specified in Section 11-3. Rough grading plans may be submitted separately from and may be approved prior to improvement plans unless prohibited by the Conditions of Approval for the project. The plans should detail only preliminary grading of a site. The design shall not allow for construction of any improvements (storm drains, streets, curbs, gutters, etc.) and shall indicate positive drainage flow except in those instances provided on the plans for erosion and/or sedimentation control. Rough grading requirements shall be as specified in Section 11-4.

11-2 **PREPARATION** - All grading plans shall be prepared by or under the direction of a Registered Civil Engineer. All sheets shall be stamped and signed by a Registered Civil Engineer.

11-3 **FINISHED GRADING PLAN REQUIREMENTS** - Grading plans for subdivisions and all developments located within Planned Development zones shall be submitted as part of the improvement plans and shall detail the following:

A. Slope symbols for all slopes 3:1 or steeper.

B. Typical lot grading details.

C. Proposed spot and/or pad elevations. All lot corner elevations shall be shown on the Grading Plan.

D. Flow directional arrows both on-site and off-site and perimeter elevations at the property line.

E. Existing spot elevations and/or contour lines on-site and off-site around the perimeter of the development. Where the existing terrain is not relatively flat, contour lines shall be shown. Contour lines shall be in maximum increments of two feet. The spot elevations or contour lines shall be extended off-site for a minimum distance of 25 feet (flat terrain - 50 feet minimum).

G. Existing trees (variety, size and elevation at base of all trees six inches in diameter or larger). For native oak trees, the plan shall show the protected zone and the approved protective fencing locations. Encroachments into the protected zone require tree permit approval.

H. A Certificate of Compliance of Grading with signature blocks for both the Registered Civil Engineer and the Geotechnical Engineer shall be provided stating the following:

CERTIFICATE OF COMPLIANCE

I HEREBY CERTIFY THAT THE GRADES SHOWN ON THESE PLANS AND APPROVED BY THE DEPARTMENT OF PUBLIC WORKS, HAVE BEEN CONSTRUCTED TO WITHIN 1/10TH OF ONE FOOT OF THEIR INDICATED ELEVATION FOR ALL LOT PADS AND IMPROVEMENTS SHOWN.

_____	_____	_____
PROJECT ENGINEER	LICENSE NUMBER	DATE

I HEREBY CERTIFY THAT THE PADS FOR THE FOLLOWING LOTS FOR THIS PROJECT HAVE BEEN TESTED FOR COMPACTION IN ACCORDANCE WITH GENERALLY ACCEPTED TEST METHODS AND BASED UPON THE RESULTS OF THESE TESTS THE COMPACTION OF SAID PADS CONFORMS TO THE RECOMMENDATIONS OF THIS PROJECTS GEOTECHNICAL REPORT:
LOTS:

I ALSO STATE THAT OUR FIRM OBSERVED THE GRADING OPERATION TO A SUFFICIENT EXTENT TO EVALUATE CONFORMANCE WITH THE PROJECT'S GEOTECHNICAL REPORT AS APPROVED BY THE CITY, AND FURTHER STATE THAT BASED UPON OUR OBSERVATIONS, THE GRADING FOR THIS SUBDIVISION CONFORMS WITH THE RECOMMENDATIONS OF SAID SOIL REPORT.

_____	_____	_____
GEOTECHNICAL ENGINEER	LICENSE NUMBER	DATE

I. Back of sidewalk elevations at property lines, curb returns, high and low points, and other areas deemed necessary by the City Engineer.

J. All existing and proposed surface and subsurface drainage facilities including drain inlets, underground pipes, surface swales, channels, and any other drainage improvement proposed to be constructed with, or as part of, the proposed work.

K. Location of existing and proposed buildings or structures on the site, including proposed pad and/or finished floor elevation. Proposed residential plot plans should not be shown on the grading plans.

L. Location of existing and proposed buildings or structures on the land of adjacent owners which are within 15 feet of the property and which may be impacted by the proposed grading operations.

M. Location of all existing and proposed retaining walls.

N. Typical sections across side and rear yard property lines where the difference in finish pad elevations exceeds 0.5 feet.

O. Names of adjacent subdivisions.

P. Off-site intersecting property lines.

Q. For all projects involving the export of soil material:

1. Location of spoil disposal. If spoil area is within a Specific Plan area of the City, a separate Conditional Use Permit is required for that site.

2. Spoil areas shall meet all the requirements of these standards.

R. Silt retention and erosion control details as necessary and specified in this manual.

S. Location of all grade breaks shown on street centerline and back of walk.

11-4 **ROUGH GRADING PLAN REQUIREMENTS** - Grading plans for subdivisions and all developments located within Planned Development zones shall conform to the same requirements as those specified for finished grading plans excepting the following:

A. **Improvements** - Only existing improvements such as utilities, curbs, gutters, etc. shall be shown. Utilities and streets to be constructed with the improvement plans shall not be shown as part of the rough grading plans.

B. **Drainage** - All rough grading plans shall provide for positive surface drainage flow except in those instances provided on the plans for erosion and/or sedimentation control. Site drainage shall be conveyed to an approved storm drainage system or channel without flowing into existing street gutters or existing roadside ditches.

11-5 **DESIGN REQUIREMENTS**

A. **Rolling Terrain Grading** - Grading of rolling terrain shall be accomplished in a manner whereby the effect of the rolling terrain is maintained as close to that which exists, to the extent practicable. Every effort shall be made to keep grading of rolling terrain to a minimum.

B. **Boundary Grading** - Special attention shall be given to grading adjacent to the exterior perimeter property line of a development. All adverse effects to off-site properties adjacent to new developments shall be kept to a minimum. Fills and cuts adjacent to the exterior perimeter property line shall be designed in accordance with the following:

1. When grading along existing residential property, the grade should be, if at all possible, held equal to or lower than the existing property grades. When grades are to be raised higher than existing adjacent residential lots, a masonry retaining wall shall be used, regardless of the difference in elevation. Existing drainage ways shall be maintained unless approved otherwise by City Engineer. The wall shall be located as close to the property line as is feasible for construction. If permission can be obtained from the adjacent property owner(s), the wall should be placed on the property line or onto the lower lot and the fence relocated to the top of the wall. Permission must also be obtained of neighbor to enter the property for construction purposes.

2. If possible, all exterior slopes, fill or cut, shall be constructed off-site, with the property line being situated a minimum of two feet inside the higher elevation. If a right of entry cannot be obtained for this, a retaining wall shall be placed as near to property line as practicable.

3. A recorded notarized right of entry shall be required for all off-site fills and grading prior to plan approval. (See Form GR-1)

4. Maximum slope shall be 2:1 or as specified by the Geotechnical Engineer.

5. All slopes steeper than 4:1 adjacent to the public right of way and private streets shall be protected with permanent erosion control measures.

6. All fill material shall achieve 90 percent relative compaction certified by a Registered Geotechnical Engineer.

7. When a drainage swale or ditch is proposed to run adjacent to the property line, a level area, minimum width of 5-feet, is required between the property line and the top of the slope bank.

8. A specific off project haul route shall be approved by the City Engineer when over 750 cubic yards of imported or exported soil is required. Where a haul route has not been determined at the time of plan approval, the permit shall be conditioned stating that no grading activities shall occur until a haul route has been approved by the City Engineer.

C. **Interior Grading** - Differences in elevations across interior property lines within a development, such that slopes or retaining walls are required, shall conform to the following:

1. Cross lot drainage is not allowed unless specifically approved by the City Engineer for tree preservation. All single-family residential lots shall have Class 1 grading as per the Standard Drawings unless approved otherwise by the City Engineer. When a Class 2 or Class 3 lot grading plan is proposed as part of a tentative map application for a single-family residential subdivision, the tentative grading plan showing rear lot drains shall be supplemented with an alternative plan showing the effect on the subdivision if rear lot drains are not utilized.

2. Retaining walls shall be required whenever adjacent side lot elevations differ by more than 1/2-foot. In such cases, a minimum 3-foot wide walk path shall be maintained adjacent to all side property lines. Where the design engineer feels that this path will be maintained without the use of a retaining wall, application for a waiver may be made by preparing and submitting a standard Sideyard Setback Guarantee. The Sideyard Setback Guarantee shall specify the lots for which a waiver of the retaining wall requirement is requested, the minimum setback of the proposed structure from the property line, and shall state that should the minimum setback not be possible during construction, a retaining wall shall be constructed to requirements of this manual. Upon approval, a copy of these will be given to the Building Division and Planning Department to utilize in their review. Any deviation to these setbacks will be subject to approval by the Public Works Department.

3. Property lines shall be situated a minimum of 1.0 foot inside the top of fill or cut slopes when pad elevations differ by 1/2-foot or less. When retaining walls are used, the property lines shall be situated on the high side of the retaining wall with a

minimum setback of 1.0 foot from the property line to the retaining wall. Where pad elevations differ by more than 1/2 foot and waiver of placement of retaining walls is requested per the requirements stated above, property lines shall be situated a minimum of 2.0 feet inside the top of fill or cut slopes.

