Chapter 1

General Considerations
Design Standards and Policies
Revised December 1999

Chapter 1, General Considerations, contains information to assist the consultant in preparation of all construction plans and document to be submitted to the City of Scottsdale for approval. Additionally, this chapter contains information to assist the consultant in the preparation of public improvement plans and documents specific to the City of Scottsdale Capital Project Management (CPM) division. This chapter also describes the overall development process and includes various checklists as a guideline for those submitting final plans to the City of Scottsdale for permitting.

Section 1.1

General Construction Plan Requirements
Design Standards and Policies
Revised December 1999

Chapter 1
General Considerations

GENERAL CONSTRUCTION PLAN REQUIREMENTS

	PARAGRAPH TITLE	PAGE
1-101	GENERAL COMMENTS	1
1-102	BASIC PLAN REQUIREMENTS	1
	A. General Submittal Standards B. Cover Sheet Format and Information	
1-103	PRESENTATION OF DESIGN AND CONSTRUCTION INFORMATION	3
	A. General B. “As-Builts”	
1-104	REPORTS AND OTHER DOCUMENTS	4
1-105	“SPECIAL PLAN” REQUIREMENTS	4
	A. Haul Route Plan/Permit	

Figures	1.1-1	Typical coversheet format
	1.1-2 a and b	Improvement Plan Approval/Signature blocks
	1.1-3	No Conflict Signature block
	1.1-4 a and b	Landscape/reapproval Signature blocks
	1.1-5	Landscape Maintenance Block
	1.1-6 a and b	No Conflict handout /Forms
	1.1-7	FEMA Blocks and information
	1.1-8	Benchmarks on Improvement plans
	1.1-9	General Construction Notes

SECTION 1.1
GENERAL CONSTRUCTION PLAN REQUIREMENTS

1-101 GENERAL COMMENTS

This chapter contains information to assist the consultant in the preparation of all construction plans and documents to be submitted to the City of Scottsdale for approval.

All plans shall conform to the latest revised copy of the City's Design Standards and Policies Manual.

Any deviation from the City's Design Standards and Policies Manual requires prior approval by Development Quality / Compliance Division staff.

1-102 BASIC PLAN REQUIREMENTS

A. General Submittal Standards

1. Plans submitted for review shall have the appropriate professional (State of Arizona) seal, signature, and date on each sheet. The City of Scottsdale does not require landscape and irrigation plans to be prepared and sealed by a registered landscape architect (except for capital improvement plans).

2. Plans shall be prepared on a 24" x 36" sheet size, with a minimum 2" left border and minimum ½" border on other sides.

3. Plans shall be drawn to a horizontal scale of 1 inch = 20 feet and to a vertical scale of 1 inch = 2 feet. A bar scale shall be provided. Unusual situations may warrant the use of a non-standard drawing scale. Prior approval from Development Quality / Compliance Division staff is required.

4. Minimum lettering and numbering size shall be 3/16" for manually drafted or 1/8" (12-point font) for mechanically produced letters, numbers, and symbols. Lettering, numbering, and line work must be uniform and with clear definition to be retrievable after microfilming.

5. Plans submitted to the City for review shall be blueline prints.

6. Plans submitted to the City for approval shall be original mylar drawings or photo-mylar copies of original drawings. Vellum is an acceptable medium for landscape and irrigation plans.

NOTE: Plans, which in the opinion of City staff cannot produce usable microfilm, will not be accepted for review.

B. Cover Sheet Format and Information (See Figure 1.1-1)

1. Title
   Include the name of the project and the content of the plan set.

2. City Name
   Below the title, include the words "Scottsdale, Arizona".

3. Vicinity Map
   Locate the project relative to two intersecting arterial streets.

4. Legal Description
   Provide project property legal description. When a legal description is not feasible, list the township, range, section, and location.

5. Benchmark
   Use City of Scottsdale datum NAVD 1988. A formula shall be provided to translate to City of Scottsdale datum/elevations if any local benchmark is used. See figure 1.1-8 for internet address and benchmark certification notes as required.

6. Additional Information
   Include the following additional information on the cover sheet. (See Figure 1.1-1)

   a. Approval block for signatures (See Figure 1.1-2a and b.) The cover sheet should also include approvals from the appropriate utility companies (See Figure 1.1-3.) If landscape and irrigation plans are not prepared by the same engineer / designer as the civil engineering drawings, a separate landscape approval block (See Figure 1.1-4 and b) shall be provided on the cover sheet of the landscape and irrigation plans. A landscape maintenance block shall also be applied to the cover sheet (See Figure 1.1-5.)

   b. All applicable City project and case numbers in the border along right edge- ¼" (24 point font) minimum lettering size. City case numbers include the zoning, development review board, plan check and native plant permit case numbers.

c. “City of Scottsdale, General Construction Notes for Public Works Construction” (See Figure 1.1-9.)

d. Sheet Index.

e. Utility system ownerships.

f. Other agency approvals as required.

g. Engineer, architect and developer company names, contact persons, addresses, and telephone and fax numbers.

h. Construction quantities (for work in public rights-of-way or easements).

i. Current zoning of the property.

j. Legend – for symbols, non-standard abbreviations, etc.

k. “Blue Stake” note is required on all plans that include excavation of any type.

l. “Key Map” shall be provided on multi-sheet plans to relate plan sheets to project locations and type of improvements.

m. Utility Conflict Coordination: The developer shall forward a copy of the proposed improvement plans and a **No Conflict Form** (Figure 1.1-6 b) to all affected utility companies that will be providing service to the site. A signed **No Conflict Form** from all affected utility companies shall be submitted to Project Review. No approvals or permits will be issued until a form is received from every affected utility company. Based on the information in the completed **No Conflict Forms**, the cover sheet for the improvement plans shall contain a completed **No Conflict Signature Block** (Figure 1.1-3.)

1-103 PRESENTATION OF DESIGN & CONSTRUCTION INFORMATION

A. General

1. Plan layout, graphics, and call-outs must be clearly presented in an uncluttered manner acceptable to Development Quality / Compliance Division staff.

2. Plans shall provide cross-referencing between all sheets that have details, detail call-outs, notes, etc.

3. Plans shall be oriented with north at the top or right side of each sheet. A north arrow and bar scale shall be provided.

B. “As-Builts”

1. Mylar drawings are required to be provided to the City for “As –Building” of construction within public rights-of-way or within easements dedicated to the City. Only original (4 mil) mylar drawings or photographic (4 mil) mylars are acceptable.

1-104 REPORTS AND OTHER DOCUMENTS

Reports and other submitted documents must include the following:

1. All reports and documents shall have the appropriate (State of Arizona) professional seal, signature, and date.

2. All reports and documents shall be provided on 8 ½" x 11" format. Larger size exhibits may be included, provided they are secured inside.

1-105 "SPECIAL PLAN" REQUIREMENTS

A. Haul Route Plan/Permit

1. Estimated dirt hauls of 5,000 cubic yards or more that require use of the pubic right-of-way shall obtain a "Haul Route/Encroachment Permit".

2. Estimated dirt hauls of less than 5,000 cubic yards may require a "Haul Route/Encroachment Permit" as determined by the City at the time of grading plan review.

3. The Public Works Inspection Supervisor will stipulate, review, and approve:

   - Haul Routes
   - Allow travel times
   - Traffic control requirements
   - Dust control requirements
   - Restoration procedures
   - Safety procedures
   - Possible additional requirements

XYZ SUBDIVISION

SEWER IMPROVEMENT PLANS
SCOTTSDALE, AZ

CITY OF SCOTTSDALE
GENERAL NOTES

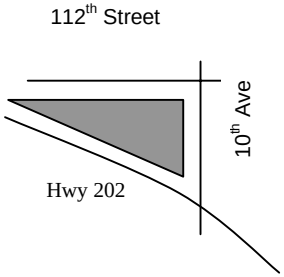
ZONING

ASSESSOR'S PARCEL
NUMBER

UTILITY COMPANIES

BENCHMARK
COS NAVD 88 DATUM

MARICOPA COUNTY
HEALTH DEPT.
APPROVAL



VICINITY MAP

LEGAL DESCRIPTION

SHEET INDEX

QUANTITIES

NATIVE PLANT PERMIT #

OWNER /DEVELOPER
CONTACT PERSON
NAME, ADDRESS
PHONE NUMBER
FAX NUMBER

ARCHITECT
CONTACT PERSON
NAME, ADDRESS
PHONE NUMBER
FAX NUMBER

ENGINEERING COMPANY
CONTACT PERSON
NAME, ADDRESS
PHONE NUMBER
FAX NUMBER

XYZ SUBDIVISION
SEWER PLANS

SEAL AND
SIGNATURE

SHEET NO.

100 DR 100 (CITY PLAN CHECK NO.)

Figure1.1-1
Typical Cover Sheet Format

CITY OF SCOTTSDALE			
REVIEW & RECOMMENDED APPROVALS BY:			
PAVING		TRAFFIC	
G &D		PLANNING	
W &S		FIRE	
RET. WALLS			
Engineering Coordination Manager (or designee)		Date	

CITY OF SCOTTSDALE REAPPROVAL			
Reappr. #	Sheet #'s Revised	Description of Revision(s)	
PAVING		TRAFFIC	
G &D		PLANNING	
W &S		FIRE	
RET. WALLS			
Engineering Coordination Manager (or designee)		Date	

Figure 1.1-2a and b

Approval/Signature Blocks

NO CONFLICT SIGNATURE BLOCK

Utility	Utility Company	Name of Company Representative	Telephone Number	Date Signed
Water				
Sanitary Sewer				
Electric				
Telephone				
Natural Gas				
Cable TV				
Other				
Other				

Engineer's Certification

I _____, being the person responsible for designing the facilities necessary to serve this development, hereby certify that all of the utility companies listed above, have reviewed this project proposal and all conflicts have been resolved at this point. 'No Conflict' Forms have been obtained from each utility company and are included in this submittal. I also certify that all onsite transformers, cable boxes and any other public/private utility appurtenances are placed such that they do not negatively impact the use or intended use of any dedicated easements or facilities developed with this project including but not limited to stormwater storage basins, sight distance easements and NAOS or other open space easements.

_____ _____

Signature **Date**

Figure 1.1-3

No Conflict Signature Block

LANDSCAPE PLAN APPROVED CITY OF SCOTTSDALE		
CASE #.	**APPROVED BY**	**DATE**
CONSTRUCTION AND INSTALLATION SHALL BE IN ACCORDANCE WITH THIS PLAN AND ANY AND ALL DEVIATION WILL REQUIRE RE-APPROVAL. LANDSCAPE INSTALLATION TO BE APPROVED BY CITY OF SCOTTSDALE INSPECTION SERVICES BEFORE CERTIFICATE OF OCCUPANCY IS ISSUED.		

LANDSCAPE PLAN REAPPROVAL CITY OF SCOTTSDALE		
REAPP. #	SHEET #'s REVISED	DESCRIPTION OF REVISION(s)
CASE #.	**APPROVED BY**	**DATE**
CONSTRUCTION AND INSTALLATION SHALL BE IN ACCORDANCE WITH THIS PLAN AND ANY AND ALL DEVIATION WILL REQUIRE REAPPROVAL. LANDSCAPE INSTALLATION TO BE APPROVED BY CITY OF SCOTTSDALE INSPECTION SERVICES BEFORE CERTIFICATE OF OCCUPANCY IS ISSUED.		

Figure 1.1-4 a and b

Landscape and Irrigation Approval/Signature Blocks

ALL LANDSCAPE AREAS AND MATERIALS, INCLUDING THOSE LOCATED IN PUBLIC RIGHTS-OF-WAY, SHALL BE MAINTAINED IN A HEALTHY, NEAT, CLEAN AND WEED-FREE CONDITION. THIS SHALL BE THE RESPONSIBILITY OF THE _____

(Property Owner, Developer or Homeowner's Association)

FIGURE 1.1-5

Landscape Maintenance Block

CITY OF SCOTTSDALE

"NO CONFLICT" FORM

PART I OF II

PART I must be completed and submitted with the improvement plans.
PART II must be completed before the Project Quality/Compliance Division may approve the improvement plans.

This form has been developed to better coordinate the location of facilities associated with dry utilities relative to improvements proposed on final plan submittals.

PROJECT NAME:_____

PROJECT ADDRESS:_____

ENGINEER:_____

CITY OF SCOTTSDALE PLAN CHECK NO.:_____

Please list the utility company name and the date that the improvement plans were sent to each appropriate utility company. The City will provide Utility Conflict Review for the following City of Scottsdale utilities: water (potable & non-potable), sewer, storm drain, and fiber optic lines.

UTILITY	UTILITY COMPANY	DATE SENT
CITY OF SCOTTSDALE UTILITIES	The Project Quality/Compliance Division will perform a utility conflict review of City utilities for the improvement plans submitted with this document. **No separate utility plan submittal is required.**	
WATER		
ELECTRIC		
TELEPHONE		
NATURAL GAS		
CABLE TV		
OTHER		

CERTIFICATION:

I, _____ , certify that plans have been submitted to the utility
ENGINEER

companies listed in the above table, on the dates listed in the above table, for conflict review.

Figure 1.1-6a

No Conflict Form – Part I of II

CITY OF SCOTTSDALE

"NO CONFLICT" FORM

PART II OF II

PART I must be completed and submitted with the improvement plans.
PART II must be completed before the Project Quality/Compliance Division may approve the improvement plans.

This form has been developed to better coordinate the location of facilities associated with dry utilities relative to improvements proposed on final plan submittals.

PROJECT NAME:_____

PROJECT ADDRESS:_____

ENGINEER:_____

CITY OF SCOTTSDALE PLAN CHECK NO.:_____

"NO CONFLICT" STATEMENT:

As a representative of _____, I certify that I have reviewed the
UTILITY COMPANY NAME

plans for the development proposal named above and, as of today, find no conflicts with regard to any new facilities that my company will need to install to serve this site.

I understand that my company must notify the City of Scottsdale's Inspection Services Department at (480) 312-5757 a minimum of 24 hours prior to installation of any surface facilities.

NAME OF COMPANY REPRESENTATIVE:_____

TELEPHONE:_____

DATE:_____

DATE ON PLANS:_____

Figure 1.1-6b

No Conflict Form – Part II of II

FEMA INFORMATION

In accordance with FEMA and City requirements, the following information must be included on the cover sheet of all plans, which establish lowest finish floor elevations and flood proofing elevations for both residential and non-residential structures.

FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

COMMUNITY Number	PANEL # PANEL DATE	SUFFIX	DATE OF FIRM (Index Date)	FIRM ZONE	BASE FLOOD ELEVATION (In AO zone, Use Depth)
045012					

Engineer's Certification: The lowest floor elevation(s) and/or floodproofing elevation(s) on this plan are sufficiently high to provide protection from flooding caused by a one-hundred year storm, and are in accordance with City of Scottsdale Revised Code, Chapter 37 – Floodways & Floodplains Ordinance.

PLEASE NOTE

From the code of Federal Rules – 44CFR 65.2. Certification of data is a statement that the data is accurate to the best of the Certifier's knowledge.

Certification of analysis is a statement that the analyses have been performed correctly and in accordance with sound engineering practices.

Certification of structural works is a statement that works are designed in accordance with sound engineering practices to provide protection from the base flood.

Certification of "as-built" conditions is a statement that the structure(s) has been built according to the plans being certified, is in place, and is fully functioning.

Rev. 12/93

Figure 1.1-7

FEMA Blocks and Information

BENCHMARKS ON IMPROVEMENT PLANS

To access the City of Scottsdale horizontal and vertical datum information on the internet , go to
Http://www.c.scottsdale.az.us/inspections/hv_search.asp

All improvement plans must contain a City of Scottsdale NAD 88 Benchmark, on the cover sheet, with an elevation equation as required. All improvement plans must also contain a statement certifying the datum used for all elevations represented on the plans. This certification shall be included on the plan cover Sheet, immediately below the benchmark, and shall state one of the following:

I hereby certify that all elevations represented on this plan are based on the elevation datum for the City Of Scottsdale Benchmark provided above.

OR:

I hereby certify that all elevations represented on this plan are based on the elevation datum equation to the City of Scottsdale Benchmark as provided above.

In addition, all Plans that include an occupiable structure, residential or non-residential, shall continue to be required to provide a Lowest Finish floor elevation on the plans, including the Engineer's Certification. The format for the Lowest Floor elevation shall be as follows: L.F. 88 + XXXX.YY, where the complete elevation is stated (e.g.: 2695.67, not 95.67 or 695.67) and shall be the basis on the NAD 88 elevation datum, not an equated datum for the site.

Figure 1.1-8

Benchmarks on Improvement Plans

General Construction Notes for Public Works Construction

1. All construction in the public rights-of-way or in easements granted for public use must conform to the latest Maricopa Association of Governments (MAG) Uniform Standard Specifications and Uniform Standard Details for Public Works Construction as amended by the latest version of the city of Scottsdale (COS) Supplemental Standard Specifications and Supplemental Standard Details. If there is a conflict, the latter shall govern.

2. The engineering designs on these plans are only approved by the City in scope and not in detail. If construction quantities are shown on these plans, they are not verified by the City.

3. Approval of plans is valid for six (6) months. If an encroachment permit for the construction has not been issued within six months, the plans shall be resubmitted to the City for re-approval.

4. A Public Works inspector will inspect all works within the City of Scottsdale rights-of-way and in easements. Notify Inspection Services 24 hours prior to starting of construction (Telephone 480-312-5750).

5. Whenever excavation is to be done, call the “Blue Stake Center,” 602-263-1100, two working days before excavation is to begin. The Center will see that the location of the underground utility lines is identified for the project. Call “collect” if necessary.

6. Encroachment permits are required for all work in public rights-of-way and easements granted for public purposes. An encroachment permit will be issued by the City upon receipt of payment of a base fee plus a fee for inspection services to be provided by the City. Copies of all permits shall be retained on-site and shall be available for inspection at all items. Failure to produce the required permits will result in immediate work stoppage until the proper permit documentation is obtained.

7. All excavation and grading which is not in the public rights-of-way or not in easements granted for public use must conform to Chapter 70, Excavation and Grading, of the latest edition of the Uniform Building Code prepared by the International Conference of Building Officials. A permit of this grading must be secured from the City for a fee established by the Uniform Building Code.

Figure 1.1-9

General Notes

Section 1.2

Capital Project Plan Requirements
Design Standards and Policies
Revised December 1999

Chapter 1
General Considerations

SECTION 1.2
CAPITAL PROJECT PLAN REQUIREMENTS

PAGE INDEX

SECTION PARAGRAPH TITLE PAGE

1-201 GENERAL INFORMATION 1

PART A - INFRASTRUCTURE AND ROADWAYS 1

1-202 DESIGN STANDARDS AND GUIDES 1

1-203 GENERAL INFORMATION 2

1-204 PLAN SHEET NUMBERING AND SEQUENCING 3

1-205 DETAILED SHEET INFORMATION 3

PART B - CITY FACILITIES 18

1-206 UNIFORM CODES AND DESIGN STANDARDS 18

1-207 GENERAL INFORMATION 19

1-208 PLAN SHEET NUMBERING AND SEQUENCING 20

1-209 DETAILED SHEET INFORMATION 20

PART C - CONSTRUCTION BIDDING DOCUMENTS 21

1-210 GENERAL 21

1-211 CONSTRUCTION DRAWINGS 21

1-212 SPECIAL PROVISIONS/ TECHNICAL SPECIFICATIONS 21

1-213 BID SCHEDULE 22

1-214 CONSTRUCTION COST ESTIMATE 22

FIGURE LIST

FIGURE DESCRIPTION
1.2-1 Typical cover sheet information
1.2-2 Sample note sheet
1.2-3 Sample quantity summary sheet
1.2-4 Sample paving plan and profile sheet
1.2-5 Guidelines for intersection cross-slopes and crown run-off

1.2-6 Worksheet for intersection cross-slopes and crown run-off
1.2-7 Sample pipe summary sheet
1.2-8 Sample storm drain plan and profile sheet
1.2-9 Sample intersection signal plan
1.2-10 Sample right-of-way exhibit
1.2-11 Sample parcel acquisition exhibit
1.2-12 Sample legal description exhibit
1.2-13 Sample schedule of bid items form
1.2-14 General construction notes for capital improvement projects

APPENDICIES

A. Bid items numbering format
B. Plan review coordination process

SECTION 1.2
CAPITAL PROJECT PLAN REQUIREMENTS

1-201 GENERAL INFORMATION

This section contains information to assist the consultant in the preparation of public improvement construction plans and documents to be submitted to the City of Scottsdale Capital Project Management division (CPM).