4. The maximum earth slopes allowed shall be 2:1 (horizontal to vertical). Minimum asphalt concrete surface slopes shall be 1% and minimum concrete cement surface slopes shall be 0.4%. All proposed slopes that are 3:1 or steeper shall be shown on the plans by some type of slope symbol delineation.

5. Lots on the low side of streets at sag points shall have pad elevations a minimum of one foot above the 100-year water surface elevation assuming failure of all subsurface drainage systems.

D. **Retaining Walls** - Retaining walls, when required, shall be shown on the plans and shall include all necessary information and details for construction. All retaining walls adjacent to the public right of way or along the exterior boundary of the project shall be masonry. Other retaining walls less than or equal to 2'-6" in height may be redwood conforming to the Standard Drawings. Walls higher than 2'-6" shall be masonry. All walls higher than 4-feet as measured from base of foundation to top of wall shall be substantiated with structural calculations stamped by a Registered Civil Engineer and a building permit shall be obtained from the Building Department prior to Engineering approving the plans which reflect installation of the retaining walls.

E. **Grading near Trees** - No person shall conduct any activity within the protected zone of a Native Oak Tree or Landmark tree without an approved Grading Permit issued in conformance with the Tree Permit Conditions. Great care must be exercised when work is conducted upon or around Protected Trees. The purpose of this section is to define procedures necessary to protect the health of the protected trees. The policies and procedures described in this section apply to all encroachments into the protected zone of Protected Trees. All Tree Permits shall be deemed to incorporate the provisions of this section except as the Tree Permit may otherwise specifically provide.

1. General

   a. Trenching within the Protected Zone of a Protected Tree, when permitted, may only be conducted with hand tools, in order to avoid root damage.

   b. Minor roots less than one inch in diameter may be cut, but damaged roots shall be traced back and cleanly cut behind any split, cracked or damaged area.

   c. Major roots over one inch in diameter may not be cut without approval of an Arborist. Depending upon the type of improvement being proposed, bridging techniques or a new site design may need to be employed to protect the root and the tree.

   d. If any Native Ground Surface Fabric within the Protected Zone must be removed for any reason, it shall be protected within 48 hours.

   e. An independent low-flow drip irrigation system may be used for establishing drought-tolerant plants within the Protected Zone of a Protected Tree. Irrigation shall be gradually reduced and discontinued after two years.

f. Planting Live material under native oak trees is generally discouraged and it will not be permitted within 6 feet of the trunk of a native oak tree with a DBH of 18 inches or less, or within 10 feet of the trunk of a native oak tree with a DBH of more than 18 inches. Only drought tolerant plants will be permitted within the protected zone of native oak trees.

g. A minimum 4 foot high chain link or orange mesh fence shall be installed at the outermost edge of the protected zone of each protected tree or group of protected trees. The fence shall not be removed until written authorization is received from the Planning Director. Exceptions to this policy may occur in cases where protected trees are located on slopes that will not be graded. However, approval must be obtained from the Planning Department to omit fences in any area of the project. The fences must be installed in accordance with the approved fencing plan prior to the commencement of any grading operations or such other time as determined by the approving body. The Developer shall call the Planning Department and Public Works Department for an inspection of the fencing prior to grading operations.

Signs must be installed on the fence in four locations (equidistant) around each individual protected tree. The size of each sign must be a minimum of 2 feet by 2 feet and must contain the following language:

WARNING
THIS FENCE SHALL NOT BE REMOVED OR RELOCATED WITHOUT WRITTEN AUTHORIZATION FROM THE PLANNING DEPARTMENT

On fencing around a grove of protected trees, the signs shall be placed at approximately 50 foot intervals.

h. Once approval has been obtained, the fences must remain in place throughout the entire construction period and may not be removed without obtaining written authorization from the Planning Department.

i. A minimum $10,000 deposit, or amount deemed necessary by the approving body, shall be posted and maintained to insure the preservation of protected trees during construction. The deposit shall be posted in a form approved by the City Attorney prior to any grading or movement of heavy equipment onto the site or issuance of any permits. Each violation of any Tree Permit condition regarding tree preservation shall result in forfeiture of a portion or the entirety of the deposit, in the discretion of the approving body.

j. In cases where a Tree Permit has been approved for construction of a retaining wall(s) within the protected zone of a protected tree, the developer will be required to provide for immediate protection of exposed roots from moisture loss during the time prior to completion of the wall. The retaining wall shall be constructed within 72 hours after completion of the grading.

k. If required, preservation devices such as aeration systems, oak tree wells, drains, special paving and cabling systems must be installed per approved

plans and certified by the developer's arborist.

l. Every effort should be made to avoid cut and/or fill slopes within or in the vicinity of the protected zone of any tree.

m. No grade changes are permitted which cause water to drain to within twice the longest radius of the protected zone of any protected tree.

n. Certification letters are required for all regulated activity conducted within the protected zone of protected trees. The developer's arborist will be required to submit a certification letter to the Planning Department within 5 working days of completion of such regulated activity attesting that all of the work was conducted in accordance with the appropriate permits and requirements of this section.

o. Any time there is activity on the project, the following information must be on site and available to City personnel, starting at the site planning meeting:

i. Arborist's report including all modifications.

ii. Tree location map with a copy of the tree fencing plan.

iii. Tree Permit and inspection card.

iv. Approved construction plans.

v. Tree preservation guidelines.

vi. Approved Planting and irrigation drawings.

2. Tree Permit Construction Phase

a. All work conducted within the protected zone of any protected tree shall be performed as required by this section and as required in project approval.

b. As a condition of the Tree Permit, the developer will be required to submit a utility trenching-pathway plan for approval following approval of the project improvement plans. The trenching-pathway plan shall depict all of the following systems: storm drains, sewers, easements, water mains, area drains, and underground utilities. Except in lot sale subdivisions, the trenching-pathway plan must show all lateral lines serving buildings. To be completely effective, the trenching-pathway plan must include the surveyed locations of all protected trees on the project as well as an accurate plotting of the protected zone of each protected tree.

The trenching-pathway plan should be developed considering the following general guidelines:

i. The trenching-pathway plan must be developed to avoid going into the protected zone of any protected tree on its path from the street to the building.

ii. Where it is impossible to avoid encroachment, the design must minimize the extent of such encroachment. Encroachments and

mitigation measures must be addressed in a supplemental arborist's report.

c. All of the tree preservation measures required by the conditions of the discretionary project approval, the arborist's report and the Tree Permit, as applicable, shall be completed and certified by the developer's arborist prior to issuing an occupancy permit.

F. **Erosion and Sedimentation Control** -- A site specific erosion and sedimentation control plan shall be submitted concurrently with the Improvement and/or Grading Plans. The project engineer should refer to "Erosion and Sediment Control Guidelines for Developing Areas of the Sierras" which was prepared by the High Sierra Resource Conservation and Development Council (latest edition) for guidelines in the preparation of erosion and sedimentation control plans.

1. Criteria - The purpose of erosion and sedimentation control plans is to ensure protection of the following:

   a. Water Quality - Measures shall be provided to prevent siltation of streams, rivers, etc; avert instream degradation due to turbidity and pollutant load; and prevent toxic materials from leaving construction sites.

   b. Collection System - Methods shall be provided to prevent sediment from entering the storm drainage system.

   c. Adjacent Properties - Methods shall be employed to prevent any damage to adjacent properties.

2. Plan Requirements - An erosion and sedimentation control plan shall be submitted along with all grading plans. These plans need not be on a separate sheet if all facilities and measures can be shown on the grading sheets without obscuring the clarity of either the grading plan or the erosion and sedimentation control plan. The erosion and sedimentation control plan shall contain the following:

   a. Revegetation Plan - The revegetation plan should detail the location of revegetation, seeding mixture, type of fertilizer and rate of application, mulch and/or straw application rate along with method of application. All sites to be revegetated shall be completed by October 5.

   b. Runoff/Drainage Control Plan - The location of all existing and proposed storm water containment and/or conveyance systems shall be shown. Examples of such include diversion dikes and swales, grade stabilization structures (temporary pipe or slope drains), ditches, straw bale dikes, and sediment basins or traps. Sufficient calculations and supporting material to demonstrate the adequacy of such measures shall be provided.

   c. Phasing of Erosion Control Measures - The Public Works Department may require phasing of the grading plan to ensure that all necessary erosion control measures are in place. As an example, this may require the developer to construct sediment traps and basins during the first phase of grading.

3. Subdivision Requirements - The following is a list of general notes that shall be placed on sedimentation and erosion control plans as erosion and sedimentation

control measures.

a. All erosion and sediment control measures shall be implemented by October 15 or as approved by the City Engineer and specified on the grading plans.

b. Straw bales shall be stockpiled on site at a rate of 1.5 bales per acre by September 25. Measures shall be provided to keep straw dry.

c. All slopes greater than 10:1 shall be covered with broadcast straw at a rate of 50 bales or 4000 pounds per acre. For slopes 4:1 or steeper, straw shall be pressed in place. Other methods are subject to approval of the City Engineer.

d. Slopes steeper than 4:1 and adjacent to City right of way, flood plains, natural drainages, park land or designated open space shall be hydroseeded.

e. All bare areas, regardless of slope, within 50 feet of natural drainages shall be covered with straw and pressed in place.

f. Where required, broadcast seed shall be applied as follows:

Blando Brome	12 lbs/acre
Rose Clover	9 lbs/acre

Areas with sandy, dry soil shall be:

Zorro Annual Fescue	6 lbs/acre
Rose Clover	9 lbs/acre

16-20-0 fertilizer or equivalent shall be applied at a rate of 500 pounds per acre.
If hydroseeding/mulching is used, seed quantities shall be increased by 30 percent.

g. No grading or trenching, except as required for erosion or sediment control, shall occur within 35 feet from the centerline of perennial and intermittent drainage swales between October 15 and April 1 except as approved by the Department of Fish and Game.

h. All erosion and sediment control measures shall be checked following all storms to ensure that all measures are functioning properly.

i. Sediment and trash accumulated in drainages or detention basins shall be removed as soon as possible. In addition, oil and material floating on water surface must be skimmed weekly and the debris properly disposed of.

j. Construction activities occurring between October 15 and April 1 shall have erosion and sediment control measures in place or capable of being placed within 24 hours. The contractor shall ensure that the construction site is prepared prior to the onset of any storm.

k. The contractor shall establish a specific site within the development for

maintenance and storage of equipment or any other activity that may adversely contribute to the water quality of the runoff. This area shall have a berm located around its perimeter. This area shall be restored to acceptable condition upon completion of project.

l. Hydroseeding may be considered as an alternative to broadcast straw subject to the Public Works Department based on a review of the existing site conditions (location, slopes, proximity to streams) and time of year.

G. **Mitigation Monitoring Requirement** - All mitigation measures and mitigation monitoring measures as required to mitigate environmental impacts shall be complied with. The developer is responsible for monitoring all mitigation measures and shall submit to the Planning Department and City Engineer a letter certifying compliance with such measures prior to beginning any construction.

H. **Certifying Pad Elevations** - Upon completion of the grading and prior to acceptance of the subdivision improvements or issuance of building permits by the City, the Consulting Engineer shall verify the final pad elevations. The elevations shall be verified at the center and the corners of each pad. Pad grades shall be certified to an accuracy of 0.10 feet. Slopes shall be within 6 inches of horizontal plan location.

A signature block (See Section 11-3H), certifying that final graded elevations in the field are the same as those shown on the plans, shall be included on the tracings of the subdivision grading plans. The consulting Engineer shall sign the signature block, certifying to the above, and shall provide three sets of record (as-built) grading plans to the City Engineer.

I. **Maintenance of Access to Utility Facilities** - Continuous, suitable access, as determined by the City Engineer, shall be maintained during all stages of construction and operation to any facility owned or operated by a utility/district providing essential services (i.e. sanitary sewer, water, drainage, electricity, gas, telephone, etc).

Right-of-Entry Form GR-1

RIGHT OF ENTRY

Project_____

Parcel No. _____

Date _____

Project Proponent

Attention: Proponent Contact

Permission is hereby granted to enter upon our land described as: __property location_____ for the purpose of __brief description of work_____ performing all required incidental work.

Very truly yours,

_____

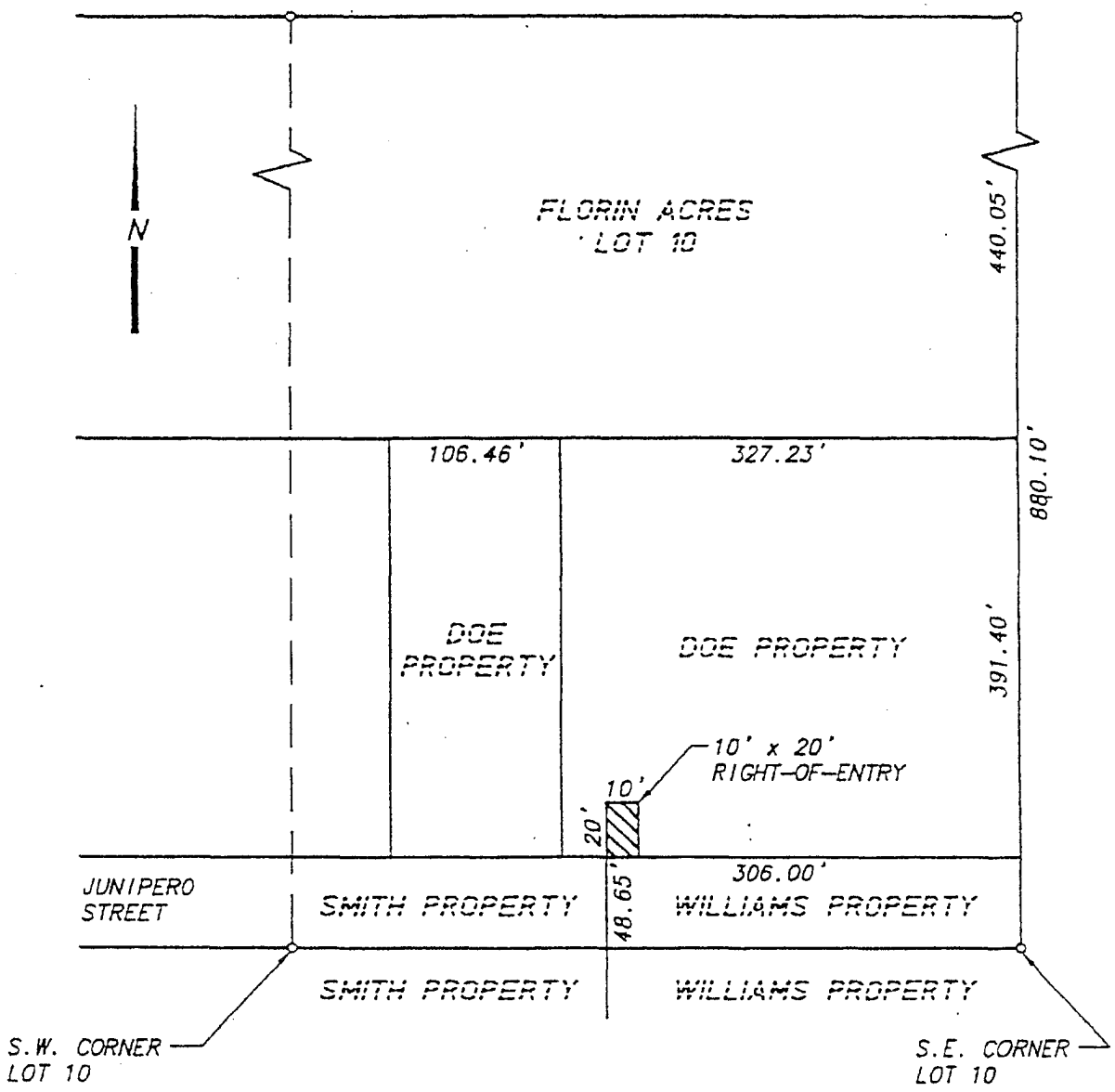
_____
John Doe
Jane Doe

ACCEPTED:
City of Lincoln
Department of Public Works

RECOMMENDED FOR APPROVAL:

By _____

By _____
Director of Public Works



RIGHT-OF-ENTRY

MORRISON CREEK ASSESSMENT DISTRICT
APN 040-1210-017 & 018

RIGHT-OF-ENTRY EXHIBIT

SECTION 12

SOUND BARRIER DESIGN

12-1 **GENERAL** - Existing and projected noise levels adjacent to new residential developments shall not exceed an average L_{DN}, as defined in the City's General Plan, of 60 dba at a point 4 feet above finished floor level. Sound barriers shall be constructed, if necessary, to achieve this level.

12-2 **SOUND STUDIES** - When required by the City Engineer, a sound study, prepared by an Acoustical Consultant, shall be submitted to the Public Works Department prior to approval of the improvement plans. Submission of this study may be required when installation of a sound barrier is required as a condition of approval of a project or when the City Engineer feels that existing or projected noise levels may necessitate the installation of such a barrier. The sound study shall include technical information and computations to support the recommendation.

12-3 **LOCATION REQUIREMENTS** - Sound barriers shall be located along the rear and side property line of residential developments adjacent to freeways, arterials, collectors, and industrial streets. The wall shall be located in a public easement or right of way.