The contents of this section are provided for the general informational use only. Project specific information must be obtained from the City's project manager. Actual project scope and tasks are contained in individual contract documents. Portions of this section may be incorporated or supplemented by reference into individual project contract documents.

PART A - INFRASTRUCTURE AND ROADWAYS

1-202 DESIGN STANDARDS AND GUIDES

A. Standard specifications and details

1. MAG Uniform Standard Specifications and Details

2. City of Scottsdale MAG Supplemental Specifications and Details

3. ADOT Standard Specifications for Road and Bridge Construction

4. ADOT Standard Drawings

5. Other governmental/utility agency specifications and details

B. Design policies and guidelines

1. City of Scottsdale Design Standards and Policies Manual

2. Project stipulations from the City's Development Review Board

3. AASHTO - A Policy on Geometric Design of Highways and Streets

4. AASHTO - Roadside Design Guide

5. Manual on Uniform Traffic Control Devices

6. ASTM/ASHTO standard specifications

7. Arizona Utility Coordination Committee - Public Improvement Project Guide

8. Other general acceptable design standards, policies and guides

1-203 GENERAL INFORMATION

A. Plans shall be prepared on standard 'D-size' (24-inch x 36-inch) sheets and be clearly reproduced on diazo print paper in a blue or black line format.

B. Upon request, the City will furnish the consultant electronic files in MicroStation or AutoCad, of base drawings shown in the figures at the end of this section. The consultant shall be responsible for the completion of the drawings as applicable to the project.

C. Each sheet, except the cover sheet, shall have a standard City title block in the lower right hand corner. The engineering company's identification shall be in the upper right hand corner of the sheet.

D. Minimum lettering size shall be 3/16 inch for manually drafted or 1/8 inch for mechanically produced lettering and must be legible when reduced 50 percent. Reproductions of drawings must be legible when microfilmed or reduced to 1/2 scale. Adhesive backed appliqués for lettering and/or shading will not be permitted without approval of CPM Plan Review.

E. On all sheets that have maps or plans, North shall be orientated to the top of the sheet or to the right. A North arrow and barscale shall be shown on each sheet. Project stationing shall increase from left to right on the sheet.

F. All construction notes shall be keynoted. Group construction keynote referencing to a specific symbol (square symbols designate demolition and removals, diamond symbols designate relocations and circular shapes for construction items). Number notes uniquely such that one number represents a specific note which only occurs on the applicable plan sheets. Each construction note shall be circumscribed by the appropriate symbol. Upon request, the City will provide a sample format for the Consultant to follow.

G. All projects shall comply with Section 404 of the Federal Clean Water Act. Before the city may issue development permits for a project, this form must be completed and submitted with improvement plans to the CPM Design and Plan Review staff. Consultants are advised to apply to the Corps as early as possible for a Section 404 permit and allow for the necessary processing time to prevent delays in obtaining development permits from the City of Scottsdale. The City of Scottsdale Section 404 Certification Form is included in Chapter 2 of this manual.

H. All projects shall comply with the City of Scottsdale’s Protection of Archeological Resources Ordinance. To help identify, preserve, and protect archaeological sites, an archaeolgical survey and report by a qualified archaeologist is required to be submitted for all public and private developments in the City of Scottsdale. A qualified archaeologist is an individual or firm meeting the Arizona State Museum’s standards and professional qualifications for an archaeologist.

Please contact the Preservation Division (480)312-7013 or your Project Manager or Project Coordinator for more information on archaeology requirements, including which projects may be exempt from requiring the survey and report.

1-204 PLAN SHEET NUMBERING AND SEQUENCING

A. Sheets shall be identified by design discipline as designated below and consecutively whole numbered within each discipline. Additionally, final consecutive numbering of the entire set of plans shall be provided on each sheet. The following sheet numbering prefixes are commonly used, and the consultant shall review the sheet sequencing and/or intended numbering with the City's project manager:

Public Works Projects
G=General
P=Paving
SD=Storm Drain
I=Irrigation
SS=Sanitary Sewer
W=Water
TS=Traffic Signalization/Signing/Markings
L=Landscape and Irrigation
S=Structural
M=Miscellaneous Plans By Others
RW=Right of Way

B. Plan sheets shall be sequenced as follows:

Order	Sheet No.	Description
1	G1	City cover sheet
2	G2	Notes, legend and key map sheet
3	G3	Quantity summary sheet
4	P1..P_	Paving plans, profiles and details
5	SD1..SD_	Storm drain plans, profiles and details
6	SD_..SD_	Profiles for catch basins and connecting pipe
7	I1..I_	Irrigation plans, profiles and details
8	SS1..SS_	Sanitary sewer plans, profiles and details
9	W1..W_	Water line plans, profiles and details
10	TS1..TS_	Traffic signal plans, schedules and details, traffic signing and pavement markings
11	L1..L_	Landscaping and irrigation plans, notes, legend and abbreviation sheet, landscaping sheets, irrigation sheets, detail sheets
12	S1..S_	Bridge and structural plans and details
13	M1..M_	Plan sheets by others: electric, telephone, gas, irrigation, cable television
14	RW1	Right of Way Strip Map

1-205 DETAILED SHEET INFORMATION

A. Cover Sheet
The City will furnish an electronic drawing file of the cover sheet upon request (see figure 1.2-1). The Engineer will add the following:

1. Project title, CPM project number, bid call number
2. Vicinity map with section, township and range noted
3. Sheet index

4. Engineering company identification and engineer's seal
5. Other agency approval blocks as applicable
6. City benchmarks for project - two (2) required on NAVD 1988 datum
7. Applicable City assigned plan review, development review and native plant numbers assigned by Project Review when submitted.

B. Notes, Legend and Key Map Sheets

1. Key Map - Show all intersections, rights-of-way, and key to all plans with stations
2. Legend of symbols used for existing and design elements
3. List of abbreviations used in plan set (other than as shown in the MAG Specifications)
4. Include City of Scottsdale general construction notes for Public works construction (see figure 1.2-14) in addition to any special project notes generated.

C.Quantity Summary Sheet

The City will provide a blank format for quantity summaries upon request (see Figure 1.2-3). The sequence number preceding the bid item should correspond to the construction note number on the plan sheets.

D. Paving Plan, Profile and Detail Sheets

1. Sheet Format:

a. Single plan and profile sheet, Highway Federal Aid Sheet - Plate 1 format, scale: 1 inch = 20 feet and not to exceed 500 feet per sheet; separate profiles for each curb and gutter and crownline at 1 inch = 2 feet vertical scale and 1 inch = 20 feet horizontal, using 3 inch separation between profiles.

b. Removal, construction, and other notes shall be categorically and numerically referenced and listed on the right-hand side of sheet. Use the same number for like work on all sheets including the quantity summary sheet. Categorize notes to type of operation, i.e. demolition/removal notes are first followed by construction notes, relocation notes, sheet notes and sheet cross-reference notes. Quantities shall be shown within each construction note and duplicated to the quantity summary sheets. The City will provide a sample format for the Consultant to use upon request.

c. In the area of match lines, portions of the same street are not to be repeated on separate sheets. Match lines shall show stationing and adjacent sheet number.

d. Intersections shall not be cut by match lines and shall be complete from BCR to ECR on same sheet. When intersecting streets are to be improved beyond ends of curb returns, additional plan and profile sheets shall be used to detail the intersecting street. The intersections at the beginning and end of the project shall be fully shown.

2. Horizontal Geometrics:

a. City major streets are typically centered along section lines, from section corner to section corner. Bearings need not be shown on plans; but deflection angles at alignment changes and all angles of intersecting streets shall be shown. All section corners, tangent points, P.I. of curvilinear sections, beginning and ending taper points and monument lines of all intersecting streets shall be labeled and stationed. Survey markers shall be installed per MAG Standard Details.

b. Show centerline stationing on plan and profile. Stationing numbers should be chosen to prevent "negative" stationing. The project need not start with 0+00. On curved sections the stationing shall be along the centerline of the curve and not the tangent lines.

c. Curve data shall be shown on same sheet as the curve. Stationing shall run from South to North and from West to East.

d. On streets that are not centered on the monument line, the stationing shall be along the construction centerline, which shall also be the proposed crown line, unless superelevation or other conditions dictate otherwise. On such streets, the right-of-way will be measured from the monument line. The offset between the monument line and construction centerline shall be shown and all offsets shown for new construction shall be from the construction centerline.

e. Design on intersecting streets shall be done in accordance with the City furnished geometrics and guides. Care must be taken to ensure a smooth grade in all directions through intersections. Special design work sheets are required to show profiles on the intersecting street to ensure smooth grades in both directions. These work sheets are to be included with the grade and alignment submittals (see Figures 1.2-5 & 1.2-6).

f. Curb return radii shall conform to type of street intersection as described in COS design criteria and procedures. All curb returns at intersecting streets (including along frontage roads) shall have sidewalk ramps conforming to ADA standards. In areas south of the CAP Canal (non-hillside development), street intersections with 30 feet return radii shall have MAG Std. Det. 231 ramps; street intersections with 25 feet return radii shall have MAG Std. Det. 232 ramps; driveways with curb returns shall conform to current COS Details. All curb return radii shall be dimensioned on the plans to back of curb.

g. On all existing roadways and intersecting streets, the plans shall show dimensions from monument line to right-of-way and to existing back of curb. Existing medians, sidewalks, etc. shall be clearly dimensioned and labeled.

h. All new pavements shall be fully dimensioned to the edge of pavement or back of curb and tied to horizontal control lines.

3. Topography and Notation:

a. Show all subdivision names, block numbers, lot numbers, property splits, lot dimensions, addresses, names of major businesses, schools, fire stations and other public facilities.

b. Show final right-of-way as a heavy ink line. Show original right-of-way where it differs from the new right-of-way line with a lighter weight line.

c. Show all existing alleys and easements with proper designations and dimensioning. Show all new easements required for the project, including temporary or permanent.

d. Show all underground utilities and appurtenances and their distances from the monument line and label size, type of material and type of utility. Utilities that are abandoned or to be abandoned shall be indicated as well as those to be removed. Any utilities to be constructed prior to the project shall be shown and so indicated. Underground electrical lines shall be denoted as direct burial cable or conduit enclosed cable.

e. Show all buried fuel tanks. When the new right-of-way is in an area where such tanks may exist, a special effort shall be made to check for the possibility of their existence.

f. Show existing underground concrete pavements. Core borings shall be utilized to determine the existence of such pavements when authorized by the City's project manager.

g. Show existing site conditions and topography to at least 10' beyond the new right-of-way line or any required easements. Use standard MAG symbols where applicable. Show all information for buildings, canopies, asphalt aprons and overhangs within 30 feet of the new right-of-way. Existing site information shall be screened approximately 40 to 60 percent, to the satisfaction of CPM plan review.

h. Show all signs within the new right-of-way and 20 feet beyond the right-of-way. Electric signs shall be so noted and their source whether overhead or underground identified.

i. Show diameter and variety of trees and shrubs within 30 feet of the new right-of-way and within temporary construction easements. The City will determine the disposition of all trees and shrubs. If slight changes in alignment could be made to save valuable trees or the sidewalk could be realigned by acquisition of additional right-of-way, it should be brought to the attention of the City's project manager at the earliest time possible.

j. Show all utility poles. Differentiate between power poles with street lights and those without. Also show all traffic signal poles and their appurtenances.

k. Show all subdivision entrance structures and indicate any utility connections. When these interfere with new construction they should be relocated or reconstructed. At times it may be necessary to obtain right-of-way for these structures.

l. As-built drawings or sufficient elevations shall be obtained to indicate the direction of surface flow on all intersecting streets, frontage roads and parking lots. The direction is to be shown by a small arrow.

m. Where certain items such as monuments, water valves, water meters (sizes if relocation is indicated) etc., are shown on City utility maps or record drawings but are not located they shall be shown and labeled "not found" on the plans.

n. Show all existing sprinkler systems. Where new construction requires alterations, these sprinkler systems must be put back in operation by the Contractor and shall be so noted on the paving plan sheets (or landscape plans).

o. The Consultant shall investigate (where new right-of-way is required) if any disconnected water or sewer connections (stub-outs) are completed to the old right-of-way line only. Where this occurs the service connection should be shown (size and material) to be extended to the new right-of-way line by the Contractor. Galvanized services will be replaced in their entirety. The City will furnish a new meter if the old meter is faulty.

p. Show all existing safety curbs. Call for relocation of existing safety curbs where required and the addition of new safety curbs where they are required.

4. Profiles and Grades:

a. Construction bench marks shall be a maximum of 1,000 feet apart and each sheet shall refer to the nearest bench mark. All bench marks must be based on the U.S.C.& G.S. datum and at least two (2) bench marks on a project shall be existing City monuments. Elevations of City bench marks will be furnished by the COS Field Engineering section upon request. Some areas of the City have experienced considerable ground subsidence. If the Consultant discovers

variations from recorded City Bench Marks, he shall bring this to the attention of the COS Field Engineering Office (312-5750).

b. The proposed construction centerline profile shall show the profile of the existing surface at the construction centerline. The proposed curb and gutter profiles shall also show the existing surface line at the location of the new curb line. If the proposed curb and gutter are adjacent to the existing curb of a frontage road, the existing surface line shall be omitted and the top of the existing curb of the frontage road shall be shown.

c. Top of embankments at ditches and bottom of ditches shall not be shown to express existing surface lines. They may be shown in addition to existing surface lines if properly labeled.

d. Existing ground elevations along the right-of-way lines shall be indicated by tick marks along the left and right gutter profile lines at approximately 100 foot intervals.

e. If the ditch bottom or banks occur at the property line, the elevation to be shown in the profile for the property line shall be taken beyond the ditch on "average" ground and the offset noted.

f. Existing roadway profiles shall be extended to a minimum of 300 feet past the ends of the project to assure a smooth transition between the existing and new roadway.

g. Elevations must also be shown in the profile at all driveways, sidewalks and parking lots. Elevations of building floors within 30' of the property line shall also be shown in the profile and any other buildings that appear to be low compared to street grades. Sufficient elevations beyond the property line shall be recorded in the field notes at driveways that may require significant alterations beyond the property line.

h. Cross section work sheets (scale of 1"= 5' at 50 feet intervals) depicting the proposed street cross section in areas where new curb and gutter is retrofitted into existing pavement and less than one lane of pavement adjacent to the curb is removed and replaced are required to insure smooth cross sectional transitions.

i. Sufficient elevations shall also be taken and recorded in the field notes of all parking areas, driveways and private property to be certain that the property will properly drain with the new curb grades. Consulting Engineers are responsible for proper drainage of paved areas on private property if drainage was into public streets prior to improvements. The importance of this survey information, its recording on the profiles and its use in setting proper street grades cannot be overstressed. No unwarranted ponding on paved areas on private property will be permitted. If, in the opinion of the City, this information is not sufficient to properly check the proposed grade, the plans will be returned to the Consultant.

j. Elevations of existing water valve nuts shall also be shown in the profile with the appropriate symbol. It is the responsibility of the Consultant to uncover these valves, obtain the elevations and replace the cover and any excavated pavement.

k. Longitudinal and transverse grades shall be designed for proper drainage following the guidelines of COS design criteria, standards and ordinances. Proposed curb grades shall be set to drain all paved adjacent property. Where this is not possible, catch basins may be required beyond the right-of-way lines, but only where permanent right-of-way or permanent drainage easements are obtained for the catch basin. Where existing curbs on adjacent frontage roads exist, the top of the new curb must be set very closely to the top of the existing curb (within 0.4 foot maximum) to facilitate landscaping and watering. Where the grades exceed this limit, no landscape watering will be allowed.

l. In projects with flat longitudinal slopes, the grades shall be set to prevent sump conditions that may flood private property during large storms. City Ordinance stipulates specific requirements for depth of water in roadways and minimum numbers of clear lanes during storm runoff. The Consultant shall obtain and design to these requirements.

m. Where possible, grades should be set to reduce high crowns where they exist. This will assist the flow of floodwaters and prevent backup into houses. Care should be used in lowering existing streets since excavation to construct pavements may uncover existing utilities and possibly change drainage patterns.

n. Any streets with horizontal curves sufficient to require superelevation shall be designed in accordance with AASHTO guidelines. The Consultant is advised to discuss this subject with the City prior to design of superelevation. Limitations on the use of super-elevations are described in COS design criteria and standards.

E. Storm Drain Plan, Profile and Detail Sheets

1. Storm Drain Design Sheet

Alternate storm drain piping materials shall be summarized on a single sheet and shall reference types of materials, design dimensions, material strengths, bedding conditions, soils information, etc. The City will provide a sample format for the Consultant to use upon request (see Figure 1.2-7).

2. Sheet Orientation:

Sheets are to be oriented and have the same horizontal scale as the paving plans (typical vertical scale: 1 inch = 5 feet).

3. Topography and Notation:

a. Storm drain drawings shall show all of the existing utilities and any new utilities proposed within a minimum of 30 feet of the centerline of the storm drain. It shall also show other existing topography as shown on the paving plans (or to within 30 feet of the drain centerline if not located within right- of-way) that is pertinent to drainage.

b. These drawings shall show in plan all proposed storm drain pipe, manholes, catch basins, connector pipes, pipe collars, and other drainage appurtenances. These items shall be listed referenced to standard details, and plan sheet quantity noted in the right-hand column. Add reference to sheets where details or sections are shown.

c. Storm drain main lines, connector pipe and catch basins shall also be shown in plan on the paving sheets. A reference to the appropriate sheet number for the storm drain plans shall be shown on each paving plan sheet.

d. If the storm drain main is existing and no separate storm drain plans are required, the catch basins and their lines shall be called out on the paving plans. Details of catch basin with connecting pipes shall be included with paving details.

e. Conflicts with existing utilities shall be noted in both plan and profile.

4. Horizontal Alignment:

The Consultant shall determine the most satisfactory alignment based on location of existing facilities. Desired location is near the centerline of the existing or proposed street. Existing utilities crossed under at an angle less than 45 degrees may require special design considerations and should be avoided. Location of the storm drain should consider the interference of water main thrust blocks and the need to provide maintenance on either system.

5. Profiles and Grades:

a. An overall system profile sheet shall be included with the set and shall show the pipe sizes, grades, and locations of manholes and lateral connections. The hydraulic grade lines shall be shown along with the existing/proposed finish grade over the pipe. Crossing utilities including sanitary sewer lines, water lines greater than 12 inches, storm drain lines, and major electric and telephone feeds shall be indicated at their proper locations.

b. The storm drain pipe and manholes shall be shown in profile. The pipe size and the slope to 4 significant figures shall also be shown in the profile. The existing ground over the proposed pipe and the proposed grade shall be shown.

c. Design of storm drain systems shall be per COS design criteria and standards. The Consultant shall obtain the applicable criteria and standards and arrange for a consultation with the City Flood Plain Administrator prior to starting design of the storm drain system. This is very important since the drainage areas to be considered in the design may vary.

d. Generally for maintenance reasons, the minimum pipe size required for the main is 24 inches and the lateral collector pipe shall be 18 inches. Smaller diameter pipes require staff approval and will be considered by the City if utility conflicts may be avoided and the pipe has sufficient capacity to carry the design flows.

e. All existing or proposed utilities crossing the new storm drain shall be shown in the profile at their proper “as-built”, “field-verified”, or “potholed” locations.

f. Prefabricated fittings shall be used for all new horizontal or vertical bends where feasible. Locations of bends or fittings shall be called out on plan and profile.