12-4 **DESIGN REQUIREMENTS** - Sound barriers shall be designed in accordance with the landscaping requirements for the area in which the project is located. Walls shall be designed for a minimum longevity of 50 years. Walls shall have a minimum height of 6 feet measured from the highest adjacent pad elevation or road side grade, whichever is higher. Footings shall be designed for a height of wall 18 inches higher than the constructed wall. Structural calculations shall be provided to the Public Works Department for all proposed soundwalls. All construction details for sound barriers, including location and limits, shall be shown on the improvement plans.

An anti-graffiti coating shall be applied to the road side of the soundwall and elsewhere as required by the City Engineer. Coating shall be Prosoco Graffiti Stop two coat application or approved equal.

SECTION 13

LANDSCAPING & BIKE PATHS

13-1 **GENERAL** - Landscaped areas serve both functional and aesthetic purposes. From a functional standpoint, a barrier is created which provides noise attenuation, security, and privacy between residential projects and roadways. Aesthetically, landscaping provide a visual buffer and softens the appearances of walls and fences. The City of Lincoln landscaping and bike path standards are designed to insure adequate recreational bike path construction, proper landscaping along soundwalls, fences, and other open areas that abut public roadways, and to assure a consistent and visually pleasant environment along the City of Lincoln's public roadways.

13-2 **DESIGN CRITERIA** - All landscaping design shall conform to these standards and any applicable Specific Plan landscaping guidelines which pertain to various areas of the City. Specific Plan Landscape Design Guidelines are available from the Planning Department.

Landscaping plans shall be drawn at a scale no smaller than 1 inch = 20 feet. The plans shall show all proposed grades, landscaping, soundwall or fence locations, utility boxes, street lights, manholes, traffic signs, and any other structure which may be impacted by revisions to grading and planting. Soundwall fence details shall be drawn at a sufficient scale to show adequate detail. For additional soundwall requirements, see the soundwall section of these standards.

13-3 **PLAN APPROVAL** - Prior to construction of any landscape related improvements (grading, irrigation installation, planting, etc.), a complete set of plans must be approved by City Engineer and seven (7) sets of approved plans provided to the Public Works Department.

13-4 **DESIGN REQUIREMENTS** - The following standards shall apply to all projects where landscaping along a soundwall, fence or open area abuts a public roadway.

A. Landscaping

1. All landscaping shall be consistent with the City's Landscape Ordinance.

2. Trees, shrubs, and ground cover plantings shall be consistent with the plant listings contained in the Specific Plan or other area Landscape Guidelines where applicable. Substitutions or alternatives shall be approved by the Planning and Parks & Recreation Departments.

3. Tree placement shall allow for sufficient root space adjacent to paved surfaces. Root guards may be required in some cases by the Parks and Recreation Director to force roots away from soundwalls, utility facilities, sidewalks, curbs, gutter, and roadways.

4. Trees shall not be located within the intersection visibility triangle as described in Section 7-12 of this manual at all intersections and driveways to maintain sufficient site distance.

5. Vegetation shall be located so as not to create conflicts with underground or above ground utility lines, services, and equipment. All such facilities shall be noted on the landscape plans.

B. Irrigation -Irrigation plans shall include the location and detail of the automatic clock system, controller, strainer, siphon valve, water, meter, drip emitters, spray heads and quick couplers

and other appropriate elements. Other requirements are as follows:

1. A drip/bubbler or other approved low flow irrigation system shall be used for trees and shrubs. Specification requirements for irrigation are per the Standard Drawings. If other irrigation type is required for ground cover, low flow control heads shall be used. Recommended spray sprinkler heads are Rainbird with PRS stem valve nozzles. Substitutions are acceptable if deemed equal or better than recommended by the Parks & Recreation Department.

2. The Developer or his consultant shall insure to the satisfaction of all departments that there are no conflicts between irrigation lines and underground or over ground utilities, equipment, and services.

3. An additional one inch line shall be installed for quick couplers (Rainbird 33D, 34D, or approved equal valve) and shall be located every 100 feet along sidewalk, road, and curb. Quick coupler keys with hose swivels may be required depending on the landscape location.

4. The landscaping consultant is responsible for insuring adequate and proper water supply connection and pressure to the main irrigation line. The consultant shall coordinate such service the Public Works Department. The connection shall be defined on the plans and inspected in the field for proper implementation during construction. The water service shall be constructed to the City of Lincoln high hazard specifications.

5. The electrical service point for the sprinkler system time clock is to be coordinated by the landscaping consultant with the City of Lincoln Public Works Department. The service point is to be approved by the City Engineer and shown on the landscaping plans. Final installation is to be inspected prior to energization of the time clock by the Public Works Department.

NOTE: It is the contractor's responsibility to call for inspections. Failure to do so may result in delay of project acceptance by the City.

C. **Grade and Line of Sight** - The maximum slope from back of sidewalk to base of soundwall shall not exceed 3:1 for non turf areas and 5:1 in turf areas. The minimum slope shall not be less than two percent. All slopes shall be rounded and tapered to blend with contours on adjacent areas.

Landscaping design along soundwalls and fences shall be according to line of sight on corners and shall not wrap around corners.

D. **Soundwalls and Fences** - All soundwalls and fences adjacent to landscape areas shall be located within a public easement or right of way. For soundwall design refer to Section 12 of these standards and any applicable specific plan landscaping guidelines. The preferred fence design in selected situations shall be a redwood headerboard and batten design in accordance with the Standard Drawings. Soundwalls or fences shall not be located within the intersection visibility triangle described in Section 7-12 of this manual at all intersections and driveways to maintain sufficient site distance as determined by the Public Works Department.

13-5 **BIKE PATHS** - All Class 1 recreational bike path design shall be in accordance with the State of California Department of Transportation, AASHTO Guide for Bike paths, and the following standards. For pedestrian /bicycle pathways within landscape corridors along roadways, refer to the

applicable specific plan landscaping guidelines.

A. **Section** - Bike path structural section shall be a minimum of 2 inches of asphalt concrete on 4 inches aggregate base or 4 inches of concrete (See 7-7). Bike paths shall have a minimum width of ten feet and two foot clearance to vertical objects each side. Minimum cross slope for drainage shall be 2 percent.

B. **Design Speed** - Bike paths shall be designed for an average design speed of ten miles per hour. On downhill sections, minimum radius curves shall be as follows:

DESIGN SPEED	RADIUS
10 mph	15 feet
15 mph	35 feet
20 mph	70 feet

C. **Grades** - Grades along bike paths shall be as follows:

1. Maximum extended grade (greater than 1500 feet) shall be 2 percent.

2. Maximum sustained grade (greater than 300 feet) shall be 5 percent.

3. Maximum grade shall be 10 percent.

D. **Striping** - Striping of bike path shall be in accordance with the California Department of Transportation Highway Design Manual, latest edition.

Also, where applicable, two barrier posts/bollards shall be placed on bike path where it intersects with roadway. Bollard shall be of a folding/collapsible design. Striping around bollards shall be in accordance with the Highway Design Manual.

E. **Bridge Undercrossings** - Where a bike path is to be placed beneath a bridge structure a minimum vertical clearance of nine feet shall be provided. The minimum elevation of the path shall coincide with the 2-year water surface elevation.

13-6 **MAINTENANCE REQUIREMENTS** - The project Developer shall be responsible to properly maintain the landscape area for a minimum of 3 months (90 days) after installation of all planting and before the City makes it final inspection. In those cases where private long-term maintenance is not required, the City will take over maintenance responsibilities after all conditions are met via the final inspection.

13-7 **AS BUILTS** - As built, reproducible mylars shall be provided to the City Parks Department prior to a notice of completion being filed for the project.

SECTION 14

ELECTRICAL AND STREET LIGHTING DESIGN STANDARDS

14-1 **GENERAL – STREET LIGHTING** – This section describes typical design practices for new or modified street lighting systems within the City of Lincoln.

14-2 **STREET DESIGN STANDARDS** – Street lighting shall be designed in conformance with the information contained herein, the current edition of the City of Lincoln Public Works Improvement Standards and the "American National Standard Practice for Roadway Lighting" of the American Standards Institute. Data and calculations supporting the satisfaction of the above requirements shall be submitted for review, or the predetermined design standard included herein shall apply.

14-3 **STREET LIGHTS REQUIRED** – Street lights shall be required for all lots and parcels being developed or constructed upon unless exempted. In addition, street lights may be required for lots and parcels containing existing structures which are being improved or altered, depending on the nature and extent of the work. Data and calculations supporting the satisfaction of the above requirements shall be submitted for review, or the predetermined design standards included herein shall apply.

14-4 **STREET LIGHTS NOT REQUIRED** – Streetlights are not required for a residential permit on an existing parcel.

14-5 **DEVELOPER'S RESPONSIBILITY** – Existing street lights which must be relocated or repositioned as a result of the construction of new streets or driveways into a development shall be the responsibility of the developer.

14-6 **UTILITY COMPANY AUTHORIZATION** – A written notice from the serving utility company, stating that line clearances and service have been checked and are adequate, shall be submitted to the City Engineer for all developments.

14-7 **STREET LIGHT DESIGN DETAILS**

A. **Intersections** – Intersections shall have at least one street light.

B. **Cul-de-sacs** – All cul-de-sacs shall have a street light within the bulb.

C. **Spacing** – Maximum street lighting spacing, measured along the street centerline, shall conform to the Standard Details.

D. **Street Light Poles** – All street light poles shall be of galvanized steel. All pole construction and materials shall conform to the standards outlined in the Improvement Standards.

The Engineer may approve special or unusual design if the character of the surrounding neighborhood warrants unusual design. Where special or unusual design street light poles are to be used, the developer shall supply to the City additional poles to be used for future pole replacement. The minimum number of replacement poles to be supplied to the City shall be 10 percent of the poles being installed with any fractional percent being rounded up to the next whole number.

E. **Luminaires** – The type of street light and the appropriate wattage shall be specified on the plans. The luminaires shall be high-pressure sodium type with internal ballasts. All luminaires shall conform to the Improvement Standards.

F. **Service** – All street lighting systems shall have underground service provided. Service points shall be provided within a utility easement immediately adjacent to or within the right-of-way and shall be open and easily accessible to the street frontage.

G. **Pullboxes** – All pullboxes, including the size, shall be shown and identified on the plans. Pullboxes shall be installed at the locations where more than two conduit runs intersect, where conduit runs are more than 200 feet long, where shown on the plans, at critical angel points, and at such locations ordered by the Engineer. Normally, a No. 5 pullbox will be used unless otherwise noted on the plans (shown on Standard drawing EL-5).

H. **Conductors** – All conductors, including quantity and size, shall be identified on the plans. Unless otherwise specified, conductors shall be single conductor with THW insulation, solid or stranded copper, sized in accordance with these standards and the National Electric Code.

The minimum conductor size shall be in accordance with the Improvement Standards.

I. **Photo Cell** – A single twist-lock receptacle suitable for SMUD photo cell shall be provided on the luminaire nearest to the service point for each service.

J. **Conduit** – All conduit runs, including the size, shall be shown and identified on the plans. The conduit size shall be determined according to the National Electrical Code, with the minimum size being 1-1/2 inch diameter conduit. Larger size conduits may be required at the discretion of the City Engineer.

K. **Electrical Equipment and Work** – Control and switching equipment and fusing of all circuits shall meet the requirements of the National Electrical Code, the Basic Electrical Regulations, Title 24, Part 3, of the California Administrative Code, the rules of the National Board of Fire Underwriters, and the City of Lincoln.

14-8 **MASTER PLANNING** – Master planning is the determination of street light locations between control points. Control points are proposed street light locations at street intersections in accordance with Section 14-6 and existing street lights. The purpose for master planning is to end up with an overall uniform street light system meeting minimum requirements. On 80-foot and wider streets, master planning shall apply to both sides of the street. The procedure for master planning is outlined as follows:

1. Determine the nearest intersections each way from the street light locations required. Determine the location of the street lights at the intersections in conformance with this manual.

2. Determine the existence of any City owned and maintained street lights situated between the adjacent intersections above.

3. Determine the distance between the adjacent designed intersection street lights above and/or adjacent existing street lights, whichever are nearest to the street light locations being determined.

4. Divide the distance into the most possible equal spaces between lights that can be obtained in conformance with the spacing requirements herein.

5. Compare the light locations to intersecting property line, driveways, pedestrian lanes and utility obstructions as follows:

a. If the location falls close to a property line and the street light location can be adjusted to the property line while staying within the maximum spacing allowed, then the adjustment should be made.

b. Generally, street lights should be situated at intersecting property lines for residential lots 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.

c. Street light locations shall be adjusted to miss driveways and existing utility obstructions by five feet.

SECTION 15

EXISTING UTILITIES

15-1 **SCOPE** – The purpose of this section is to assist in the gathering and interpretation of information concerning the location of existing utilities, both above and below ground, that affect the design and preparation of plans for public and private improvements.

Such public and private improvements include the installation of storm drain lines, sanitary sewer lines, water mains, gas, electrical, CATV, telecommunications and new streets. Also included is the widening of existing streets, construction of bridges, pump stations, open channels, and the installation of traffic signals and street lighting systems.

The guidelines contained herein are intended to help the design engineer either avoid conflicts in alignment and elevation or resolve conflicts in alignment and elevation that often occur between proposed public improvements and existing utilities.

This section covers only the technical aspects of avoiding or resolving conflicts with existing utilities. The handling of utility conflicts with regard to prior rights, financial responsibility for relocation of existing utilities, etc., is beyond the scope of this section.

15-2 **BACKGROUND** – The avoidance or resolution of conflicts between proposed public improvements and existing utilities, particularly underground utilities, is a crucial part of the design process. Research concerning the location of existing utilities, careful planning, and close attention to detail are useful tools in determining the degree of impact that existing utilities will have on the horizontal and vertical alignment of proposed water mains, storm drain lines, and sanitary sewer lines. The location of above and below ground utilities may also affect the design of the geometric alignment of streets as well as the alignment and typical cross section of open drainage channels.

Information of the type, location, alignment, length, height and depth of existing public, municipal, and privately owned utilities may be obtained from the owner of the utility. The information comes in the form of maps, plans, drawings, and other records kept by the utility's owner as well as public improvement plans for past projects. In addition, field trips to the site of a proposed public improvement project and the performance of field investigations such as "potholing" provide accurate first hand knowledge of the location of existing utilities.

15-3 **TYPES OF UTILITIES** – Utilities may be classified according to ownership (public or private) and location (overhead or underground).

A. **Above Ground (Overhead) Utilities** – Common overhead public utility lines include electrical power (Pacific Gas and Electric Company, etc.), and communication such as telephone (American Telephone and Telegraph, Pacific Bell, etc.), cable TV.

B. **Underground Utilities** – Underground public utilities include electrical power in the form of duct banks (stacked ducts made of or encased in concrete) or direct burial cable (Pacific Gas & Electric). Communication lines may also be placed underground in the form of duct banks or buried insulated cable (Pacific Bell, Sacramento Cable, etc.). Natural gas pipelines (Pacific Gas and Electric) are generally underground. At stream crossings, however, natural gas lines may be mounted on bridges.

C. **Municipal Utilities** – Municipal utilities serving urban and suburban areas are also included in the category of public utilities. Examples of underground municipal utilities

include storm drain and sanitary sewer lines, both gravity and pressure (force mains), water transmission and water distribution mains.

D. **Privately Owned Utilities** – Privately owned utility lines include pipelines used to transmit petroleum products such as lines owned by Southern Pacific Transportation Company, Chevron Corporation, or Unocal Corporation. In addition, manufacturing companies may have their own pipelines for transmitting natural gas or other gases to their plants for their own use.

Railroads often have pole lines within the rights-of-way running parallel to their tracks that support overhead wires for operation of switches, gates at grade crossings, signals, communication and other operational equipment.

15-4 <u>FIELD VISITS TO PROJECT SITES</u> – Knowing what to look for when visiting project sites in the field can provide considerable insight as to the potential impact existing utilities and related facilities may have on a proposed public improvement project.

A. **Electrical Power (Overhead and Underground)**

Overhead Electrical Power – Overhead facilities for the distribution of electrical power are rather obvious in the field and include poles (mostly wood but sometimes steel), conductors (wires and cables), pole mounted transformers, guy wires and anchors, etc. Most power pole lines are placed within street right-of-way, although they may also be located in easements.

High voltage transmission lines supported on tall steel poles as well as lattice towers are also a type of overhead facility used for the distribution of electrical power. Many of these high voltage transmission lines run through one part of town to another within their own easements.

The wooden power pole with supported wires and related hardware is the most common type of overhead electrical power distribution facility normally encountered in the field. Besides ordinary line poles, however, certain other types of poles are frequently encountered in the field.

Joint Poles – Power poles supporting telephone lines are often referred to as joint poles. Joint use power poles may also be supporting lines for fire alarm and cable TV in addition to overhead electrical and telephone lines.

Power Mounted Risers – Some power poles have conduit risers strapped to the pole that originate near the top of the pole, run down the side, and continue underground. The conduit risers contain electrical wires or cables that connect to a pole mounted transformer or to power lines supported by the pole and extend underground to electrical service panels of buildings, ground mounted transformers, service pedestals for street lighting and traffic signal systems, etc.

Pole Mounted Transformers – Power poles may have one or more electrical transformers mounted near the tops of the poles.

Switch Poles – Certain poles, designated as switch poles, may have manually operated throw switches situated near the tops of the pole. Switch poles may be recognized by the presence of a lever position 10 or 12 feet above ground level connected by galvanized steel bar linkage to the switch at the top of the pole. There may also be a steel grounding plate located at ground level near the base of the pole below beneath the switch operating handle.