F. Profiles For Catch Basins and Connecting Pipe

1. Sheet Orientation:

a. These sheets are to be all cross-section sheets, Highway Federal Aid Sheet - Plate 3 format.

b. Sheets shall have the appropriate COS title blocks.

c. Catch basins and their connecting lines shall be drawn facing North or facing East.

d. Scale is typically 1 inch = 5 feet; and the horizontal and vertical scale shall be the same.

2. Profiles and Grades:

a. Profiles shall show the correct top of curb elevation at the catch basin and a cross section of the proposed catch basin. Invert elevations of the connector pipe shall be shown at the outlet from the catch basin and the inlet to the storm sewer as well as any grade breaks. The size of the pipe and the percent of slope (to 4 significant digits) shall be shown. Also, show the catch basin type and size, the station and offset, and a cross reference to the storm drain plan and profile sheet where catch basin is shown.

b. All existing utilities crossing the proposed pipe shall be shown at their proper location and elevation. As-built drawings shall be used to obtain the correct elevation. When elevations are available from as-built plans the elevation shall be called out on the profiles. Where no elevations are available the utility shall be located from the best available information.

c. A note should be included on each sheet stating that the elevation is unknown unless noted on the profile. Where elevations of existing utilities are not known and their existence could be in conflict with the proposed pipe or catch basin, the Consultant shall coordinate with the respective utility company for potholes to be dug to determine the exact elevations and horizontal location.

d. Utilities located in the field shall be shown in plan and profile at their correct location and noted in profile with their exact elevation and the notation "potholed elevation".

e. Minimum vertical clearance between the proposed pipe and all existing utilities other than SRP pipe shall be per MAG Standard Specifications or the City of Scottsdale Supplement thereto. SRP requires 2 feet horizontal clearance with underground utility lines, poles, fences, buildings, etc., and 1 foot vertical clearance with underground utilities. On special occasions they will permit 3 inches horizontal clearance with catch basins.

f. Utilities that will require relocation shall be noted in the cross sections and shown at the existing and new locations.

g. All pipe collars and pipe supports required shall be called out on the cross section. Prefabricated tees will be utilized whenever possible.

G. Irrigation Plan, Profile and Detail Sheets

1. Sheet Orientation:

Sheets shall have the same orientation as the paving plan sheets.

2. Topography and Notation:

Paving removal items shall be called out on the paving sheets, not on the irrigation sheets. When Salt River Project does their own construction, removals to be done by Salt River Project forces shall be called out on the paving sheets and it shall be noted that they will be removed by Salt River Project forces. Construction items for irrigation work shall be called out on the irrigation sheets. If Salt River Project is to do its own construction, the construction items shall be listed and noted to be done by Salt River Project.

3. Horizontal Alignment and Design

a. Private irrigation pipe, ditches and structures shall be placed on private property using a temporary construction easement, if it is necessary to replace them. If, in placing pipe on private property, it would result in the loss of existing trees or landscaping or cutting of planters or buildings or concrete pavement parking areas; the private irrigation pipelines may be placed under the proposed sidewalk if there is no conflict with SRP. Private irrigation ditches and structures, however, shall be placed on private property.

b. SRP irrigation pipe may be placed under the proposed sidewalk; however, their structures are to be placed on City right-of-way behind the sidewalk.

c. In locating private or Salt River Project pipe, care should be used to allow space for utility poles, street lights or traffic signal pole bases along the property line and sufficient horizontal clearance between any structures and the proposed pipe.

d. The Consulting Engineer, at the earliest opportunity, shall notify the Salt River Project, in writing, of the project and request a design schedule and estimated design cost. A copy of this request and the proposed schedule shall be sent to the City. The Consultant shall supply all available information on the location of other utilities, street grades, and street alignment to the Salt River Project and cooperate with them so that the final design will meet their standards and be most economical for the City.

e. The Consultant shall send a set of grade and alignment plans to Salt River Project at the same time they are submitted to the City for review and request them to determine the right-of-way requirements for their facilities. It is essential in order to meet right-of-way schedules that these right-of-way requirements be submitted to the City as soon as possible.

f. A second set of grade and alignment plans shall be sent to Salt River Project after their approval by the City and after any corrections have been made. Based on these plans, Salt River Project shall proceed with the design. Salt River Project will prepare a red-line preliminary design and transmit it to the Consultant. The Consultant shall review the red-line preliminary design and return it to Salt River as soon as possible, with his comments. Salt River Project will then complete the final design.

g. If either existing private or Salt River Project irrigation pipes can remain as is, the Consultant shall investigate the type of pipe and its condition and the elevation of pipes to be sure enough cover will be provided over the pipe even during the time of construction and that the existing pipe is in good enough condition to remain. Consultant shall meet with SRVWUA to determine the requirements to be met for the project.

h. On private irrigation lines and ditches, the Consultant shall obtain the delivery quantities and irrigation schedule from the Water Master. The Consultant will be completely responsible for the design of private irrigation systems. Once again, the determination of right-of-way requirements at an early date is essential in maintaining the time schedule. The Consultant shall submit these requirements to the City as soon as possible. Hydraulic computations on private irrigation shall be furnished to the City. All work involving private irrigation, or SRP irrigation shall be coordinated with the City's project manager.

i. Normally Salt River Project will decide to construct all of their facilities. If so, the Consultant shall show Salt River Project's design on the plan of the paving sheets and shall carefully show the proper notation as to which work shall be done by the City's Contractor and which will be done by Salt River Project. Mylar plans of Salt River Project work are to be placed at the end of the construction plans for a permanent record.

4. Profiles and Grades:

Profiles shown for irrigation pipes shall show the proposed surface grades over the centerline of the pipe as well as the invert profile of the pipe and the top of the pipe. Top elevations shall also be shown for all irrigation structures. Grades of pipe shall be established which will provide sufficient cover over the pipe and will also work efficiently hydraulically.

H. Sanitary Sewer Plan, Profile and Detail Sheets

1. Sheet Orientation:

Sheets shall have the same orientation as described in the paving plans section.

2. Topography and Notations:

a. The same siting information as required for the paving plan base sheets shall be provided for the sanitary sewer plan sheets.

b. If the sewer is located in an easement outside the right-of-way, all existing site conditions shall be shown to 30 feet minimum along each side of the pipeline.

3. Horizontal and Vertical Control:

a. One construction benchmark shall be established for every 1000 feet minimum along the alignment of the pipeline. At least two City benchmarks shall be referenced and tied into the project.

b. Stationing will be established along the pipeline, increase from lower to higher invert elevations, and be referenced to street centerline or monument lines at manholes or angle points where possible. Where not possible, the use of bearings and distances along the pipe centerline shall be utilized. The beginning and end point of the sanitary sewer line shall be tied to the nearest monument point.

4. Soils Testing:

a. The geotechnical investigation shall be prepared as described under the general requirements for this project.

b. Additionally, soils boring logs shall be provided at a minimum spacing of 1320 feet along projects whose average trench depth exceeds 10 feet. Boring shall extend to 24 inches below the proposed bottom of the trench and be of sufficient diameter to allow for laboratory testing and analysis. Locations of borings shall be identified on the plans. Soil boring logs shall be included on a geotechnical report along with a discussion of any particular bedding, shoring, excavating or dewatering considerations.

5. Profiles and grades:

a. Profiles shall indicate the existing and design grade line over the pipe and shall include the "as-built", "field-verified", or "potholed" locations of all crossing utilities.

b. Vertical locations of storm drains and sanitary sewers shall be interpolated from verifiable field elevations along accessible points. Locations of other pipes shall be taken from information on existing "as-built" drawings or actual field "pothole" datum.

c. When existing "as-built" plans of a water line greater than 12 inches diameter, a high pressure gas line greater than 4 inches diameter, telephone or electrical conduits do not indicate a depth of bury, the Engineer shall coordinate with the utility company for a “pothole" location to be provided.

d. Existing utilities will be identified by name, size, and type of pipe in the profile. If existing or proposed pipes are greater than 21 inches (inside) diameter, show top and bottom invert grade line and indication of pipe wall thickness in profile. For pipes 21 inches or smaller (inside) diameter, indicate only top and bottom invert grade lines in profile.

e. Water relocations as may be necessary shall be per COS Detail No. 2370. Coordinate requirements for shut-off and air release/vacuum valving with the City Water Resources Department.

f. Invert and rim elevations shall be shown on all manholes and pipeline invert elevations shown on all ends of stubouts or at points of match sheet. Pipeline grades shall be established to four decimal places.

g. Invert elevations and lengths of pipe will be calculated from center of manhole to center of manhole. Sections of pipe connected to manholes shall be 5 foot maximum length to minimize the adverse affects of any settlement.

I. Water Line Plan, Profile and Detail Sheets

1. General:

Sheet orientation, topography and notations, horizontal and vertical control, and soils testing shall be similar to those criteria described for the previous section "Sanitary Sewer Plans, Profiles and Details".

2. Profiles and Grades:

a. Profiles are required for all waterlines 12 inches and greater.

a. Profiles shall indicate the existing and design grade line over the pipe and shall include the "as-built", "field-verified", or "potholed" locations of all crossing utilities.

b. Vertical locations of storm drains and sanitary sewers shall be interpolated from verifiable field elevations along accessible points. Locations of other pipes shall be taken from information on existing "as-built" drawings or actual field "pothole" datum.

c. When existing "as-built" plans of a water line, a gas line, telephone or electrical conduits do not indicate a depth of bury, the Engineer shall coordinate with the utility company for a "pothole" location to be provided.

d. Existing utilities will be identified by name, size, and type of pipe in the profile.

e. Existing water line relocations may be necessary and shall be per COS Detail No. 2370. Minimum separations between water lines and electric/gas lines shall be per City of Scottsdale Detail No. 2372.

f. All fire line services and hydrant connections shall be constructed with DIP.

g. Water mains 12 inches in diameter shall have a minimum cover of 48 inches to finish grade; mains smaller than 12 inches diameter shall have a minimum cover of 36 inches to finish grade; mains greater than 12 inches diameter shall have a minimum cover of 60 inches to finish grade. Water mains in industrial areas or in major collectors and arterials shall have a minimum of 48 inches cover.

h. All bends, angle points, fittings shall be stationed. On water lines 12 inches or larger diameter, the design top of pipe elevation shall be shown. Cut stakes shall be provided for the trenching of all water lines 12 inches or more in diameter.

J. Traffic Signal Plan, Schedule and Detail Sheets

1. Sheet Format:

a. Plan Sheets will be orientated same as paving plans and shall follow the format shown in COS design criteria and standards. These sheets will include the same title block as used on the other plan sheets.

b. Signal design will follow the guidelines established in COS design criteria and standards which detail the tasks of the consulting engineer. Traffic signal equipment and construction shall conform to ADOT standard drawings and specifications unless shown otherwise in COS design criteria or the COS Transportation Department Traffic Engineering Division Specifications For Traffic Control Equipment.

2. Plan Sheet:

a. This sheet should be at a scale that permits clear detailing of existing and new signal components, usually 1" = 10'. As-built plans for most of the existing signalized intersections are available from the COS Traffic Engineer's office. The Consultant shall make his own investigation of the intersection to verify all existing conditions.

b. Existing features including all signal poles, control boxes, pull boxes, underground conduit and conductors, detector loops, power source, etc., shall be shown dashed with the proposed new work superimposed thereon. Existing and proposed street configuration shall be taken from the paving plans and the same stationing and offset data used to locate new signal equipment.

c. Locations of poles, traffic signal pullboxes and controller equipment shall be coordinated to remain out of sidewalks to facilitate pedestrian traffic and reflect the ultimate desired position where possible.

d. Pavement markings at the intersection will be shown to coordinate signal lights with traffic lanes. If street construction beyond the intersection is being done by the same project, separate plans for signing and striping will also be prepared as described below in paragraph K.

e. Detector loops shall be stationed to a corner of the loop and will be dimensioned off the new curb or edge of pavement.

3. Notes and Schedules:

Develop these as necessary to show the conductor schedules, controller and pole schedules, phasing details, etc., and general notes with cross references to items shown on the plan sheet. The City has a list of standard notes which will be included on each sheet.

K. Traffic Signing and Pavement Markings

1. Sheet Format:

Use double plan at 1 inch = 40 feet scale, same orientation as the paving plans.

2. Plans:

a. Signing and striping will conform to ADOT Specifications and Standard Drawings and the Manual of Uniform Traffic Control Devices, unless shown otherwise in COS design criteria and standards, or as directed by the Scottsdale Traffic Engineering Program.

b. Existing striping will be shown and dimensioned to a minimum of 300 feet beyond where it ties into the new work. All new work will be appropriately dimensioned from lip of gutter to center of stripe, etc. Overall dimensioning will be provided across pavement widths and rights-of-way. The City has a list of applicable notes which will be placed on the plans.

c. All permanent pavement striping, including crosswalks shall be hot sprayed 6 mil thermoplastic. Temporary pavement markings and island noses shall be reflectorized traffic paint. Legends and Arrows will conform to ADOT Specifications and Standard Drawings.

d. Raised pavement markers are generally required for all new COS paving projects.

L. Landscape and Landscape Irrigation Plans

1. Sheet Format:

Landscaping and irrigation may be combined on the same plan for simpler projects but generally require separate plan sheets. In either case, the orientation and scale will be the same as for paving plans, using a double plan on each sheet.

2. Note and Legends Sheet:

This sheet may be combined for the landscaping and irrigation plans and will contain general notes, landscaping notes, irrigation notes, list of plants and shrubs used (noting common and botanical names), list of irrigation components, legends of landscape and irrigation symbols, quantities, approval block, maintenance statement and miscellaneous details. If the project goes before Development Review, the DR number shall be placed on the right hand lower corner of each sheet.

3. Plan Sheets:

a. Landscape plans will show individual shrubs and trees plus types and areas of various ground cover, including grass, decomposed granite, pavers, exposed aggregate paving, etc., with quantities shown on the right hand column. Identify restoration work behind new sidewalks, or in other areas disturbed by construction work. Existing items to be removed or transplanted will be shown with special attention to native plants that are required to be salvaged. The City will furnish guidance and assistance in identifying plants to be salvaged or transplanted as well as selecting types of new plants that will conform to the City landscaping policy and to the requirements of the Arizona Department of Water Resources for the Phoenix Active Management Area.

b. Sight lines will be shown on the landscaping plans and will conform to COS criteria and standards. Design consideration should be given to placement of plants, size of plant at maturity, canopy widths and general maintenance. Generally, shrubs should be kept a minimum of four feet away from the curb or sidewalk and within a sight line shall not exceed a maturity height of 24 inches above the curb.

c. Trees should be located so that the mature canopy will not overhang the curb or sidewalk line. Within a sight line trees shall have a single trunk with a clear height of 7 feet to the canopy.

d. Irrigation plans will provide detailed design from the service side of the meter. The irrigation service and meter will be provided and noted on the civil plans.

e. Identify, detail and dimension or station the locations and layout of the meter, backflow preventer, control valves, main and lateral lines, pressure regulator, emitters, etc. Diagrammatic

layout plans will not be accepted by the City. The Consultant shall clearly indicate with stations, and dimension to the back of curb or sidewalk the proposed locations of the irrigation components.

f. Separate emitters shall be shown to each plant. Typical planting details shall show an emitter location at each plant. Multi-port emitters will be allowed on each tree with a maximum of four leads of plastic drip tubing thirty-six inches in length.

g. Electrical source will be shown plus controller location and all wiring, including conduits and sleeves. Details for the controller cabinet installation and a schematic of the electric service are shown on COS Standard Detail 2630.

h. The City will provide the Consultant, upon request, a listing of products which may be listed for performance and quality control. The drawings need to reference 'or approved equivalent' in all cases.

M. Bridge and Structural Plans and Details

1. At the City's option, bridges on canals may be designed as a separate contract to be bid separately from the roadway plans since the bridge must be built during the annual canal dry-up. Bridges over washes may be included as part of the paving plans.

2. The sheets required on a typical set of bridge plans which are independent of the roadway plans are as follows:

Sheet No. 1 - City cover sheet with information as shown under paragraph A.

Sheet No. 2 - Typical section sheet to show sections of roadway work included.

Sheet No. 3 - Notes and legend sheet with information shown under paragraph B with additional bridge and structural notes.

Sheet No. 4 - Paving plans and profile sheet with additional information concerning bridge and structural details.

Sheet No. 5 - Detour plan and profile, if required, showing all details required for the detour in plan and profile.

Sheet No. 6 - Plan and profile for any water, sewer, or irrigation alterations to be included as part of the bridge contract.

Sheet No. 7 - Bridge location plan showing the bridge in plan and profile and the bridge quantities.

Sheet No. 8 - Soil boring log sheet showing all soils information obtained and the note concerning responsibility.

Sheet No. 9 - Abutment Details.

Sheet No. 10 - Pier Details.

Sheet No. 11 - Deck Details.

Sheet No. 12 - Miscellaneous details (approach ramps).

Sheet No. 13 - Handrail and Guard Details.

Sheets 7 through 13 described above would be consecutively numbered B1..B_ if incorporated into a roadway project.

3. The Consultant shall discuss the project at an early date with SRP to obtain their requirements when designing a bridge over a canal or when any SRP facilities are involved. Generally, the first phase of a bridge design over a SRP canal shall be to obtain a statement from SRP as to whether they consider the bridge a restriction in the canal. If they do consider it a restriction, it will be necessary for the Engineer to submit a hydraulic study to SRP to assure that construction of the new bridge or bridge widening will not adversely affect hydraulic characteristics in the canal. Upon approval of that study by SRP, the Consultant shall proceed with preparation of preliminary plans. Following review and approval of such plans by the City and SRP, the Consultant shall proceed to drafting final plans. Throughout all stages of project design, the Consultant shall coordinate all work with SRP in order to minimize any possible conflicts. Bridges over SRP canal facilities shall conform to prevailing SRP standards and requirements.

4. Consultant shall consider sight distance requirements when designing the roadway portion of the contract.

5. Consultant shall coordinate with, at an early date, other utilities such as U.S. West, SRP, APS, Southwest Gas, Cable TV, and the COS Water and Wastewater Department and coordinate with them any relocations of their facilities.

N. Plan Sheets by Others

1. General:

a. Private electrical, gas, telephone, cable television facilities may need extension, upgrading or relocation as a result of this project.

b. Where possible, reproducible copies of utility agency designs should be attached to the end of the plans set and labeled for Contractor reference and information only - work to be done by others.

c. There may be situations where the Contractor is required to provide trenching and conduit installation for a utility company. Such work shall be clearly described in the Special Provisions.

O. Right of Way Plans

1. Strip map - Strip maps shall be at a scale (generally 1" = 100') sufficient to differentiate the various easements and parcels. Format should be shown on a 24" x 36" sheet. Each parcel abutting the project shall be shown and shall indicate proposed and existing dimensioned rights-of-ways, easements, ownership, and areas.

a. Format: 24 x 36 per City
b. Scale: 1 inch = 100 feet
c. Property addresses and occupants identified
d. Property owners identified
e. Existing easements and R/W identified
f. New easements and R/W to be acquired identified

2. Parcel exhibits - One per parcel. One exhibit per parcel is required. One exhibit per ownership may be submitted with approval from the COS Right of Way & Design Manager.

Parcel exhibit maps are to be prepared on individual sheets and are to include a legend indicating the type of acquisition. The plan view shall show the parcel boundary dimensioned to section corners (non-subdivided lots), adjacent right-of-way centerline, any onsite improvements along with all existing and proposed easements and rights-of-ways clearly identified and dimensioned. The identification of existing rights-of-way and easements shall include the appropriate county recording information.

a. Format: 8.5 x 11 per City
b. Title block at lower right identifying the City's project, project number, tax parcel no., and owner of the parcel.
c. North arrow and scale
d. 1/4 section ties
e. Property addresses and occupants identified
f. Property owners identified
g. Existing easements and R/W identified
h. New easements and R/W to be acquired identified
i. Individual areas noted
j. Parcels dimensioned and bearings

3. Parcel descriptions - The individual parcel descriptions for all new easements and/or rights-of-way shall be prepared by or under the direct supervision of a land surveyor registered in the State of Arizona and be sealed by the same. All parcel descriptions shall be typed on separate 8-1/2" x 11" formats and shall be consistent with A.P.L.S. standards.

The description shall be typed in single space format and double spaced between its various parts as outlined below:

a. Caption

1. Brief introduction stating location of parcel, portion of a subdivision, aliquot portion of sectional breakdown, township and range.

b. Body

1. Tie true point of beginning to an established section corner, identifying its character

2. Metes and bounds courses

3. Identify boundary lines of joiners, citing Maricopa County Recorders numbers and pages

c. Area of easement or R/W

1. Stated to nearest s.f. and 10,000th ac.

PART B - CITY FACILITIES

1-206 UNIFORM CODES AND DESIGN STANDARDS

A. Standards and Codes

1. Uniform Building Code

2. Uniform Mechanical Code

3. National Electrical Code

4. Uniform Plumbing Code

5. Uniform Fire Code

6. Title 34, Arizona Revised Statutes regulating public buildings and improvements

B. Design policies and guidelines

1. City of Scottsdale Design Standards and Policies Manual

2. City's Development Review Board stipulations

3. Other general acceptable design standards, policies and guides

1-207 GENERAL INFORMATION

A. Plans shall be prepared on standard 'D-sized' (24-inch x 36-inch) sheets unless prior approval is obtained from the City's project manager for the larger 'E-sized' (30-inch x 42-inch) sheets. All sheets shall be clearly reproduced on diazo print paper in blue or black line format.

B. Upon request, the City will furnish the consultant electronic files of base drawings shown in the figures at the end of this section. The consultant shall be responsible for completion of the drawings as applicable for the project.

C. Each sheet shall have a standard City title block in the lower right hand corner. The architect's identification/ logo shall be shown along the right edge or upper right corner of the sheet along with that of any sub-consultant.

D. Minimum lettering size shall be 3/16 inch for manually drafted or 1/8 inch for mechanically produced lettering and must be legible when reduced 50 percent. Reproduction of final drawings must be legible when microfilmed or reduced to 1/2 scale. CPM Plan Review shall determine the legibility of all drawings submitted. Adhesive backed appliques for lettering and shading will not be permitted without approval of CPM Plan Review.

E. On all sheets which have maps or plans, north shall be orientated to the top of the sheet and referenced to actual north. A north arrow and appropriate reference to scale shall be shown on all applicable sheets. Reference Part A for layout and scale representations for sitework sheets.

F. All construction notes shall be keynoted. Group construction keynotes referencing to a specific symbol (square symbols designate demolition and removals, diamond symbols designate relocations and circular shapes for construction items.

G. Each sheet must be sealed prior to final plans approval. Plan review submittals shall be either sealed or clearly marked for City review only. Plans submitted for City Building reviews (generally at the third or 90% submittal) shall be sealed and signed by the registrant or they may be rejected for review.

H. All projects shall comply with Section 404 of the Federal Clean Water Act. Before the city may issue development permits for a project, this form must be completed and submitted with improvement plans to the CPM Design and Plan Review staff. Consultants are advised to apply to the Corps as early as possible for a Section 404 permit and allow for the necessary processing

time to prevent delays in obtaining development permits from the City of Scottsdale. The City of Scottsdale Section 404 Certification Form is included in Chapter 2 of this manual.

1-208 PLAN SHEET NUMBERING AND SEQUENCING

A. Sheets shall be identified by design discipline as designated below and consecutively numbered. Additionally, final consecutive numbering of the entire set of plans shall be provided on each sheet. The following sheet numbering prefixes are commonly used, and the consultant shall review the sheet sequencing and/or intended numbering with the City's project manager:

G=General
C=Civil
L=Landscape
A = Architectural
S=Structural
M=Mechanical
P = Plumbing
E = Electrical

B. Plan sheets shall be sequenced as follows:

Order	Sheet No.	Description
1	G1	City cover sheet
2	G2	Notes, legend and key map sheet
3	C1	Existing site survey
3	C2	Civil grading and drainage plans
4	C_	Civil site utility plans
5	L1	Landscaping and irrigation plans
6	A1	Architectural site plan
7	A2	Architectural plans, elevations, sections, details, schedules
8	S1	Structural gereral notes
9	S2	Structural plans
10	M1	Mechanical legends, notes, abbreviations
11	M2	Mechanical plans, details, schedules
12	P1	Plumbing plans, details and diagrams
13	E1	Electrical legends, notes, abbreviations
14	E2	Electrical site plan
15	E3	Electrical plans, schedules and details

1-209 DETAILED SHEET INFORMATION

A. Cover Sheet
City will furnish an electronic drawing file of the cover sheet upon request (see figure 1.2-1). The Engineer will add the following:

1. Project title, CPM project number, bid call number
2. Vicinity map with section, township and range noted
3. Sheet index
4. Engineering company identification and engineer's seal
5. Other agency approval blocks as applicable
6. City benchmarks for project - two (2) required on NAVD 1988 datum
7. Applicable City assigned project, development review and native plant numbers assigned by

Project Review when submitted.

8. Listing of applicable codes and City ordinance amending/ adopting same

B. Notes, Legend and Key Map Sheets

1. Key Map - Show all intersections, rights-of-way, and key to all plans with stations
2. Legend of symbols used for existing and design elements
3. List of abbreviations used in plan set (other than as shown in the MAG Specifications)
4. Include City of Scottsdale general construction notes for Public works construction (see figure 1.2-14) in addition to any special project notes generated.

C. Plan Submittal Packaging

Projects which consist of sitework and facility work must be packaged in such a way that civil and landscape plans can be separated from the package as a stand alone submittal for review purposes. Consultants shall coordinate this packaging with the CPM Design and Plan Review staff prior to plan submittal.

PART C - CONSTRUCTION BIDDING DOCUMENTS

1-210 GENERAL

The project's scope of work will contain specific requirements for the construction documents to be provided by the consultant.

Generally the consultant provides the following bidding documents to the City of Scottsdale:

- construction plans
- project special provisions
- project schedule of bid items
- construction cost estimate

1-211 CONSTRUCTION DRAWINGS

A. Original drawings submitted to the City will remain property of the City. All drawings shall be on clear 4 mil mylar with original ink, mechanically plotted or photographically reproduced. Ammonia based sepias or electrostatic media will not be accepted by the City. All drawings mechanically plotted shall be of such quality that the plotted medium does not peel or scratch off with reasonable handling. The Consultant shall guarantee the quality of the drawings and shall replace any drawings on which the lettering and/or line work peels, smudges or is otherwise deemed to be unacceptable by the City. Such drawing replacement shall be at no cost to the City.

B The design engineer shall provide to the City electronic files of the construction drawings, special provisions and the schedule of bid items. Drawing formats shall be in MicroStation, latest version. The special provisions and schedule of bid items shall be in Microsoft Word, latest version. Electronic files may be submitted on 3 1/2 inch diskettes or compact disk.

1-212 SPECIAL PROVISIONS/ TECHNICAL SPECIFICATIONS

"Invitation To Bid" documents follow a specific format for all Capital Improvement projects. They include City drafted boiler plates consisting of the notice inviting bids, information for bidders, general conditions, bid forms, contracts, bonding and insurance forms, etc.. The project special provisions will supplement the City boiler general conditions.

The City will provide the consultant, upon request, a sample format of the project special provisions including a compilation of guideline special provisions. The consultant shall thoroughly review the guideline special provisions and determine which portions are applicable for their specific project and determine the need for supplementation.

The special provisions are updated as needed so the consultant should request a current version for each Capital Project design.

1-213 BID SCHEDULE

The consultant will complete a standard schedule of bid items consistent with the City's required format (see Figure 1.2-13).

Bid item numbers shall be taken from a master list of items which is available from CPM Plan Review. Project specific item numbers not listed shall be coordinated with CPM Plan Review.

The master bid item list is frequently updated so the consultant shall request a current version for each design project.

1-214 CONSTRUCTION COST ESTIMATE

The engineer/ architect shall provide the City with a final detailed estimate of the probable cost of construction.

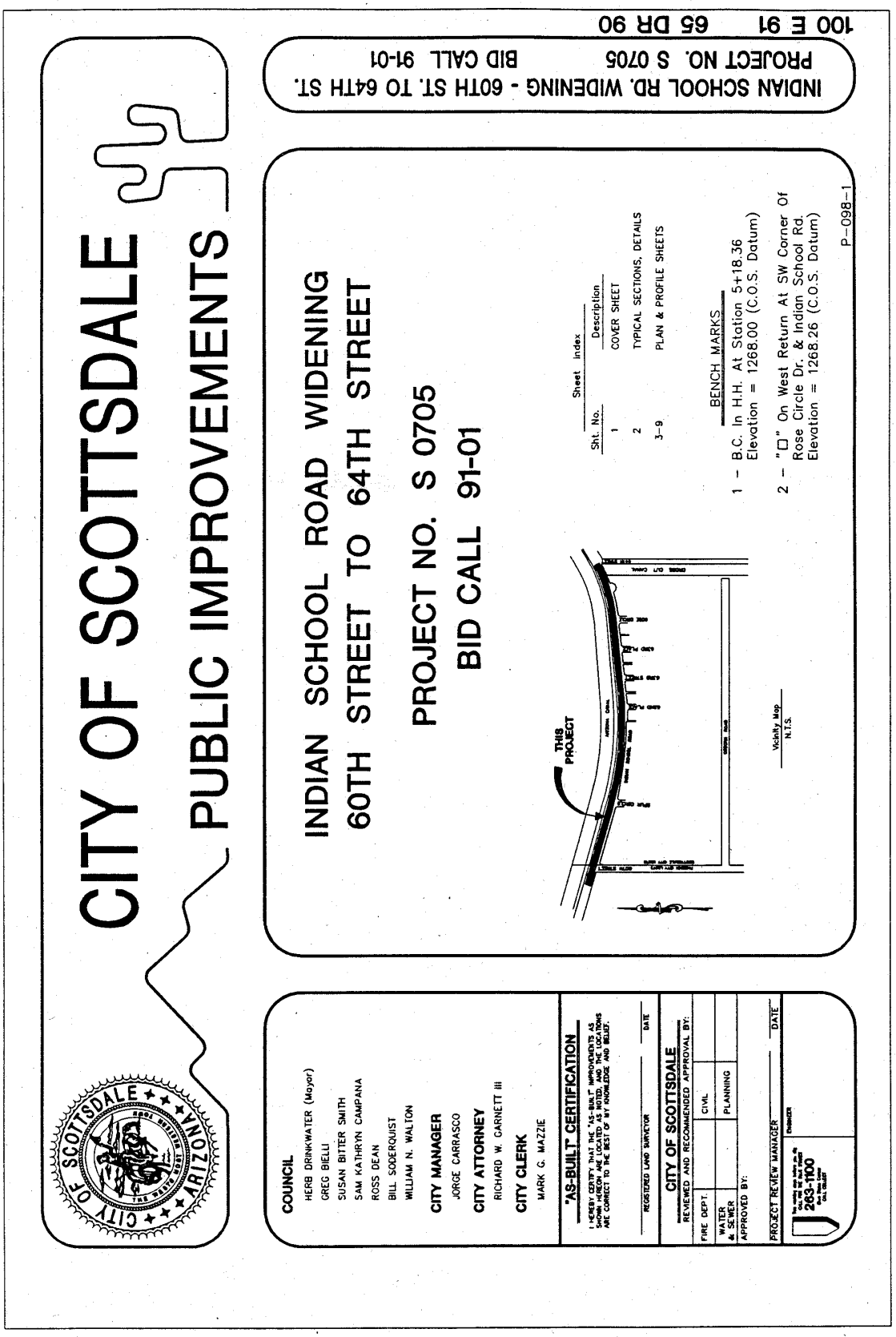


Figure 1.2-1
Typical Cover Sheet Information

GENERAL CONSTRUCTION NOTES
FOR PUBLIC WORKS CONSTRUCTION

1. All construction in the public rights-of-way or in easements granted for public use must conform to the latest Maricopa Association of Governments (MAG) Uniform Standard Specifications and Uniform Standard Details for Public Works Construction as amended by the latest version of the City of Scottsdale (COS) Supplemental Standard Specifications and Supplemental Standard Details. If there is a conflict, the latter shall govern.

2. The engineering designs on these plans are only approved by the City in scope and not in detail. If construction quantities are shown on these plans, they are not verified by the City.

3. Approval of plans is valid for six (6) months. If an encroachment permit for the construction has not been issued within six months, the plans shall be resubmitted to the City for re-approval.

4. A Public Works Inspector will inspect all works within the City of Scottsdale rights-of-way and in easements. Notify Inspection Services 24 hours prior to starting of construction (telephone 391-5750).

5. Whenever excavation is to be done, call the "Blue Stake Center", 263-1100, two working days before excavation is to begin. The Center will see that the location of the underground utility lines is identified for the project. Call "select" if necessary.

6. Encroachment permits are required for all work in public rights-of-way and easements granted for public purposes. An encroachment permit will be issued by the City upon receipt of payment of a base fee plus a fee for inspection services to be provided by the City. Copies of all permits shall be retained on-site and shall be available for inspection at all times. Failure to produce the required permits will result in immediate work stoppage until the proper permit documentation is obtained.

7. All excavation and grading which is not in the public rights-of-way or not in easements granted for public use must conform to Chapter 70, Excavation and Grading, of the latest edition of the Uniform Building Code prepared by the International Conference of Building Officials. A permit for this grading must be secured from the City for a fee established by the Uniform Building Code.

LEGEND

	Existing	New
AC Pavement		
Slurry Seal		
Exposed Aggregate Concrete		
Decomposed Granite		
Single Curb		
VCAG, Sidewalk		
Striping		

Notes, Legend & Abbreviations

MANAGEMENT SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
3939 CIVIC CENTER BLVD.
SCOTTSDALE, ARIZONA 85251

PROJECT TITLE

DRAWN BY: JB-SAS

SHT. G-2

Figure 1.2-2
Sample Plan Sheet

QUANTITY SUMMARY SHEET

PLAN REFER NO.	ITEM NO.	DESCRIPTION	UNIT	SHEET NUMBER P-1	P-2	P-3	P-4	TOTAL
1	321302	2" AC C-3/4	SY	130	250	265	115	760
2	340002	Vert Curb & Gutter, MAG 220A	LF	460	820	905	425	2,610
3	340201	Conc Sidewalk, MAG 230	SF		210	1,245		1,455
1	350001	Remove AC Pavement	SY	35	70	20		125
2	350041	Remove Curb & Gutter	LF	125	280			405
							TOTAL	