Dead End Poles and Guyed Poles – Poles located at the termination of overhead electrical power lines are dead end poles and are restrained by guy wires. The guyed poles resist the horizontal thrust (pull) exerted by the electrical power lines supported on a run of line poles. Guy wires are also used to stabilize individual poles placed at angle points in the alignment of a pole line.

A type of dead end pole may also be placed at intervals along a series of line poles. Although the power lines supported by this type of dead end pole extended away from the pole in opposite directions, the power lines may actually terminate at the pole. Electrical continuity is provided by a form of jumper wire that connects the opposing ends of the individual power lines terminating on each side eof the pole. This type of dead end pole is not guyed as the horizontal pull exerted by the power line cancel out.

The positioning of the ceramic insulators on the wooden cross arms of power poles is a clue in the identification of any type of dead end pole (besides the presence of a guy wire). The insulators of ordinary line poles are mounted on the top of the wooden cross arms whereas the insulators for dead end poles are mounted on the sides of the cross arms. The positioning of the insulators is directly related to the need to resist the horizontal pull of the power lines supported by the poles.

Relocation of Power Poles – The existence of any of the various types of power poles may affect how readily and expeditiously the poles will be relocated if the existing location of other poles is determined to be in the way of a proposed public improvement project. There may be a cost to a project for any existing poles incorrectly relocated or if the existing poles are situated within their own easement lying outside the original public right-of-way. In addition, certain pole lines may support conductors carrying high voltage electricity that can only be shutdown at specific times of low demand such as during weekends or holidays.

B. Underground Electrical Powers – Underground electrical distribution facilities include direct burial insulated cables as well as uninsulated grounding cables. Along streets in new subdivisions these cables are most often placed within the 12.5 foot wide public utility easement located behind the street right-of-way line.

In certain areas, underground electrical power lines are placed within stacked multiple duct banks. Underground vaults are placed at electrical service points and junctions of these duct banks. These underground vaults may be found in the street within the traveled way or they may also be found within the sidewalk area.

As mentioned previously, power poles may support conduit risers extending the full height of the pole and continuing underground. Poles with conduit risers can be readily seen in the field. The direction and/or length of the underground portion of the conduit may or may not be so obvious but they may interfere with the placement of shallow municipal utility lines such as water and sewer services as well as leads from drainage inlets. The alignment and depth of such underground lines can only be accurately determined by "potholing."

C. Telephone (Overhead and Underground)

Overhead Telephone – Overhead telephone lines often share the same poles as electrical power lines and are referred to as joint poles as mentioned previously. The telephone lines are mounted several feet below the electrical power lines. Poles supporting both power and telephone lines are usually owned by PG&E. Certain pole lines may be carrying telephone lines only, in which case they are owned by Pacific Bell or possibly American Telephone and Telegraph.

Conduit risers for underground telephone service lines may also be mounted on telephone poles. The depth and/or alignment of the underground portion of the conduit riser may interfere with the placement of shallow municipal utility lines such as water and sewer services as well as leads from drainage inlets.

Underground Telephone – Underground telephone facilities consist of direct burial insulated cable as well as single or multiple duct banks. The buried cables are not usually encased in concrete while the ducts, there are several in number, usually are encased in concrete. Telephone ducts installed in the recent past are plastic and are often 4 inches in diameter. Older duct banks may consist of precast concrete units made with tubular voids that when placed end to end form continuous underground enclosed conduits.

When telephone ducts are encased in concrete they are usually grouped or stacked to form a duct bank. The pattern of the ducts within the duct bank is generally in the form of columns and rows and may be two or three ducts wide and two to six or more ducts deep.

Concrete encased duct banks can present a somewhat impenetrable barrier to the desired placement of storm drain lines and sanitary sewer lines. Although the telephone company (Pacific Bell) may have fairly accurate records on the size, number, and possibly the arrangement of the ducts making up a particular duct bank, the actual depth of cover and the extent or thickness (top and bottom elevation) of this type of underground telephone facility is bed determined by "potholing."

The buried cables and the duct banks often pass through, join other cables and duct banks from different directions, or terminate at telephone manholes. Telephone manholes may appear innocuous when viewing the distinctive manhole covers on the ground or pavement surface. In reality, telephone manholes may be sizeable underground vaults that could very well interfere with the placement of storm drain lines, drain inlet leads, sanitary sewer lines, sewer services, and water mains as well as water services.

Should a grade conflict occur at a crossing of a proposed storm drain line or sanitary sewer line with an existing underground telephone duct bank and the slope of the drain or sewer line is critical, in some instances, it may be possible for the existing telephone facility to be splayed into two separate (upper and lower) parts. This will allow the drain or sewer line to pass between the divided duct bank while maintaining the desired vertical alignment.

Splaying involves the excavation and exposure of a suitable length of the existing duct bank in each direction from the location of the conflict to gain slack. This is followed by separating the ducts apart far enough to create an opening large enough for the sewer or drain pipe to pass through. The splaying of an underground telephone duct bank is an expensive and time consuming solution to a grade conflict and should only be used if there is no other vertical alignment option for the proposed drain line or sewer line.

Other telephone facilities observed in the field are pedestals mounted at ground level or on telephone poles. The pedestals are fabricated from sheet metal an are generally painted a light green in color. The pedestals often contain terminal boards and no doubt indicate the presence of underground telephone facilities.

Worded signs warning of the existence of underground telephone facilities are often seen spaced at intervals along the alignment of underground cables and duct banks.

D. **Natural Gas (Underground)** – Generally natural gas mains and gas service lines are installed underground. At stream crossings gas lines may be mounted on the superstructure of bridges constructed across the water course.

Gas meters are mounted above the ground near the point where the gas service line enters the customer's premises and thus are clues of the presence and location of underground gas services.

At railroad grade crossings of city streets, any gas mains crossing beneath the tracks are placed inside steel pipe casings. All pipe casings for gas mains are required to be vented at one or both ends by 1-1/2 or 2-inch diameter steel pipes routed to one side of the street somewhat opposite the ends of the casing. The existence of casing vent pipes at railroad grade crossings is a clue of the presence of an underground gas main extending under the track(s) and beyond.

15-5 **UNDERGROUND SERVICE ALERT (USA) COLOR CODE** – Contractors are required to have the location of all underground utilities marked on the ground within the limits of any excavation prior to beginning the excavation. The alignment and size, if appropriate, of the underground utilities are marked on the ground or pavement surface in a specific color according to the type of utility. The standardized color code used to mark and identify the location of existing utilities in the field is as follows:

RED	Underground electrical power lines in the form of ducts (concrete encased or non-encased), cables, or conduits. Also includes conduits for traffic signal and street lighting systems.
YELLOW	Natural gas mains and services as well as pipelines carrying petroleum products.
ORANGE	Underground telephone and other communication, fire alarm, railroad signal, telegraph, etc., lines in the form of ducts (encased and non-encased), cables, and conduits.
BLUE	Water mains and water services as well as landscape irrigation lines.
GREEN	Sanitary sewer lines and sewer services as well as storm drain lines.

The markings made in the field by the representatives of the owner of the underground utility indicate only the approximate location of the underground facility. The markings do no signify the exact location but only indicate the particular underground utility is located somewhere within a strip of land not more than 2 feet on either side of the exterior surface of the underground installation. Information on the depth of an existing utility is normally not given, only location and alignment.

15-6 **UTILITY INFORMATION AND NOTIFICATION** – It is important to obtain accurate and factual information concerning the location of existing aerial and underground utilities early in the design process.

For private development projects, the design professional shall demonstrate their coordination with public/private utilities and submit certification that this coordination has been accomplished.

In the preparation of construction plans, the various utility companies are to be notified in writing according to the following procedure:

A Letter Send a minimum of six months in advance of the anticipated bid date for the project. It is beneficial to send this letter as soon as preliminary design is complete.

Provide information on location and limits of project, scope or description of the work, etc. Include vicinity map, typical sections, right-of-way requirements, and if available preliminary plans with survey notes plotted.

B Letter Send at time of advertising project for bids.

Copies of complete plans that have been signed are sent with this letter. Include date bids are to be received and date construction is expected to begin.

Blank copies of these utility notification letters are included as Exhibits at the end of this section.

For many projects the sending of the two standard notification letters may need to be supplemented with visits to the field, "potholing," telephone calls, and the arrangement of meetings with utility company representatives. This is to insure that any required relocation of existing utilities not to be performed by the contractor will be completed in a manner that will not delay a contractor constructing a project. This is especially important for large projects where utility relocations may be numerous and time consuming.

Early receipt and thorough analysis of utility information (size, alignment, depth, etc.) as related to the design and construction of new public improvements should greatly reduce the number of change orders, construction delays, and contractor claims resulting from conflicts with existing utilities encountered in the field.

As part of the design work for a public improvement project, an effort should be made to identify, locate (by "potholing" if necessary), and arrange a time schedule for the relocation of existing utilities found to be in conflict with any proposed improvement elements.