MANAGEMENT SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
3939 CIVIC CENTER BLVD.
SCOTTSDALE, ARIZONA 85251

Figure 1.2-3

Sample Quantity Summary Sheet

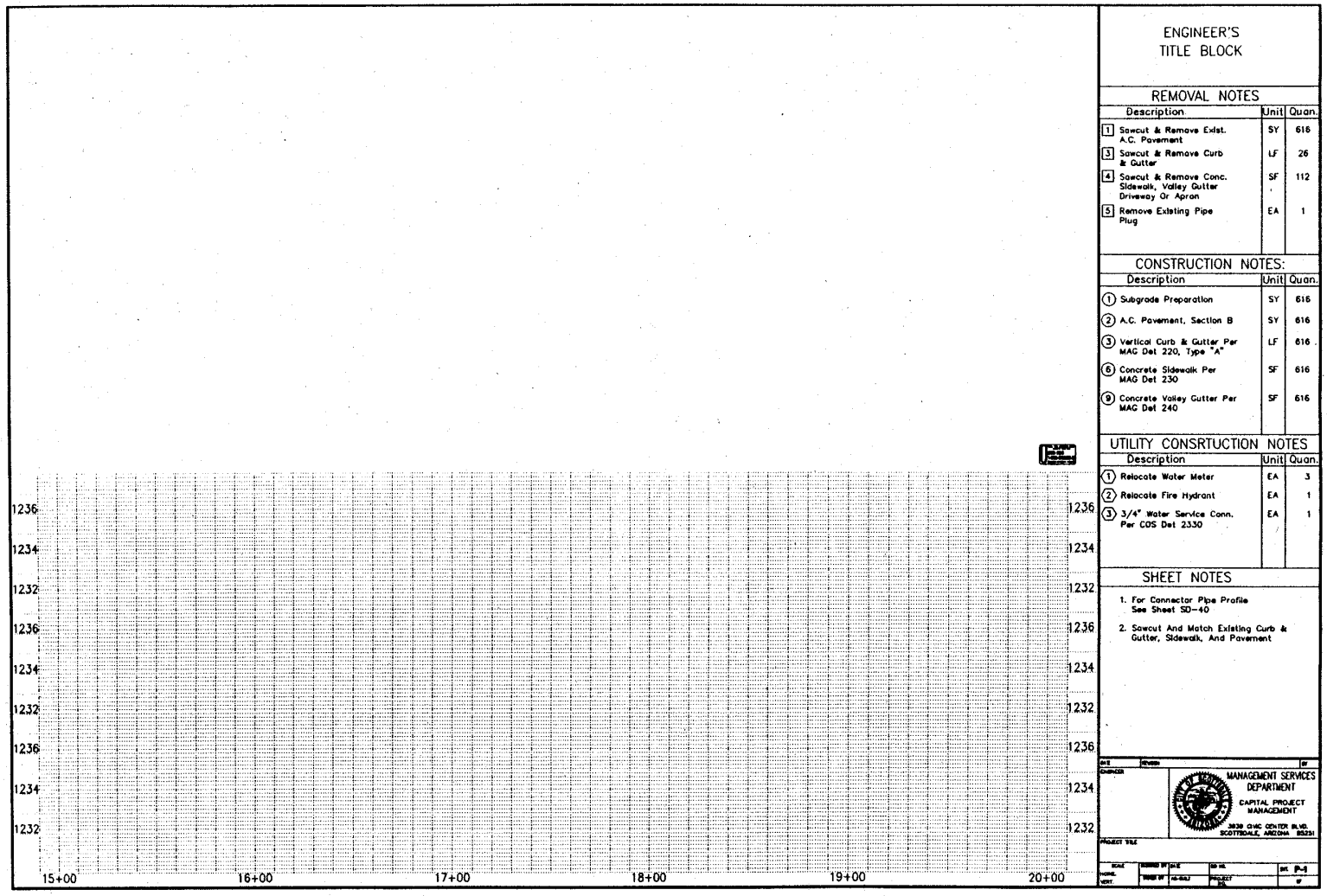


Figure 1.2-4

Sample Paving (n & Profile Sheet

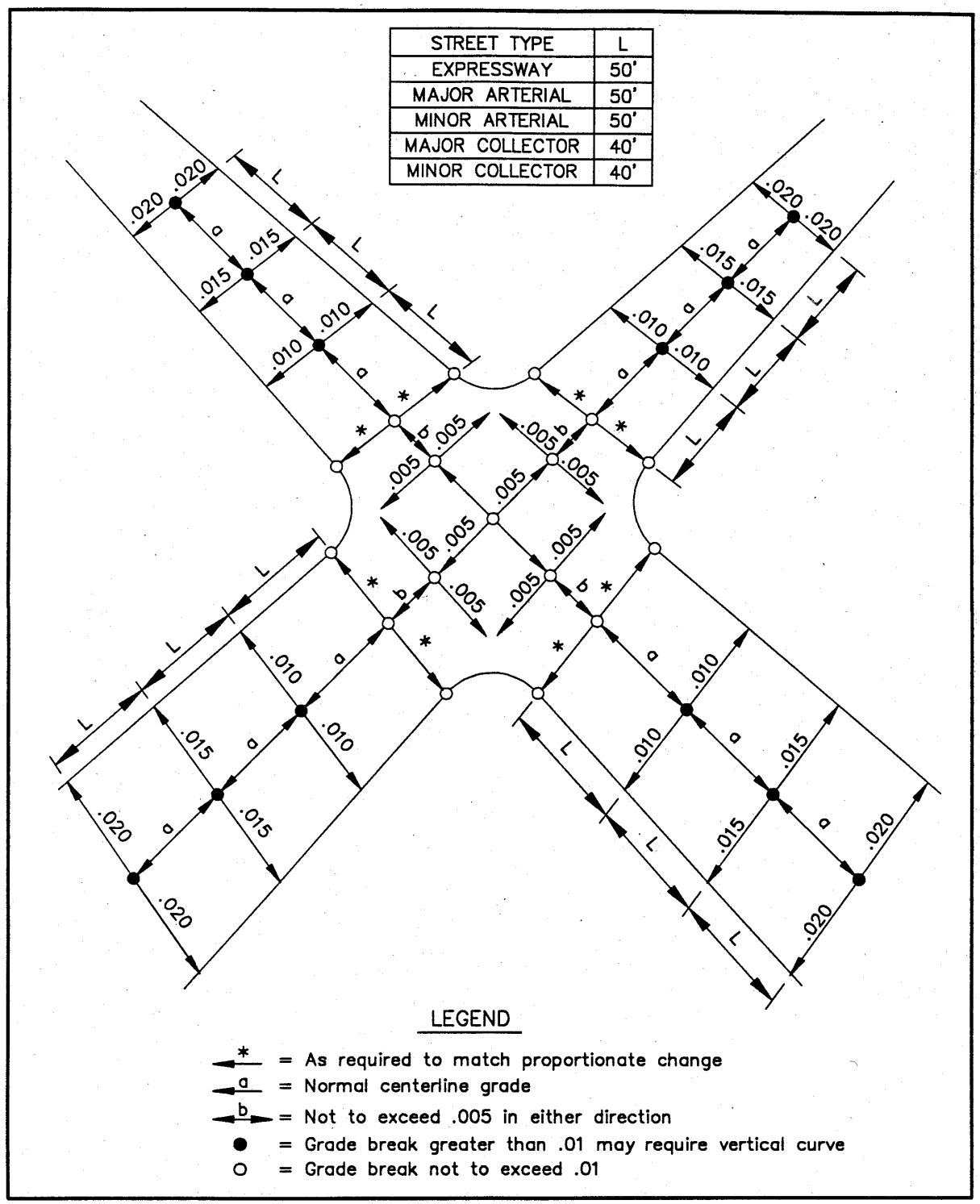


Figure 1.2-5

Guidelines For Intersection Cross-slopes & Crown Run-off

PROJECT NO. _____ DATE _____

PROJECT NAME _____

INTERSECTION _____ BY _____

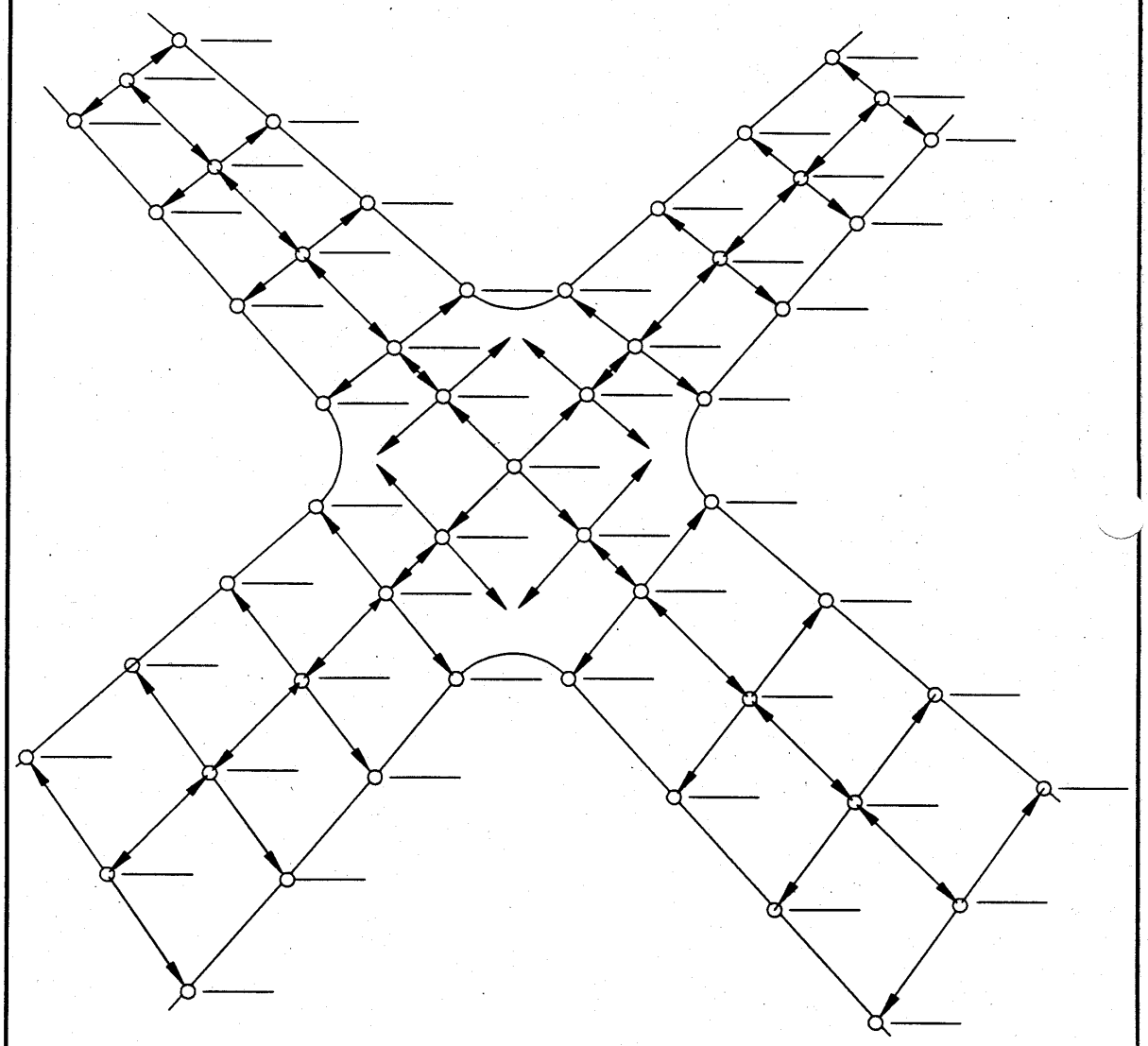


Figure 1.2-6

Worksheet For Intersection Cross-slopes & Crown Run-off

ALTERNATE PIPE MATERIAL FOR MAIN LINE

STATION		LENGTH	DEPTH TO TOP OF PIPE		R.G.R.C.P.			C.I.P.P.		CORRUGATED METAL PIPE			CONCRETE LINED C.M.P.			SPIRAL RIB METAL PIPE		H.D.P.E.	
FROM	TO		MAX.	MIN.	SIZE	"D" LOAD	CLASS	SIZE	MIN. WALL THICK (in.)	SIZE	CORRUGATION	GAUGE	SIZE	CORRUGATION	GAUGE	SIZE	GAUGE	SIZE	R.S.C.

NOTE

The storm drain pipe shown on this set of plans is labeled on the plan and profile as RGRCP as a basis of design by the Engineer.

The Contractor may have the option of bidding alternate materials, as indicated hereon. Refer to the Special Provisions.

SOILS DATA		
STATION	pH	RESISTIVITY

MANAGEMENT SERVICES DEPARTMENT
CAPITAL PROJECT MANAGEMENT
3939 CIVIC CENTER BLVD.
SCOTTSDALE, ARIZONA 85251

SD-1

Figure 1.2-7
Sample Pipe Summary Sheet

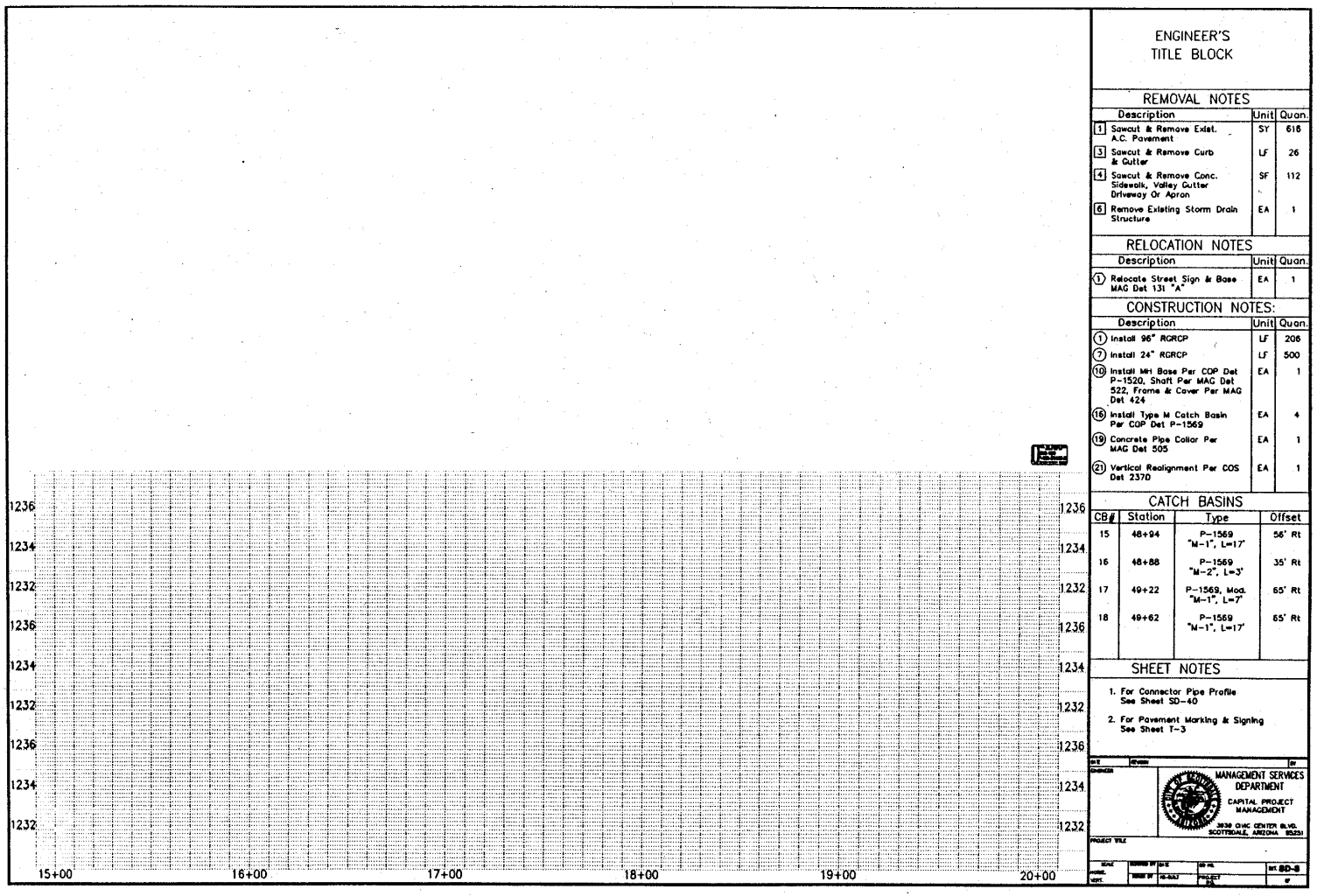


Figure 1.2-8

Sample Storm Drai Plan & Profile Sheet

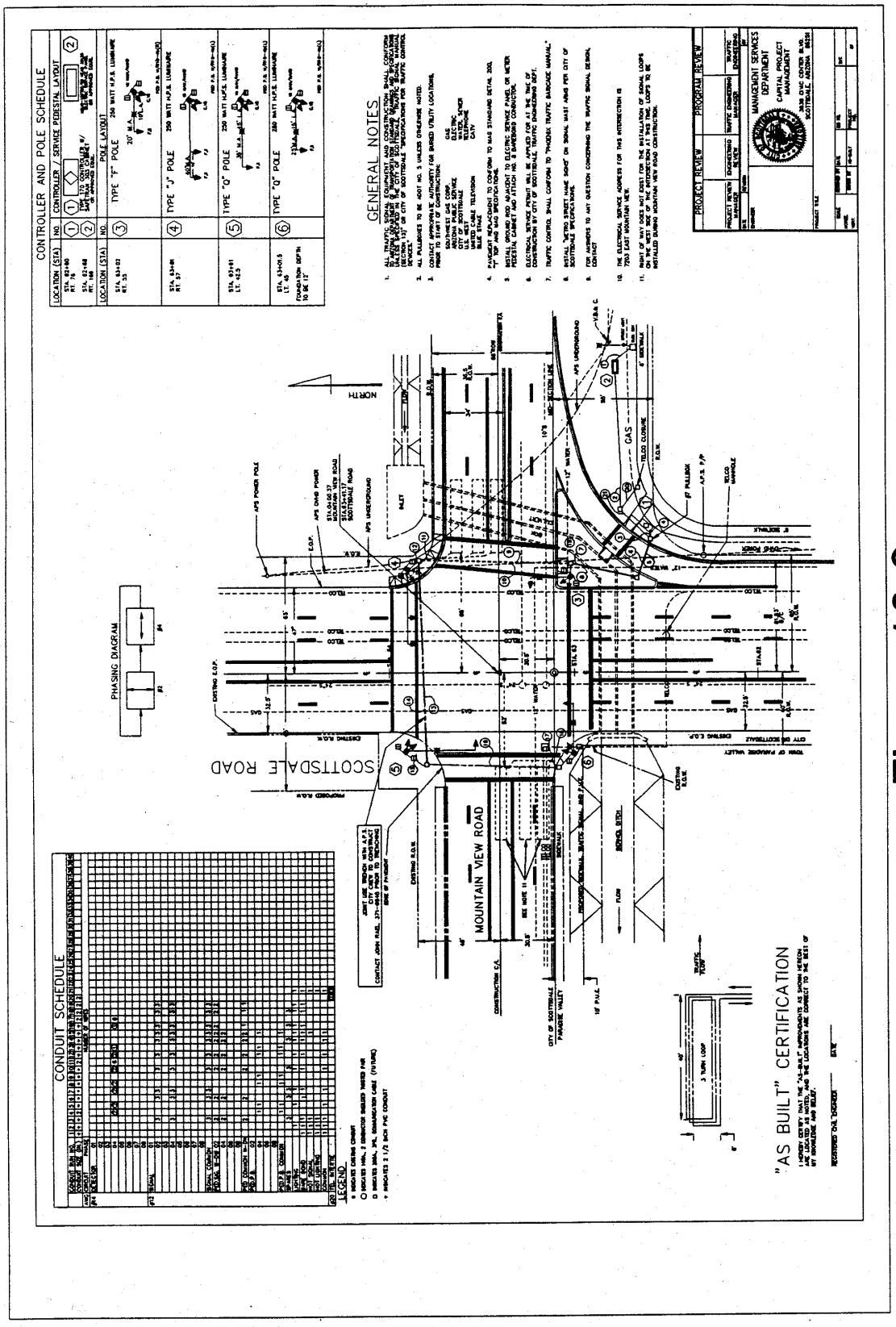


Figure 1.2-9
Sample Intersection Signal Plan

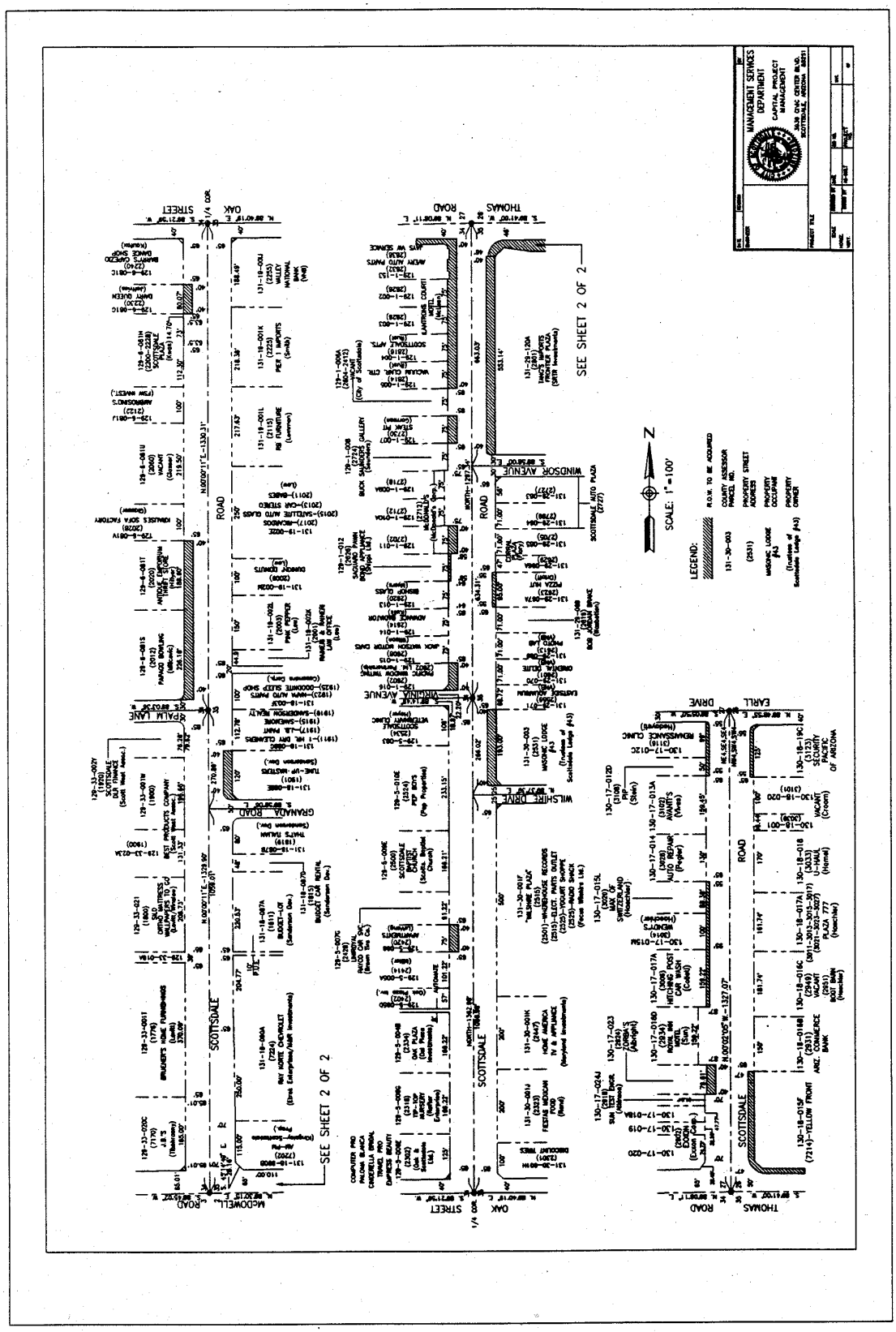


Figure 1.2-10
Sample Right-of-Way Exhibit

LINE	DIRECTION	DISTANCE
L1	N 88°43'01" E	25.00'
L2	S 70°20'55" E	19.11'
L3	S 88°43'01" W	28.00'

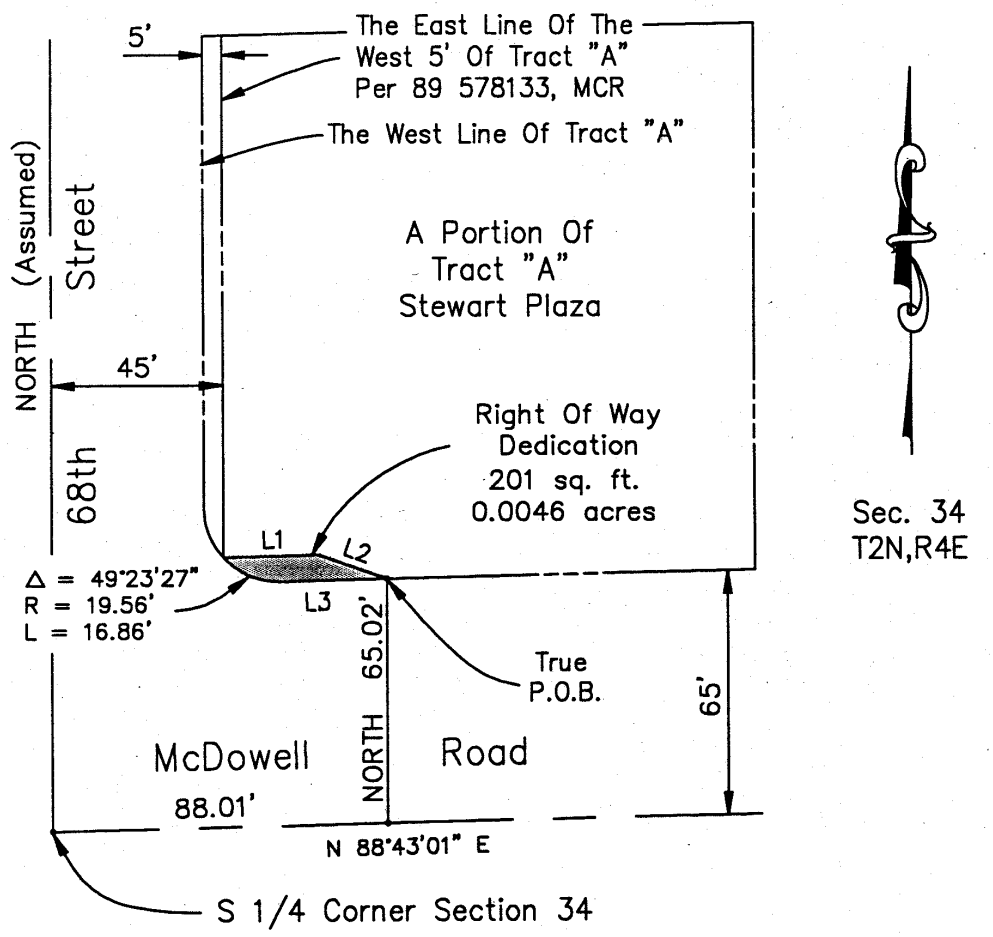


EXHIBIT "A"

ACQUISITIONS	PROJECT
Required Right-of-Way	Scottsdale Rd Widening McDowell Rd to Earll Dr
Temp Constr Easement	PROJECT NO. S 5518
Drainage Easement	TAX PARCEL # 130-23-197
Public Utility Easement	OWNER Wilson B. Johnson
Other	BY: DRM DATE 3/24/93 SHT OF

Figure 1.2-11

Sample Parcel Acquistion Exhibit

Project:	Project Name
Project No:	XXXX
Tax Parcel No:	XXX-XX-XXX
Owner:	Owner's Name

RIGHT-OF-WAY DESCRIPTION

A parcel of land located in Tract "A" of Stewart Plaza, a subdivision recorded in Book 71, Page 24, Maricopa County Records, and situated int he Southesast Quarter of Section34, Twonship Tw(2) North, Range Four (4) East of Gila and Salt River Base and Meridian Maricopa County, Arizona. Soad parcel bing more particulary described as follows:

Commencing at the South Quarter Corner of said Section 34,thence North 88°43'01" East along the South line of said Section a distane of 88.01 feet; thene North a distance of 65.02 feet to a point on the South line of said Tract "A", said point also being the TRUE POINT OF BEGINNING.

Thence South 88°43'01" West a distance of 28.00 feet along the south line of said Tract "A" to the beginning of a trangent curve to the right, concave Notheasterly with a radius of 1956 feet; thence Northwesterely along the arc of said curve through a central angle of 49°23'27" a distance of 16.86 feet to a pointon the east line of the West 5 feet of said Tract "A: as described in document 89-588133, Maricopa County Recordds' thece North 88°43'01" East parallel to the South line of Tract "A" a distance of 25.55 feet; thence South 70°20'55" East a distance of 19.11 feet to the TRUEPOINT OF BEGINNING.

Said parcel containing an area of 201 square feet (.0046 acres) ±.

Surveyor's
Seal

Figure 1.2-12
Sample Legal Description Exhibit

Project Number: _____ Bid page: _____
Bid Call Number: _____ Sheet: _____
Of: _____

Project name
Schedule of Bid Items

Item No.	Item Description	Estimated Quantities	Unit	Unit Price	Total Amount

FIGURE 1.2-13
Sample Schedule of Bid Items Form

Project Number: _____ Bid page: _____
Bid Call Number: _____ Sheet: _____
Of: _____

Project name
Schedule of Bid Items

Item No.	Item Description	Estimated Quantities	Unit	Unit Price	Total Amount

Total Bid _____ Dollars
(in writing)
_____ Cents
$ _____

Contractor's Name: _____

FIGURE 1.2-13a
Sample Schedule of Bid Items Form

GENERAL CONSTRUCTION NOTES FOR CAPITAL IMPROVEMENT PROJECTS

1. All construction shall comply with the latest Maricopa County Association of Governments Standard Specifications and Details for Public Works Construction as amended by the latest version of the City of Scottsdale Supplemental Standard Specifications and Details, unless referenced otherwise on the drawings.

2. The engineering designs on these plans is approved by the City in scope and not on detail. If construction quantities are shown on these plans they are not verified by the City.

3. Approval of the plans by the City is valid for six (6) months. If an encroachment permit for the construction has not been issued within six months, the plans shall be resubmitted to the City for re-approval.

4. A City Capital Projects Inspector will inspect all work within the City right-of -way and in easements.

5. Wherever excavation is done contact the Blue Stake Center at 263-1100, two working days before excavation is to begin. The Center will see that the location of the underground utility lines is identified for the project. Call collect if necessary.

6. City encroachment permits are required for all work in public right-of-way and easements granted for public purposes. An encroachment permit will be issued by the City through the City's One-Stop Shop. Copies of all permits shall be retained on-site and shall be available for inspection at all times. Failure to produce the required permits will result in immediate work stoppage until the proper permit documentation is obtained.

7. All excavation and grading which is not in public right-of-way or in easements granted for public purposes must conform to Chapter 70, Excavation and Grading, of the latest edition of the Uniform Building Code prepared by the International Conference of Building Officials. A permit for this grading must be secured from the City.

8. Thrust restraint, where required, on all City water lines shall be provided using Megalug mechanical joint restraints or City approved equal.

FIGURE 1.2-14
General Construction Notes for Capital Improvement Projects

APPENDIX A - BID ITEMS NUMBERING FORMAT

CITY OF SCOTTSDALE - CAPITAL PROJECT MANAGEMENT
MASTER LIST OF BID ITEMS
UPDATE: APRIL 1998

ITEM NO.	DESCRIPTION	UM
104150	PROJECT SIGNS (NEW)	EA
104250	PROJECT HOTLINE	LS
105801	CONSTRUCTION SURVEYING & AS-BUILTS	LS
107001	PERMITS & FEES	LS
201001	CLEARING & GRUBBING	SY
201101	REMOVE BUSINESS SIGNS	EA
205001	ROADWAY EXCAVATION	CY
206001	STRUCTURAL EXCAVATION	CY
206101	STRUCTURAL BACKFILL	CY
210001	BORROW	CY
211001	FILL	CY
215001	CHANNEL/DRAINAGE EXCAVATION	CY
215101	GRADER DITCH	LF
220401	PLAIN RIPRAP	CY
220402	PLAIN RIPRAP (SPECIFY THICKNESS)	SY
220501	GROUTED RIPRAP	CY
220502	GROUTED RIPRAP (SPECIFY THICKNESS)	SY
220551	SEEDED RIPRAP (6' DEPTH)	SY
220601	CONCRETE RIPRAP	CY
220602	CONCRETE RIPRAP (SPECIFY THICKNESS)	SY
220701	WIRE GABIONS	CY
301201	SUBGRADE PREPARATION	SY
301501	GRADING OUTSIDE ROADWAY	SY
310104	4" ABC	SY
310106	6" ABC	SY
310108	8" ABC	SY
310110	10" ABC	SY
310112	12" ABC	SY
310114	14" ABC	SY
310204	6" SELECT FILL	SY
310208	8" SELECT FILL	SY
310210	10" SELECT FILL	SY
310212	12" SELECT FILL	SY
310214	14" SELECT FILL	SY
311006	SOIL CEMENT BASE COURSE	CY
312006	6" CEMENT TREATED BASE	SY
312008	8" CEMENT TREATED BASE	SY
312010	10" CEMENT TREATED BASE	SY
312012	12" CEMENT TREATED BASE	SY
312014	14" CEMENT TREATED BASE	SY
321001	PAVEMENT SECTION NO. 1 (FOR BIDDING)	SY
321002	PAVEMENT SECTION NO. 2 (FOR BIDDING)	SY
321003	PAVEMENT SECTION NO. 3 (FOR BIDDING)	SY
321010	THICKENED PAVEMENT EDGE, MAG 201-A	LF
321011	THICKENED PAVEMENT EDGE, MAG 201-B	LF
321102	2" AC A-1 1/2 OR R-25	SY
321104	4" AC A-1 1/2 OR R-25	SY
321106	6" AC A-1 1/2 OR R-25	SY
321201	1 1/2" AC C-3/4 OR R-19	SY
321202	2" AC C-3/4 OR R-19	SY
321203	2 1/2" AC C-3/4 OR R-19	SY
321204	3" AC C-3/4 OR R-19	SY
321205	4" AC C-3/4 OR R-19	SY
321301	1" AC D-1/2 OR R-12.5	SY
321302	1 1/2" AC D-1/2 OR R-12.5	SY

321303	2" AC D-1/2 OR R-12.5	SY
321401	1" RUBBERIZED ASPHALT	SY
321501	1" RECYCLED ASPHALT PAVEMENT	SY
321502	1 1/2" RECYCLED ASPHALT PAVEMENT	SY
321503	2" RECYCLED ASPHALT PAVEMENT	SY
321601	1" AC A-12.5	SY
321602	1 1/2" AC A-12.5	SY
321603	2" AC A-12.5	SY
321701	1 1/2" A-19	SY
321702	2" AC A-19	SY
321703	2 1/2 " A-19	SY
321704	3" AC A-19	SY
321801	2" AC A-25	SY
321802	2 1/2" AC A-25	SY
321803	3" AC A-25	SY
321901	SPEED BUMPS	EA
321902	SPEED HUMPS	EA
322001	1" D-1/2 OVERLAY	SY
322002	1" C-3/4 OVERLAY	SY
322003	1 1/2" C-3/4 OVERLAY	SY
322004	2" C-3/4 OVERLAY	SY
324104	4" PCC PAVEMENT	SY
324106	6" PCC PAVEMENT	SY
324108	8" PCC PAVEMENT	SY
324201	BUS BAY, COS 2266-1	EA
324202	BUS BAY, COS 2266-2	EA
324203	BUS BAY, COS 2267	EA
324301	BUS SHELTER PAD, COS 2269	EA
324302	BUS SHELTER, COS STANDARD	EA
329101	TACK COAT	SY
330101	CHIP SEAL	SY
332201	SLURRY SEAL- TYPE I	SY
332202	SLURRY SEAL- TYPE II	SY
334201	PRESERVATIVE SEAL	SY
335201	HOT-ASPHALT RUBBER SEAL	SY
336001	SAWCUT PAVEMENT	LF
336301	PAVEMENT REPLACEMENT, COS 2200	SY
340001	VERT CURB & GUTTER, MAG 220 TYPE "A"	LF
340002	VERTICAL CURB & GUTTER, COS 2220 TYPE "A"	LF
340004	CURBWALL, COS 2221 TYPE "W"	LF
340021	RIBBON CURB, MAG 220 TYPE "B"	LF
340022	VERTICAL CURB & GUTTER, COS 2220 TYPE "B"	LF
340041	ROLL CURB & GUTTER, MAG 220 TYPE "C"	LF
340042	ROLL CURB & GUTTER, MAG 220 TYPE "D"	LF
340061	SINGLE CURB, MAG 222 TYPE "A"	LF
340062	SINGLE CURB, MAG 222 TYPE "B"	LF
340081	6" EXTRUDED CONCRETE CURB	LF
340101	6" EXTRUDED ASPHALT CURB	LF
340121	CUT-OFF WALL, COS 2228	LF
340204	4" CONCRETE SIDEWALK, MAG 230	SF
340206	6" CONCRETE SIDEWALK, MAG 230	SF
340214	10' WIDE CONCRETE BIKEPATH (4IN THICKNESS)	SF
340216	10' WIDE CONCRETE BIKEPATH (6IN THICKNESS)	SF
340221	MEDIAN NOSE PAVING	SF
340241	TEXTURED CONCRETE SIDEWALK	SF
340242	STAMPED CONCRETE SIDEWALK	SF
340261	SIDEWALK RAMP, MAG 231 TYPE "A"	EA
340262	SIDEWALK RAMP, MAG 232 TYPE "B"	EA
340263	SIDEWALK RAMP, MAG 233 TYPE "C"	EA
340264	SIDEWALK RAMP, MAG 234 TYPE "D"	EA
340301	CONCRETE VALLEY GUTTER, MAG 240	SF
340302	CONCRETE VALLEY GUTTER, COS 2240	SF
340406	DRIVEWAY ENTRANCE, MAG 250, DEPTH=6"	SF
340407	DRIVEWAY ENTRANCE, MAG 250, DEPTH=7"	SF
340508	ALLEY ENTRANCE, MAG 260 (8")	SF

340601	SCUPPER, MAG 206--DESIGNATE LENGTH--	EA
342001	INTERLOCKING CONCRETE PAVERS-TRAFFIC	SF
342002	INTERLOCKING CONCRETE PAVERS-NON-TRAFFIC	SF
342051	BRICK PAVERS (TRAFFIC AREA)	SF
342052	BRICK PAVERS (NON-TRAFFIC AREA)	SF
342061	PAVER CONC HEADER (TRAFFIC AREA)	LF
342062	PAVER CONC HEADER (NON-TRAFFIC AREA)	LF
342082	TEXTURED CONCRETE-TRAFFIC AREA	SF
343001	EXPOSED AGGREGATE SIDEWALK	SF
343002	EXPOSED AGGREGATE (DECORATIVE)	SF
345001	ADJUST MANHOLE FRAME & COVER, COS 2270	EA
345101	ADJUST VALVE BOX & COVER, COS 2270	EA
345201	ADJUST METER BOX	EA
350001	REMOVE AC PAVEMENT	SY
350011	ROTOMILL AC PAVEMENT (PER 1" DEPTH)	SY
350016	ROTOMILL PAVEMENT (1 1/2")	SY
350017	ROTOMILL PAVEMENT (2")	SY
350021	REMOVE CONCRETE PAVEMENT	SY
350041	REMOVE CURB & CUTTER	LF
350051	SAWCUT CURB FROM GUTTER	LF
350061	REMOVE CONCRETE SIDEWALK	SF
350081	REMOVE CONCRETE DRIVEWAY	SF
350101	REMOVE CONCRETE VALLEY GUTTER	SF
350201	REMOVE PIPES (LESS THAN 24")	LF
350221	REMOVE PIPES (24" TO 48")	LF
350241	REMOVE PIPES (54" TO 96")	LF
350261	REMOVE PIPES (GREATER THAN 96")	LF
350301	REMOVE IRRIGATION STRUCTURE	EA
350321	REMOVE GROUTED RIPRAP/GUNITE	SY
350341	REMOVE STORM DRAIN STRUCTURE	EA
350401	REMOVE IRRIGATION HEADWALL	EA
350441	REMOVE STORM DRAIN HEADWALL	EA
350501	REMOVE TREES (12" TO 24")	EA
350541	REMOVE TREES (GREATER THAN 24")	EA
350601	REMOVE TRAFFIC MARKINGS, SANDBLAST	LF
350602	REMOVE TRAFFIC MARKINGS, SHOTBLAST	LF
350603	REMOVE TRAFFIC MARKINGS, SLURRY	LF
350701	REMOVE UNDERGROUND STORAGE TANKS	LS
350702	REMOVE CONTAMINATED SOIL	CY
350801	MISC. REMOVALS AND OTHER WORK	LS
350901	REMOVE AND RELOCATE BRICK PAVERS	SF
350902	REMOVE AND RELOCATE CHAIN LINK FENCING	LF
350902	MISCELLANEOUS RELOCATIONS	LS
401001	TRAFFIC CONTROL	LS
401101	OFF-DUTY POLICE OFFICER	HR
401201	PROJECT HOT-LINE	LS
402001	LANE STRIPING (FOR ESTIMATING)	LS
402101	4" WHITE STRIPE (60MIL THERMO PLASTIC)	LF
402102	4" YELLOW STRIPE (60MIL THERMO PLASTIC)	LF
402104	4" WHITE STRIPE (90MIL THERMO PLASTIC)	LF
402111	4" WHITE STRIPE (PAINT)	LF
402112	4" YELLOW STRIPE (PAINT)	LF
402121	PAVEMENT LEGEND- ONLY (TYPE I PREFORM)	EA
402122	PAVEMENT ARROW (TYPE I PREFORM)	EA
402126	BIKE LANE DIAMOND	EA
402127	BIKE LANE ARROW	EA
402128	BIKE LANE SYMBOL	EA
402131	PAVEMENT LEGEND- ONLY (PAINT)	EA
402132	PAVEMENT ARROW (PAINT)	EA
402136	PAINT MEDIAN NOSE	LF
402141	RAISED PAVEMENT MARKERS, TYPE "D"	EA
402142	RAISED PAVEMENT MARKERS, TYPE "G"	EA
402143	RAISED PAVEMENT MARKERS, TYPE "H"	EA
402144	RAISED PAVEMENT MARKERS, TYPE "M"	EA
402145	RAISED PAVEMENT MARKERS, DAGMARS (8")	EA