15-7 CLEARANCES TO EXISTING UTILITIES

A. Excavating Near Power or Telephone Poles – In streets improved with curbs, gutters, and sidewalks, power poles and telephone poles are placed at the back of curb in the sidewalk or planter area. In paved streets that lack curbs, gutters, and sidewalks, the poles are generally placed a few feet inside the street right-of-way line but behind any drainage swales or roadside ditches. In easements, such as along the rear lot lines of residential subdivisions or along drainage channels, power poles are usually placed inside the easement right-of-way line far enough for the crossarms to remain within the easement.

May public improvement projects, particularly street widening projects, may involve the installation of municipal utilities (storm drain lines, sanitary sewer lines, and water mains) in close proximity to existing power or telephone poles. Existing power and/or telephone poles may need to be set back if the street widening project includes the acquisition of addition a right-of-way. However, until the additional right-of-way is acquired and the poles relocated to their ultimate position, the current location of the poles may greatly influence, if not completely dictate, the placement of the proposed drain lines, sewer lines, or water mains.

In determining the placement of drain lines, sewer lines, or water mains relative to fences, channel banks, power poles, telephone poles, street lights, traffic signal standards, etc., consideration should be given to the working space needs of excavating equipment used to install the drain lines, sewer lines, or water mains.

Large capacity trench excavating equipment may have a side overhang of approximately 7 feet measured from the centerline of the trench. The space needs of the excavating equipment may be also governed by the minimum horizontal and vertical clearances to

overhead wires. In general, the deeper or wider a pipe trench is, the larger will be the size of the machine used to excavate the trench and the farther the pipeline will need to be from a line of poles or other fixed objects.

Descriptive literature giving the dimensions and working space needs of specific models of excavators from various manufacturers (Caterpillar Co., Deere and Co., etc.) is available upon request form dealers of such equipment.

Existing power or telephone poles may need to be braced if the stability of the poles is threatened by the excavation of a trench nearby. The work of bracing of the poles is performed by the utility company owning the poles (Pacific Bell). For some types of projects (usually privately funded ones) the utility company may charge for the cost of bracing the poles.

Situations occur where the horizontal and/or vertical clearances between the bucket and boom of an excavator and the energized overhead wires of a power pole line may be less than safety standards allow. If an existing electrical power line cannot be temporarily shutdown (de-energized) for a long enough period of time to complete the excavation of a trench and installation of pipe, a temporary power pole line or "shoofly" may need to be installed parallel to but some distance form the existing pole line.

Following completion of installation of a "shoofly" the existing power line between the limits of the "shoofly" is de-energized thus allowing the safe use of excavating equipment. Any customers normally served from the de-energized overhead line are temporarily connected to the energized "shoofly."

B. **Horizontal and Vertical Clearances to Underground Utilities** – If at all possible, water mains are to be placed to provide 10 feet of horizontal clearance from parallel sanitary sewer lines. A minimum of one foot of vertical clearance shall be provided between water mains and gravity sewer lines at all transverse crossings. Water mains shall be installed a minimum of 2 feet above sanitary sewer force mains at all transverse crossings. In addition, water mains shall cross over rather than under sanitary sewer lines unless the depth of cover over the water main dictates otherwise.

A minimum of 6 inches of vertical clearance shall be provided between water mains and storm drain lines and other non-sanitary utility lines.

All new, relocated, or replacement water distribution mains as well as small to medium size sewer or drain lines (12 to 18 inches in diameter) shall be placed at least 5 feet, centerline to centerline, from such underground utility lines as gas mains and electrical or telephone cables and ducts, provided the existing underground facilities are not too large (wide).

In areas where the clearances between existing and proposed facilities is extremely limited, new or replacement drain lines, sewer lines, or water mains may be placed such that no portion of the substructure of an existing underground utility is closer than two feet to the trench wall of the new or replacement facility.

Long skew crossing of proposed storm drain lines, sanitary sewer lines, or water mains over and especially under of underground existing utility lines should be avoided if at all possible. Such crossings are very costly to construct due to the amount of difficult excavation and tunneling required (usually by hand) and the need to provide special support for the portion of the existing utility that is exposed.

15-8 **<u>"POTHOLING" EXISTING UTILITIES</u>** – "Potholing" an existing utility involves the excavation and exposure of the utility's substructure at the location of a potential conflict to determine the utility's

depth and size. Using the "pothole" measurements, the location and depth of the existing utility should be indicated on the profile of the improvement plans. In some cases the depth and location of an existing utility is best shown on a cross section.

If there is a strong possibility a conflict will occur between a proposed municipal utility line and an existing underground utility, and the owner of the existing utility line is unable to provide its exact elevation at the location of the interference, the Design Engineer for the proposed project should arrange to have the existing utility "potholed." It is recommended a survey party be on hand at the time a "pothole" excavation is made to accurately record the necessary measurements of location and depth (election). A representative of the owner of the underground utility should also be at the site of the "pothole" excavation.

15-9 **SHOWING EXISTING UTILITIES ON PUBLIC IMPROVEMENT PLANS** – All major existing above and below ground utilities should be shown on the public improvement plans in an accurate manner. The location of any existing utility parallel to and within 5 feet of any proposed municipal utility line or which crosses a proposed municipal utility line at an angle of 30 degrees or less should be determined with an accuracy of plus or minus one foot. The distances between existing underground utility lines and proposed storm drain lines, sanitary sewer lines, or water mains within 5 feet of one another should be dimensioned on the plans.

The horizontal or vertical alignment of a proposed facility requiring the permanent relocation of an existing utility line should be thoroughly analyzed before the alignment is finalized to determine if feasible options other than relocation are available.

Completed plans for proposed projects should clearly differentiate, insofar as possible, existing utilities that are:

1. Existing utilities to remain in place
2. Already abandoned in place
3. To be abandoned in place
4. To be relocated by others
5. To be removed by others
6. To be removed by the contractor
7. Salvage applicability and responsibility

The contractor's responsibility for the protection, removal, relocation, or avoidance of interference with existing utilities should be indicated on the plans.

APPENDIX

UTILITY LETTER "A"

(date)

name and address)

Re: Project Name

Dear (Name):

For your information, please find enclosed two sets of preliminary plans showing improvements to be constructed as part of the _____ project located _____ _____, together with a partially completed Utility Information Form.

The anticipated advertising date for the subject project is _____.

On one of the copies of the enclosed plans, please verify the location, size and depth, if underground, of any of your company's facilities that may be affected by the proposed work. Within 15 days of receiving this letter, please return the marked up copy to this office. Also, please complete the attached Utility Information Form and indicate the estimated time schedule for completing any utility relocation work necessary as a result of this project.

If you desire further information concerning the proposed work, please call me at _____.

Sincerely,

NAME
Title

Enclosures

cc: City of Lincoln, City Engineer

UTILITY LETTER "B"

(date)

(name and address)

Re: Project Name

Dear (Name):

You are hereby advised that the City of Lincoln is planning the improvements of the _____ project in the near future by public contract.

Plans showing the improvements to be made are enclosed for your information. The anticipated bid date for the project is _____. It is expected that your facilities will be relocated prior to the start of construction (approximately three weeks after bid date).

If you desire further information concerning the proposed work, please call me at _____.

Sincerely,

NAME
Title

Enclosure

cc: City of Lincoln, City Engineer

FORM 6D

UTILITY INFORMATION FORM
(To be filled in by Engineer)

Date:_____

To: _____
(PAC Bell, PG&E, SMUD, etc.)

From:_____ Address:_____
(Name of Engineering Firm)

Phone:_____

Developer:_____ Address:_____

Project:_____ Phone:_____
(Name of Subdivision; street address, etc.)

TO BE FILLED IN BY UTILITY COMPANY

Utility Representative:_____ Phone:_____

Date Plans Received:_____

Do facilities require relocation or removal? _____ Yes _____ No

If yes, give location: _____

_____

_____

Comments:_____

_____

Time required to engineer project: _____ working days
Time required to schedule and complete construction
after payment of relocation cost (if required) _____ working days

TOTAL _____ Working days

If poles, are they jointly owned? _____ Yes _____ No

If yes, jointly owned with: _____
(PAC Bell, SMUD, Citizens Utilities, etc.)

_____ _____
Signature of Utility Representative Date

NOTE: This form is to be returned to Name of Engineer within 15 days.