402150	FLEXIBLE MARKERS	EA
402301	METRO STREET SIGN	SF
402401	REFLECTIVE SIGNS	SF
402411	TELESPAR SIGN POST	LF
402412	TELESPAR SIGN POST BASE	EA
402421	SIGN BANDS (FOR POLES)	EA
402611	BARRICADE, MAG 130-B	LF
402801	TRAFFIC SIGNS (FOR ESTIMATING)	EA
403001	1 1/2" TS CONDUIT/SLEEVE W/ PULL WIRE	LF
403002	2" TS CONDUIT/SLEEVE W/ PULL WIRE	LF
403004	2 1/2" TS CONDUIT/SLEEVE W/ PULL WIRE	LF
403051	LEAD-IN CONDUCTOR WIRE	LF
403101	TRAFFIC SIGNAL EQUIPMENT, INTER 'A'	LS
403102	TRAFFIC SIGNAL EQUIPMENT, INTER 'B'	LS
403103	TRAFFIC SIGNAL EQUIPMENT, INTER 'C'	LS
403301	TRAFFIC SIGNAL POLES, ADOT A-TYPE	EA
403302	TRAFFIC SIGNAL POLES, ADOT Q-TYPE	EA
403303	TRAFFIC SIGNAL POLES, ADOT R-TYPE	EA
403425	MAST ARMS, 25' LENGTH	EA
403435	MAST ARMS, 35' LENGTH	EA
403440	MAST ARMS, 40' LENGTH	EA
403501	FOUNDATIONS--PER POLE TYPE--	EA
403601	SIGNAL HEADS/MOUNTINGS--PER EACH TYPE--	EA
403701	CONTROLLERS/LOAD CENTERS	EA
403801	PEDESTRIAN HEADS/BUTTONS	EA
403901	MISC. TRAFFIC SIGNAL	EA
404001	SIGNAL DETECTOR LOOPS (6 x 40)	EA
404002	COUNTER DETECTOR LOOPS (6 x 6)	EA
404011	SIGNAL DETECTOR SYSTEM (PER INTERSECTION)	LS
404012	COUNTER DETECTOR SYSTEM (COMPLETE)	LS
404201	NO. 3 1/2 PULL BOX, ADOT T.S. 1-1	EA
404202	NO. 5 PULL BOX, ADOT T.S. 1-2	EA
404204	NO. 7 PULL BOX, ADOT T.S.1-4	EA
405001	SURVEY MONUMENT, MAG 120, TYPE "A"	EA
405101	SURVEY MONUMENT, MAG 120, TYPE "B"	EA
405201	SURVEY MONUMENT, MAG 120, TYPE "C"	EA
410103	PRECAST SAFETY CURB, 3' LONG	EA
410104	PRECAST SAFETY CURB, 4' LONG	EA
410106	PRECAST SAFETY CURB, 6' LONG	EA
415001	GUARD RAIL, MAG 135	LF
415101	G4 W BEAM (TIMBER POST) ADOT C-10.04	LF
415102	G4 W BEAM (STEEL POST) ADOT C-10.05	LF
415201	FLARED BREAKAWAY CABLE (TIMBER) ADOT C-10.15	EA
415202	FLARED BREAKAWAY CABLE (STEEL) ADOT C-10.16	EA
415206	BCT (TIMBER) ADOT C-10.18	EA
415207	BCT (STEEL) ADOT C-10.17	EA
415301	W BEAM TRANSITION TO CONC BARRIER	LF
418101	GUARD POSTS, COS 2356	EA
420006	6' CHAIN LINK FENCE	LF
420007	7' CHAIN LINK FENCE	LF
424001	PARKWAY GRADING	SY
430001	DECOMPOSED GRANITE (SPECIFY THICKNESS)	SY
430002	RIVER-RUN ROCK	SY
430003	RESODDING	SY
430101	GROUND COVER, 1 GAL.	EA
430102	GROUND COVER, 5 GAL.	EA
430201	SHRUBS, 1 GAL.	EA
430202	SHRUBS, 5 GAL.	EA
430301	TREES, 1 GAL.	EA
430302	TREES, 15 GAL.	EA
430303	TREES, 24" BOX	EA
430304	TREES, 36" BOX	EA
430306	TREES, 42" BOX	EA
430308	TREES, 48" BOX	EA
430401	PALM TREES, TO 30'	EA

430402	PALM TREES, 30'+	EA
430501	SAGUARO	LF
430602	SALVAGE & RELOCATE NATIVE CACTI	LF
430611	RELOCATE PALMS	EA
430621	SALVAGE & RELOCATE NATIVE TREES	EA
430631	RELOCATE OTHER TREES	EA
430701	NATIVE PLANT SALVAGE/STORAGE	LS
430801	LANDSCAPING (FOR ESTIMATING)	LS
430811	MEDIAN LANDSCAPING	LS
430821	BACK OF CURB LANDSCAPING	LS
430831	LANDSCAPE RESTORATION (PRIV. PROP.)	LS
440001	BACKFLOW PREVENTER WITH CAGE (3/4")	EA
440002	BACKFLOW PREVENTER WITH CAGE (1")	EA
440003	BACKFLOW PREVENTER WITH CAGE (1 1/2")	EA
440004	BACKFLOW PREVENTER WITH CAGE (2")	EA
440101	CONTROL CABINET WITH CLOCK	EA
440201	IRRIGATION PIPING	LF
440261	IRRIGATION SLEEVING	LF
440301	IRRIGATION CONTROL VALVES	EA
440321	PRESSURE REGULATOR VALVES	EA
440341	IRRIGATION GATE VALVES	EA
440361	IRRIGATION FLUSH VALVES	EA
440401	IRRIGATION VALVE BOXES	EA
440501	IRRIGATION EMITTERS	EA
440521	IRRIGATION BUBBLERS	EA
440541	IRRIGATION SPRAY HEADS	EA
440701	IRRIGATION WIRING	LF
440801	MISC. IRRIGATION ITEMS	EA
440901	IRRIGATION SYSTEM (FOR ESTIMATING)	SF
440911	MEDIAN IRRIGATION SYSTEM (DRIP)	LS
440912	MEDIAN IRRIGATION SYSTEM (BUBBLER)	LS
440921	BACK OF CURB IRRIGATION	LS
440931	IRRIGATION RESTORATION (PRIVATE PROPERTY)	LS
505001	CURB INLETS @ 300' (FOR ESTIMATING)	EA
505101	CATCH BASIN, MAG 530	EA
505102	CATCH BASIN, MAG 531	EA
505103	CATCH BASIN, MAG 532	EA
505104	CATCH BASIN, MAG 533	EA
505105	CATCH BASIN, MAG 534	EA
505106	CATCH BASIN, MAG 535	EA
505111	CATCH BASIN, COP 1569 TYPE M-1, L=3	EA
505112	CATCH BASIN, COP 1569 TYPE M-2, L=3	EA
505113	CATCH BASIN, COP 1569 TYPE M-1, L=6	EA
505114	CATCH BASIN, COP 1569 TYPE M-2, L=6	EA
505115	CATCH BASIN, COP 1569 TYPE M-1, L=10	EA
505116	CATCH BASIN, COP 1569 TYPE M-2, L=10	EA
505117	CATCH BASIN, COP 1569 TYPE M-1, L=17	EA
505118	CATCH BASIN, COP 1569 TYPE M-2, L=17	EA
505121	CATCH BASIN, COP 1572, SINGLE	EA
505122	CATCH BASIN, COP 1572, DOUBLE	EA
505123	CATCH BASIN, COP 1572, TRIPLE	EA
505132	CONCRETE HEADWALL, MAG 501 12"-36"	EA
505133	CONCRETE HEADWALL, MAG 501 42"-84"	EA
505135	DROP INLET, MAG 501	EA
505191	SPECIAL CONCRETE DETAILS	EA
505192	SPECIAL CONCRETE DETAILS	EA
505401	BOX CULVERTS- CONCRETE	CY
505402	BOX CULVERTS- REINF.STEEL	LB
505461	BOX CULVERT WINGS- CONCRETE	CY
505462	BOX CULVERT WINGS- REINF. STEEL	LB
505481	BOX CULVERT APRON- CONCRETE	CY
505482	BOX CULVERT APRON- REINF. STEEL	LB
505501	__x__ BOX CULVERT (FOR ESTIMATING)	LF
505502	BOX CULVERT WINGWALLS (FOR ESTIMATING)	EA
505551	BOX CULVERTS (FOR BIDDING)	LF

505552	BOX CULVERTS (FOR BIDDING)	LS
505601	SLAB BRIDGE-CONCRETE	CY
505602	SLAB BRIDGE-REINFORCING STEEL	LB
505611	GIRDER BRIDGE-CONCRETE	CY
505612	GIRDER BRIDGE-REINFORCING STEEL	LB
505701	HALF-BARRIER (PRECAST) ADOT C-10.11	LF
505702	MEDIAN BARRIER (PRECAST) ADOT C-10.14	LF
505751	BARRIER TRANSITION (TANGENT) ADOT C-10.98	LF
505752	BARRIER TRANSITION (CURVE) ADOT C-10.99	LF
505806	6' CONCRETE RETAINING WALL	LF
505808	8' CONCRETE RETAINING WALL	LF
505810	10' CONCRETE RETAINING WALL	LF
505815	15' CONCRETE RETAINING WALL	LF
505820	20' CONCRETE RETAINING WALL	LF
505850	ARCHITECTURAL SURFACE TREATMENTS	LS
505901	ACCESS BARRIER, COP P1563	EA
505902	TRASH RACK, MAG 502	EA
505903	SPECIALITIES	EA
510004	4' CONCRETE BLOCK WALL	LF
510006	6' CONCRETE BLOCK WALL	LF
510008	8' CONCRETE BLOCK WALL	LF
515101	TRANSIT SHELTER	EA
520001	STEEL HANDRAILS, COS 2508	LF
520002	ALUMINUM HANDRAILS, COS 2508	LF
522202	WROUGHT IRON FENCES (SPECIFY HEIGHT)	LF
522401	WROUGHT IRON GATES (SPECIFY DIMS)	EA
525003	3" NON-REINFORCED GUNITE	SF
525004	4" NON-REINFORCED GUNITE	SF
525013	3" REINFORCED GUNITE	SF
525014	4" REINFORCED GUNITE	SF
602001	BORING, TO 18"	LF
602002	BORING, 18"+	LF
602101	JACKING, TO 36"	LF
602102	JACKING, 36"+	LF
603008	8" HDPE	LF
603010	10" HDPE	LF
603112	12" HDPE	LF
603115	15" HDPE	LF
603118	18" HDPE	LF
603124	24" HDPE	LF
603130	30" HDPE	LF
603136	36" HDPE	LF
610008	8" WATER LINE (FOR BIDDING)	LF
610010	10" WATER LINE (FOR BIDDING)	LF
610012	12" WATER LINE (FOR BIDDING)	LF
610104	4" ACP WATER LINE	LF
610106	6" ACP WATER LINE	LF
610108	8" ACP WATER LINE	LF
610110	10" ACP WATER LINE	LF
610112	12" ACP WATER LINE	LF
610116	16" ACP WATER LINE	LF
610204	4" PVC WATER LINE	LF
610206	6" PVC WATER LINE	LF
610208	8" PVC WATER LINE	LF
610210	10" PVC WATER LINE	LF
610212	12" PVC WATER LINE	LF
610304	4" DIP WATER LINE	LF
610306	6" DIP WATER LINE	LF
610308	8" DIP WATER LINE	LF
610310	10" DIP WATER LINE	LF
610312	12" DIP WATER LINE	LF
610316	16" DIP WATER LINE	LF
610324	24" DIP WATER LINE	LF
610414	14" CCP WATER LINE	LF
610416	16" CCP WATER LINE	LF

610424	24" CCP WATER LINE	LF
610514	14" WSP WATER LINE	LF
610516	16" WSP WATER LINE	LF
610524	24" WSP WATER LINE	LF
610601	CAST IRON FITTINGS ALLOWANCE	LB
610701	PIPE SUPPORT, MAG 403, TYPE A	EA
610702	PIPE SUPPORT, MAG 403, TYPE B	EA
610703	PIPE SUPPORT, MAG 403, TYPE C	EA
610711	CONC ENCASE, MAG 404 (REINFORCED)	LF
610712	CONC ENCASE, MAG 404 (NON-REINFORCED)	LF
610721	6" WATER LINE VERT. REALIGN, COS 2370	EA
610722	8" WATER LINE VERT. REALIGN, COS 2370	EA
610723	10" WATER LINE VERT. REALIGN, COS 2370	EA
610724	12" WATER LINE VERT. REALIGN, COS 2370	EA
610725	16" WATER LINE VERT. REALIGN, COS 2370	EA
610728	24" WATER LINE VERT. REALIGN, COS 2370	EA
610741	6" WATER LINE DIP REPLACEMENT	LF
610742	8" WATER LINE DIP REPLACEMENT	LF
610743	10" WATER LINE DIP REPLACEMENT	LF
610744	12" WATER LINE DIP REPLACEMENT	LF
610801	FIRE HYDRANT, MAG 360	EA
610802	FIRE HYDRANT BYPASS, COS 2360	EA
610803	FIRE HYDRANT RELOCATION	EA
610804	FIRE HYDRANT REPLACEMENT	EA
610806	ADJUST FIRE HYDRANT	EA
610811	WATER SERVICE CONNECTION, 3/4 INCH	EA
610812	WATER SERVICE CONNECTION, 1 INCH	EA
610813	WATER SERVICE CONNECTION, 1 1/2 INCH	EA
610814	WATER SERVICE CONNECTION, 2 INCH	EA
610841	CURB STOP, MAG 390, TYPE A	EA
610842	CURB STOP, MAG 390, TYPE B	EA
610851	RELOCATE WATER METER	EA
610861	WATER SERVICE REPLACEMENT, 3/4 TO 2 IN.	EA
610902	ELECTROLYSIS TEST STATION, 2 WIRE	EA
610904	ELECTROLYSIS TEST STATION, 4 WIRE	EA
615008	8" SAN. SEWER LINE (FOR BIDDING)	LF
615010	10" SAN. SEWER LINE (FOR BIDDING)	LF
615012	12" SAN. SEWER LINE (FOR BIDDING)	LF
615104	4" VCP SEWER LINE	LF
615106	6" VCP SEWER LINE	LF
615108	8" VCP SEWER LINE	LF
615110	10" VCP SEWER LINE	LF
615112	12" VCP SEWER LINE	LF
615115	15" VCP SEWER LINE	LF
615204	4" PVC SEWER LINE	LF
615206	6" PVC SEWER LINE	LF
615208	8" PVC SEWER LINE	LF
615210	10" PVC SEWER LINE	LF
615212	12" PVC SEWER LINE	LF
615216	16" PVC SEWER LINE	LF
615304	4" DIP SEWER LINE	LF
615306	6" DIP SEWER LINE	LF
615308	8" DIP SEWER LINE	LF
615310	10" DIP SEWER LINE	LF
615312	12" DIP SEWER LINE	LF
615316	16" DIP SEWER LINE	LF
615424	24" CONCRETE SEWER PIPE	LF
615430	30" CONCRETE SEWER PIPE	LF
615436	36" CONCRETE SEWER PIPE	LF
615448	48" CONCRETE SEWER PIPE	LF
615506	6" SEWER LINE DIP REPLACEMENT	LF
615508	8" SEWER LINE DIP REPLACEMENT	LF
615510	10" SEWER LINE DIP REPLACEMENT	LF
615512	12" SEWER LINE DIP REPLACEMENT	LF
615601	PIPE PLUG, 12" - 36", MAG 427	EA

615602	PIPE PLUG, 33" - 72", MAG 427	EA
615603	PIPE PLUG, 78" - 108", MAG 427	EA
615704	4" SEWER BUILDING CONNECTION, MAG 440	EA
615706	6" SEWER BUILDING CONNECTION, MAG 440	EA
615804	4" SEWER CLEANOUT, MAG 441	EA
615806	6" SEWER CLEANOUT, MAG 441	EA
615808	8" SEWER CLEANOUT, MAG 441	EA
618018	18" STORM DRAIN PIPE (FOR BIDDING)	LF
618024	24" STORM DRAIN PIPE (FOR BIDDING)	LF
618030	30" STORM DRAIN PIPE (FOR BIDDING)	LF
618036	36" STORM DRAIN PIPE (FOR BIDDING)	LF
618042	42" STORM DRAIN PIPE (FOR BIDDING)	LF
618054	54" STORM DRAIN PIPE (FOR BIDDING)	LF
618060	60" STORM DRAIN PIPE (FOR BIDDING)	LF
618066	66" STORM DRAIN PIPE (FOR BIDDING)	LF
618072	72" STORM DRAIN PIPE (FOR BIDDING)	LF
618084	84" STORM DRAIN PIPE (FOR BIDDING)	LF
618096	96" STORM DRAIN PIPE (FOR BIDDING)	LF
618112	12" RGRCP	LF
618115	15" RGRCP	LF
618118	18" RGRCP	LF
618124	24" RGRCP	LF
618130	30" RGRCP	LF
618136	36" RGRCP	LF
618142	42" RGRCP	LF
618148	48" RGRCP	LF
618160	60" RGRCP	LF
618172	72" RGRCP	LF
618184	84" RGRCP	LF
618196	96" RGRCP	LF
618212	12" NONREINFORCED CONCRETE PIPE	LF
618215	15" NONREINFORCED CONCRETE PIPE	LF
618218	18" NONREINFORCED CONCRETE PIPE	LF
618224	24" NONREINFORCED CONCRETE PIPE	LF
618512	12" PIPE COLLAR, MAG 505	EA
618515	15" PIPE COLLAR, MAG 505	EA
618518	18" PIPE COLLAR, MAG 505	EA
618524	24" PIPE COLLAR, MAG 505	EA
618530	30" PIPE COLLAR, MAG 505	EA
618536	36" PIPE COLLAR, MAG 505	EA
618715	15" STORM DRAIN CONNECTOR LATERAL	LF
618718	18" STORM DRAIN CONNECTOR LATERAL	LF
618721	21" STORM DRAIN CONNECTOR LATERAL	LF
618724	24" STORM DRAIN CONNECTOR LATERAL	LF
618730	30" STORM DRAIN CONNECTOR LATERAL	LF
619001	_x_ PRECAST BOX CULVERT	LF
619002	_x_ PRECAST BOX CULVERT	LF
619901	PRECAST BOX APPURTENANCES	EA
620018	18" CAST-IN-PLACE PIPE	LF
620024	24" CAST-IN-PLACE PIPE	LF
620030	30" CAST-IN-PLACE PIPE	LF
620036	36" CAST-IN-PLACE PIPE	LF
620042	42" CAST-IN-PLACE PIPE	LF
620048	48" CAST-IN-PLACE PIPE	LF
620054	54" CAST-IN-PLACE PIPE	LF
620060	60" CAST-IN-PLACE PIPE	LF
620072	72" CAST-IN-PLACE PIPE	LF
620084	84" CAST-IN-PLACE PIPE	LF
620096	96" CAST-IN-PLACE PIPE	LF
621018	18" CMP	LF
621024	24" CMP	LF
621030	30" CMP	LF
621036	36" CMP	LF
621042	42" CMP	LF
621048	48" CMP	LF