CITY OF LINCOLN

640 "5th Street, Lincoln, CA 95648

PLAN CHECK SUBMITTALS TRANSMITTAL

- PROJECT: _____
- DRAWING/PLAN DESCRIPTION _____
- PROJECT ENGINEER: _____

  PHONE NO.: _____

SUBMITTAL REVIEW/CHECK

- PLAN CHECK SUBMITTAL NO. (1) ☐ (2) ☐ (3) ☐ (4) ☐ ☐ OTHER: _____
- PLAN CHECK REVIEW ENGINEER: _____

  CONTACT PERSON: _____

  PHONE NO.: _____

- NO. OF PLANS SUBMITTED: _____ NO. OF SHEETS/PAGES: _____
- PLAN CHECK REVIEW ITEMS:

☐ SEWER
- ☐ CALCS
- ☐ OTHER _____

☐ WATER
- ☐ CALCS
- ☐ OTHER _____

BACKFLOW/X-CONNECTION

☐ DRAINAGE
- ☐ CALCS
- ☐ OTHER _____

☐ LIGHTING
- ☐ CALCS

☐ LANDSCAPING

☐ FIRE
- ☐ CALCS

☐ DRY UTILITIES

☐ TRANSIT

☐ GRADING
- ☐ CALCS
- ☐ OTHER _____

☐ STRIPING

☐ STREETS
- ☐ CALCS
- ☐ OTHER _____

☐ SIDEWALKS

☐ TRAFFIC STUDIES
- ☐ OTHER _____

MISC.: _____

TO BE COMPLETED BY APPLICANT FOR ALL SUBMITTALS

☐ ORIGINAL ENGINEER'S ESTIMATE $ _____ DATE: _____

☐ UPDATED COST ESTIMATE $ _____ DATE: _____

☐ PLAN CHECK (1%) FEE $ _____

☐ INSPECTION (2%) FEE +$ _____

☐ FEES RECEIVED =$ _____ DATE PAID: _____ CHECK NO. _____

☐ GRADING PERMIT FEE $ _____ DATE PAID: _____ CHECK NO. _____

☐ FEES RECEIVED (REVISED/ADDITIONAL) AMOUNT $ _____ DATE: _____

SPECIAL SUBMITTALS REVIEW

☐ CITY PLANNING/BUILDING

CONTACT PERSON: _____

NO. OF SETS: _____

☐ CITY POLICE/FIRE

CONTACT PERSON: _____

NO. OF SETS: _____

NOTES/REMARKS

PLEASE RETURN COMMENTS NO LATER THAN: _____

SUBMITTED BY: _____ DATE: _____

CITY OF LINCOLN
SUBDIVISION/PARCEL MAP CHECK LIST
CITY ENGINEER/PUBLIC WORKS DEPARTMENT
AND PLANNING DEPARTMENT
1390 First Street
Lincoln, California 95648

MAP NAME _____ PROJECT _____
ASSESSOR'S PARCEL NO. _____ ACREAGE _____
DATE RECEIVED _____ DATE DEEMED COMPLETE _____ NO. OF LOTS _____
ZONING _____ PLANNING CONTROL NO: _____
MAP NO. _____ PLAN CHECK FEE _____
SURVEYOR / ENGINEER _____ PHONE _____

DEPT.	ITL.	DATE	
PLANNING	____	_____	☐ CHECK FOLDER FOR COMPLETENESS OF CONTENTS AND ANY NOTES ON OUTSIDE OF FOLDER FOR FEES PAID
PLANNING	____	_____	☐ DATE TENTATIVE APPROVED BY THE CITY COUNCIL
PLANNING	____	_____	☐ CHECK FOR ADJACENT MAPS
PLANNING	____	_____	☐ CHECK MAP FOR TENTATIVE MAP AND CEQA CONDITIONS
PLANNING	____	_____	☐ STATEMENT OF APPLICANT'S RESPONSIBILITY
PLANNING	____	_____	☐ MAP CONFORMS TO TENTATIVE MAP APPROVAL CONDITIONS, VARIANCES AND REZONES (DATE OF TENTATIVE MAP APPROVAL TO APPEAR ON MAP)
DPW/ENGR	____	_____	☐ FIELD CHECK: FENCES, HOUSE TO PROPERTY LINE, FENCES TO MONUMENTS, ALL MONUMENTS SAME AS SHOWN ON MAP. SAME CHARACTER AS REFERENCE MAPS
DPW/ENGR	____	_____	☐ CHECK PARCEL DESIGNATIONS
DPW/ENGR	____	_____	☐ CHECK FIRE HYDRANT REQUIREMENTS (HYDRANT INSTALLED BEFORE FINAL MAP)
DPW/ENGR	____	_____	☐ CHECK LOT AREA FOR ZONE COMPLIANCE (LOT ARE AFTER SURVEY VS. TENTATIVE)
DPW/ENGR	____	_____	☐ CHECK ENGINEER'S STATEMENT
DPW/ENGR	____	_____	☐ CHECK CITY CLERK / DEDICATION ACCEPTANCE STATEMENT
DPW/ENGR	____	_____	☐ CHECK OWNER'S STATEMENT, NOTARY
DPW/ENGR	____	_____	☐ CHECK SURVEY OR / ENGINEER'S STATEMENT
DPW/ENGR	____	_____	☐ CHECK RECORDER'S STATEMENT
DPW/ENGR	____	_____	☐ CHECK AND COMPLETE IMPROVEMENT REQUIREMENTS CERTIFICATE
DPW/ENGR	____	_____	☐ TITLE SUBTITLE, SHORT LEGAL DESCRIPTION SHOWN ON ALL SHEETS (TRACT NUMBER, BLOCK AND LOT NUMBER) SECTION, TOWNSHIP, RANGE
DPW/ENGR	____	_____	☐ SHEET NUMBERING (TITLE SHEET FIRST, 1 OF 2, ETC.)
DPW/ENGR	____	_____	☐ SCALE, NORTH ARROW
DPW/ENGR	____	_____	☐ LEGIBILITY OF LETTERING AND SYMBOLS, MIN. HEIGHT 1/10"
DPW/ENGR	____	_____	☐ CHECK SUM OF INTERIOR DISTANCES
DPW/ENGR	____	_____	☐ CHECK MAP FOR SEGREGATION OF SEWER ASSESSMENT(S)
DPW/ENGR	____	_____	☐ CHECK BOUNDARY ESTABLISHMENT (DEED, ADJACENT SURVEYS, FENCES, ETC.) TIE TO SECTION CORNER
DPW/ENGR	____	_____	☐ CHECK BASIS OF BEARINGS
DPW/ENGR	____	_____	☐ CHECK CITY LIMIT LINES, COUNTY BOUNDARY LINES, 100 YEAR FLOOD PLAIN, (NOTE FOR MEAN HIGH WATER LINE) WATER COURSES, CANALS, ROADWAYS, CO. ROAD #
DPW/ENGR	____	_____	☐ LABEL LOT CORNERS AND / OR LOT LINES
DPW/ENGR	____	_____	☐ CHECK CLOSURES (MAXIMUM ALLOWABLE ERROR 1/50,000)
DPW/ENGR	____	_____	☐ CHECK LOT ACREAGE (ACCURACY TO THREE DECIMAL PLACES)
DPW/ENGR	____	_____	☐ CHECK CURVE DATA (RADIUS: CHORD AND BEARING, OR DELTA)
DPW/ENGR	____	_____	☐ CHECK FOR BEARINGS AND DISTANCES ON ALL LINES (ARROW WHEN NECESSARY)
DPW/ENGR	____	_____	☐ CHECK ADJACENT STREET SHOWN FOR NAMES (INCLUDING DUPLICATIONS AND "SOUND ALIKES" FOR NEW STREETS) AND RIGHT OF WAY INFORMATION AND TIE TO NEAREST CROSS STREET
DPW/ENGR	____	_____	☐ CHECK CENTERLINE OF RIGHT OF WAY TO PROPERTY LINE DIMENSION
DPW/ENGR	____	_____	☐ VERIFY AND DIMENSION ALL EXISTING PUBLIC UTILITY EASEMENTS, RIGHT OF WAY, ETC. (HOW MUCH, TO WHOM, WHAT FOR). REVIEW TITLE REPORT. ACCESS RIGHTS SHOWN
DPW/ENGR	____	_____	☐ ADJACENT PROPERTY OWNERS WHERE APPROPRIATE
DPW/ENGR	____	_____	☐ CHECK LEGEND (MONUMENT CHARACTER, ABBREVIATIONS, REFERENCES)
DPW/ENGR	____	_____	☐ BE SURE ALL REQUIRED DEDICATIONS (EASEMENTS, RIGHTS OF WAY, I.O.D.'S) HAVE DEDICATION INFORMATION BLOCKS PROVIDED AND THE LOCATIONS OF DEDICATIONS ADEQUATELY SHOWN
DPW/ENGR	____	_____	☐ UTILITY FEES PAID (APPRAISAL FORM/FEE, FEE CALCS, FEE PAYMENT)
DPW/ENGR	____	_____	☐ CALIFORNIA COORDINATES
DPW/ENGR	____	_____	☐ PARCEL MAP GUARANTEE, TAX LETTER, TAX ESTIMATE, RECORDING FEE

APPROVED

_____ TECHNICAL CORRECTNESS _____ DATE

_____ L. S. NUMBER

APPROVED

_____ JOHN PEDRI, CITY ENGINEER _____ DATE

_____ MAP SENT FOR RECORDING/COUNCIL _____ DATE