621054	54" CMP	LF
621060	60" CMP	LF
621072	72" CMP	LF
621084	84" CMP	LF
621096	96" CMP	LF
621118	18" CMP (CONCRETE LINED)	LF
621124	24" CMP (CONCRETE LINED)	LF
621130	30" CMP (CONCRETE LINED)	LF
621136	36" CMP (CONCRETE LINED)	LF
621142	42" CMP (CONCRETE LINED)	LF
621148	48" CMP (CONCRETE LINED)	LF
621154	54" CMP (CONCRETE LINED)	LF
621160	60" CMP (CONCRETE LINED)	LF
621172	72" CMP (CONCRETE LINED)	LF
621184	84" CMP (CONCRETE LINED)	LF
621196	96" CMP (CONCRETE LINED)	LF
621218	18" CMP (SMOOTH METAL LINED)	LF
621224	24" CMP (SMOOTH METAL LINED)	LF
621230	30" CMP (SMOOTH METAL LINED)	LF
621236	36" CMP (SMOOTH METAL LINED)	LF
621242	42" CMP (SMOOTH METAL LINED)	LF
621248	48" CMP (SMOOTH METAL LINED)	LF
621254	54" CMP (SMOOTH METAL LINED)	LF
621260	60" CMP (SMOOTH METAL LINED)	LF
621272	72" CMP (SMOOTH METAL LINED)	LF
621284	84" CMP (SMOOTH METAL LINED)	LF
621296	96" CMP (SMOOTH METAL LINED)	LF
621318	18" SPIRAL RIB METAL PIPE	LF
621324	24" SPIRAL RIB METAL PIPE	LF
621330	30" SPIRAL RIB METAL PIPE	LF
621336	36" SPIRAL RIB METAL PIPE	LF
621342	42" SPIRAL RIB METAL PIPE	LF
621348	48" SPIRAL RIB METAL PIPE	LF
621354	54" SPIRAL RIB METAL PIPE	LF
621360	60" SPIRAL RIB METAL PIPE	LF
621372	72" SPIRAL RIB METAL PIPE	LF
621384	84" SPIRAL RIB METAL PIPE	LF
621396	96" SPIRAL RIB METAL PIPE	LF
625001	4' DIA. MANHOLE TO 10' DEPTH, MAG 420	EA
625002	5' DIA. MANHOLE 10' TO 15' DEPTH, MAG 420	EA
625003	5' DIA. MANHOLE 15'+ DEPTH, MAG 420	EA
625011	MANHOLE DROP CONN, MAG 426, TYPE B	EA
625012	MANHOLE DROP CONN, MAG 426, TYPE A	EA
625021	STORM DRAIN MANHOLE, MAG 522 & 520	EA
625022	STORM DRAIN MANHOLE, MAG 522 & 521	EA
625023	STORM DRAIN MANHOLE, MAG 522 SHALLOW	EA
630304	4" GATE VALVE, B & C, MAG 391, TYPE C	EA
630306	6" GATE VALVE, B & C, MAG 391, TYPE C	EA
630308	8" GATE VALVE, B & C, MAG 391, TYPE C	EA
630310	10" GATE VALVE, B & C, MAG 391, TYPE C	EA
630312	12" GATE VALVE, B & C, MAG 391, TYPE C	EA
630316	16" GATE VALVE, B & C, MAG 391, TYPE C	EA
630324	24" GATE VALVE, B & C, MAG 391, TYPE C	EA
630404	4" TS & V WITH VB & C, MAG 391, TYPE C	EA
630406	6" TS & V WITH VB & C, MAG 391, TYPE C	EA
630408	8" TS & V WITH VB & C, MAG 391, TYPE C	EA
630410	10" TS & V WITH VB & C, MAG 391, TYPE C	EA
630412	12" TS & V WITH VB & C, MAG 391, TYPE C	EA
630416	16" TS & V WITH VB & C, MAG 391, TYPE C	EA
630424	24" TS & V WITH VB & C, MAG 391, TYPE C	EA
630516	16" BUTTERFLY VALVE W/ MANHOLE	EA
630524	24" BUTTERFLY VALVE W/ MANHOLE	EA
630602	2" AIR RELEASE/VACUUM VALVE, COS 2348	EA
630603	3" AIR RELEASE/VACUUM VALVE, COS 2348	EA
630604	4" AIR RELEASE/VACUUM VALVE, COS 2348	EA

630612	2" PRV, COS 2342	EA
630614	4" PRV, COS 2342	EA
630616	6" PRV, COS 2342	EA
630618	8" PRV, COS 2342	EA
630701	VALVE BOX AND COVER, CAST IRON	EA
630901	MISCELLANEOUS VALVE BOXES	EA
640101	STREET LIGHTING (FOR ESTIMATING)	LS
640301	STREET LIGHT J-BOXES	EA
640311	STREET LIGHT CONDUIT AND TRENCH	LF
640321	STREET LIGHT POLES (FOR ESTIMATING)	EA
640322	STREET LIGHT POLES	EA
640323	STREET LIGHT POLES (COUPLET STD)	EA
640324	RELOCATE STREET LIGHT POLES	EA
640401	UTILITY TRENCHING--DESIGNATE TRENCH TYPE--	LF
640402	UTILITY TRENCHING--DESIGNATE TRENCH TYPE--	LF
640601	LUMINAIRES	EA
640701	ELECTRIC CONVERSIONS	LS

APPENDIX B – CPM PLAN REVIEW COORDINATION PROCESS

The following represents typical project review coordination procedures utilized by the Capital Project Management project review staff:

A. GENERAL - Typical Review Submittals

1. Public Works Projects

a. Concept Submittal / Preliminary Drainage Study

b. First Submittal (Grade & Alignment review)

c. Right Of Way Submittal

d. Second Submittal (Progress plans)

e. Third Submittal (Completed plans)

f. Approval Submittal (Sealed plans 100% complete)

2. Facilities

a. Schematic\Program Design

b. Design Development

c. Construction Documents (90% Complete)

d. Final Const. Documents (Sealed Plans 100% complete)

B. DEVELOP PROJECT REVIEW SCHEDULE

1. Establish project review schedule utilizing division monthly report.

2. Verify project submittal dates with Project manager.

3. Coordinate project review schedule with One Stop Shop Final Plan Review.

4. Update and review schedule monthly.

C. TYPICAL PRE-SUBMITTAL PREPARATION - Prior to a scheduled project submittal

1. Verify submittal date with Project manager.

2. Coordinate with COS staff members to be included in the review process and establish time frames for their participation.

a. Designated One Stop Shop Final Plan Review staff member and deliver any noted project particulars which deviate from design criteria or General Plan.

b. Floodplain Administrator or his designee for preliminary drainage study compliance with floodplain management policies.

c. Traffic Engineering Director or his designee for approval of traffic related deviations from Master Plan, review of signalization, striping, signing and counter loop locations.

d. Field Services for review and input on landscaping and irrigation systems.

e. Field Services for review and input on pavement, signing and striping designs.

f. Facilities Maintenance for review and input on all City maintained structures and/or equipment.

g. Water Resources if project involves any facilities, main transmission, supply or trunk lines.

h. Contact Right-of-Way Agents and City's appraiser for brief presentation at right-of-way submittal.

i. Planning as may be involved with theme districts or roadway-scaping.

D. PROJECT REVIEW PERIOD - usually two weeks from date of plan submittal to Project manager

1. Upon receipt of plans, confirm review dates with other involved COS staff and provide documents for their review and apprise them of review completion deadline.

2. Obtain design criteria from the Project Coordinator.

a. Scope of work from contract.

b. Minutes of meetings which contain design criteria determination.

3. Perform plan review for:

a. Compliance with Master Plan.

b. Compliance with plan format in accordance with the Project's Scope of Work.

c. Compliance with minimum technical requirements for particular submittal per City's criteria and applicable standard specifications and details.

d. Technical accuracy.

e. Constructability.

f. Value Engineering.

g. Right-of-way utilization.

h. Compliance with COS Codes.

4. Coordinate comments with those of City Departmental reviews.

a. Schedule a meeting to resolve any conflicts in review.

b. Arrange for any required departmental input on comments.

5. Complete CPM Review comment form and incorporate with One Stop Shop Final Plan Review's comments.

a. Add to CPM's redlines the outstanding comments from One Stop Shop Final Plan Review for a single presentation of City comments.

6. Return copy of comments to Project manager.

a. Project manager to schedule a review conference with the Consultant.

b. Coordinate with any COS staff to be present at review conference.

E. POST-REVIEW ACTIVITY

1. Attend conference with consultant and Project manager to resolve review issues.

2. File review documents.

Section 1.3

Development Process

Design Standards and Policies
Revised December 1999

Chapter 1
General Considerations

City of Scottsdale, Arizona
Design Standards and Policies Manual
Chapter 1 of 8
Section 3 of 3

SECTION 1.3
DEVELOPMENT PROCESS

Page Index

Section	Paragraph Title	Page
1-301	General Information	1
1-302	Project Review	5

Figure List

Figure	Description
1.3-1	City of Scottsdale's Development Process

Section 1.3

DEVELOPMENT PROCESS

1-301 PROCESSING AND REVIEW OF DEVELOPMENT APPLICATIONS

A. General

The City of Scottsdale's Development Process is designed to move development applications through the system, not only efficiently, but also in a way that produces the best possible product. The amount of time an application takes depends on many variable factors, including but not limited to: type of application, the calendar of the council, commission or board hearing the case, completeness of the application submittal and public involvement. Each type of case is discussed in detail below. Figure 1.3-1, provides a simplified schematic depiction of the Development Process. All development proposals shall begin with a Pre-Application Meeting. This mandatory meeting is part of the overall development process and is discussed in detail below.

1. Pre-Application Stage

Any person with a development proposal must first contact the Community Development Division either in person or by phone to obtain a Pre-Application Questionnaire and a list of required attachments. The Community Development Division is located at:

7447 East Indian School Road
Suite 105
Scottsdale, Arizona 85251
(SEC of Indian School Rd. and Civic Center Blvd.)
480-312-7000

The completed Pre-Application Questionnaire and required attachments shall be turned in at the Community Development Division front desk for processing. A Pre-Application Meeting will be scheduled with a Project Coordinator (PC) and held at the address listed above. This is the time for the applicant and his/her consultants to discuss pertinent development issues.

Following the Pre-Application Meeting, the PC will present the pre-application materials to the entire Community Development Division staff and solicit feedback on the development proposal with regard to drainage, traffic circulation, architectural design, landscaping, utilities, site planning, etc. For development proposals that require amendments to the General Plan (GP) or contain significant

issues, the pre-application materials will be presented in other regularly scheduled meetings to obtain additional feedback.

Next, the Technical Assistants (Tech Staff) will review the pre-application materials for major issues and report back to the PC with comments and questions. Finally, the PC will provide the applicant with a submittal checklist as well as all comments and concerns collected from staff.

2. Formal Application Stage

When the applicant is ready to proceed, a formal submittal is made to the One-Stop Shop (Suite 100) at the address listed above. The formal application shall contain all of the required materials indicated on the Submittal Shopping List and incorporate or otherwise address the feedback provided by staff. Incomplete or inadequate submittals shall be returned to the applicant. Before the case proceeds to a public hearing, the applicant will receive a formal response to the submittal in the form of a Staff Recommendation Report (Staff Report). The Staff Report will include a package of project stipulations and ordinance requirements that must be complied with. Project stipulations include design and construction requirements regarding water, sewer, paving, traffic, dedications, grading and planning as well as other conditions that must be met in order to proceed to the next step in the process.

It is imperative that the applicant and his/her consultants understand that the project stipulations are staff recommendations, which become development requirements after ratification by the presiding council, commission or board.

B. Zoning (ZN) and Use Permit (UP) Applications

This process begins with the Pre-Application process described above. The formal application shall:

1. demonstrate compliance with applicable codes, ordinances and policies
2. address staff comments and concerns
3. clearly define the impact that the development proposal will have on the subject site and surrounding properties.

All ZN and UP applications shall be presented to the Planning Commission and City Council for approval. Though the length of the process can vary, in general Zoning and Use Permit cases will be heard by the Planning Commission in roughly 8 weeks and by the City Council in roughly 11 weeks.

General Plan Amendments will increase the time required to process the application.

C. Preliminary Plat (PP) Applications

This process begins with the Pre-Application process described above. The formal application shall:

1. demonstrate compliance with applicable codes, ordinances, policies and previously approved master plans, and
2. address staff comments and concerns.

Chapter 6 of this Manual contains the submittal requirements for PP Applications. All PP applications shall be presented to the Development Review Board for approval. The PP

Staff Report includes project stipulations and ordinance requirements as well as the procedures for filing the Final Plat. Though the length of the process can vary, in general the Development Review Board will hear Preliminary Plat applications in roughly 8 weeks.

D. Development Review (DR) Applications

All commercial developments and some single-family developments require Development Review Board approval. This process begins with the Pre-Application process described above. The formal application shall:

1. demonstrate compliance with applicable codes, ordinances, policies and previously approved master plans, and
2. address staff comments and concerns.

Upon approval by the Development Review Board, the development proposal shall incorporate all of the requirements set forth in the Staff Report prior to submitting final improvement plans to Project Review. Though the length of the process can vary, in general the Development Review Board will hear this type of application in roughly 6 weeks.

E. Abandonment (AB) Applications

All requests to abandon public right-of-way including streets, alleys, GLO patent easements and roadway easements require Planning Commission and City Council approval. This process begins with the Pre-application submittal (See Figure 1.3-2.) The formal request shall demonstrate compliance with applicable codes, ordinances and the City of Scottsdale's General Plan. City staff may require additional information so that a proper analysis of the request can be made.

The abandonment application shall satisfy all application requirements and staff stipulations. These may also include stipulations from the Planning Commission and/or City Council hearings. These public hearings typically occur 6-8 weeks following staff review and acceptance of a completed abandonment application. The abandonment is approved upon City Council adoption of the abandonment resolution.

F. Meeting Dates

The meeting dates listed here are general and are subject to change based on specific holidays and the time of year. Contact Project Coordination for information about specific meeting dates.

City Council meets on the 1st and 3rd Tuesday of each month.

Planning Commission meets on the 2nd and 4th Wednesday of each month (following a City Council Meeting.)

Development Review Board meets on the 1st and 3rd Thursday of each month (following a City Council Meeting.)

Board of Adjustment meets on the 1st Wednesday of each month.

CITY of SCOTTSDALE'S DEVELOPMENT PROCESS

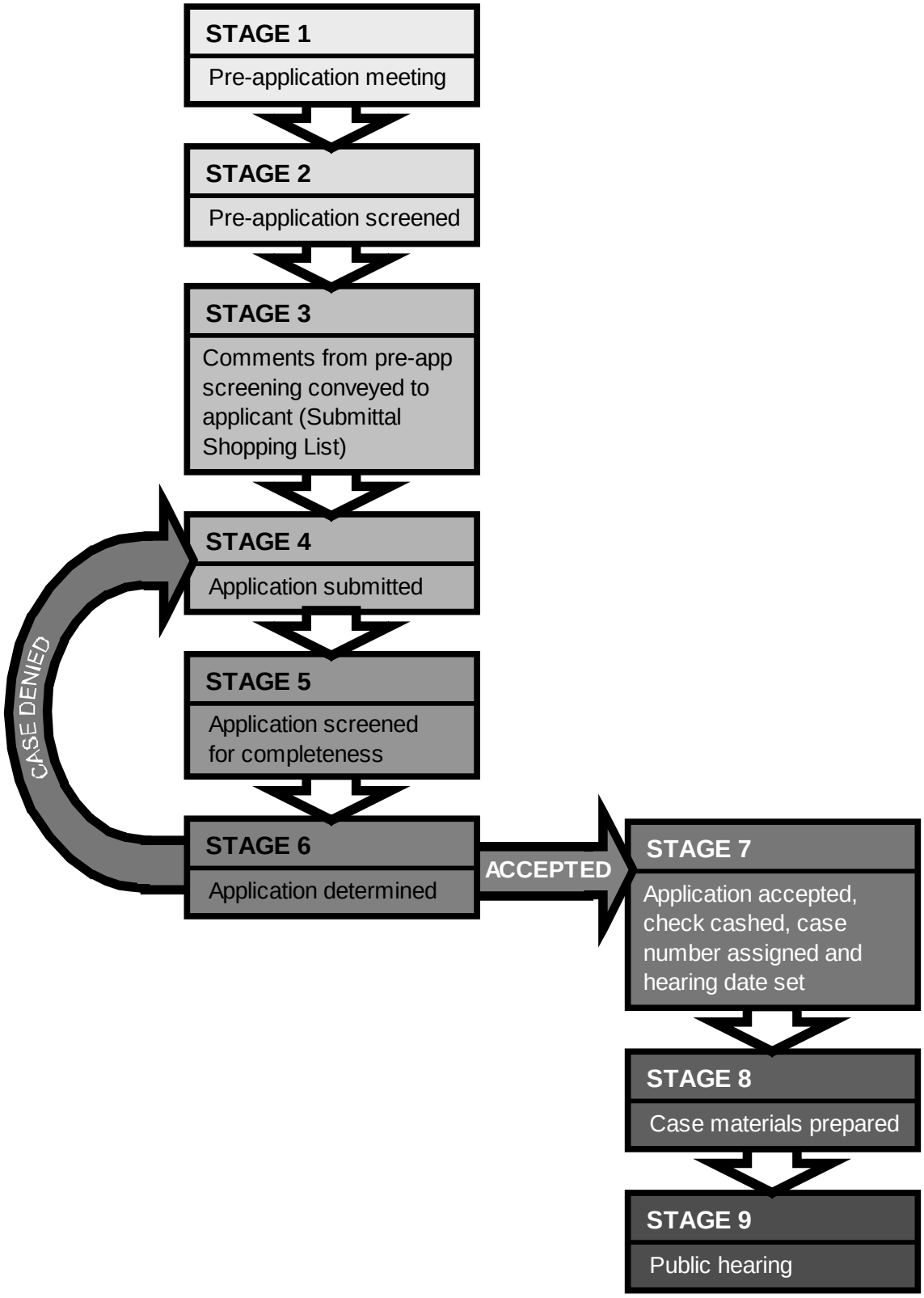


FIGURE 1.3-1

CITY of SCOTTSDALE ABANDONMENT PROCESS *

PREAPPLICATION SUBMITTAL

PREAPPLICATION FORMS ARE AVAILABLE IN THE CITY'S PROJECT REVIEW OFFICE. A $58 FEE AND THE REQUIRED INFORMATION LISTED ON THE PREAPPLICATION FORMS WILL BE COLLECTED AT THIS TIME.

PREAPPLICATION MEETING

CITY STAFF WILL CONTACT THE APPLICANT TO SCHEDULE AN INFORMATIONAL MEETING PRIOR TO SUBMITTING THE ABANDONMENT APPLICATION

SCREENING

CITY STAFF WILL REVIEW THE ABANDONMENT REQUEST IN RELATIONSHIP TO ITS IMPACT UPON ADJACENT PROPERTIES AND ITS CORRELATION TO THE CITY'S GENERAL PLAN AND ORDINANCE REQUIREMENTS. THE APPLICANT WILL BE INFORMED OF THE PERTINENT ISSUES IDENTIFIED BY STAFF. THE APPLICANT MAY SUBMIT THE ABANDONMENT APPLICATION TO THE CITY'S ONE-STOP SHOP AT THIS TIME.

APPLICATION STATUS REVIEW

CITY STAFF WILL REVIEW THE APPLICATION FOR COMPLETENESS. APPLICANT WILL BE NOTIFIED BY MAIL OF HEARING DATES. CITY STAFF MAY REQUEST ADDITIONAL ITEMS PRIOR TO SCHEDULING HEARING DATES.

ADDITIONAL REQUIREMENTS REQUESTED

CASE SCHEDULED FOR PUBLIC HEARING CYCLE

THE CASE IS ENTERED INTO A PUBLIC HEARING CYCLE. PLANNING COMMISSION AND CITY COUNCIL HEARINGS ARE TYPICALLY HELD 6 to 8 WEEKS FOLLOWING THE COMPLETION OF THE APPLICATION STATUS REVIEW.

PLANNING COMMISSION AND CITY COUNCIL HEARINGS

ABANDONMENT RESOLUTION ADOPTED AND RECORDED

STIPULATIONS TIED TO RESOLUTION ADOPTION

IN SOME CASES THE PLANNING COMMISSION OR CITY COUNCIL MAY REQUIRE THAT CERTAIN STIPULATIONS BE MET BEFORE THE ABANDONMENT RESOLUTION CAN BE ADOPTED.

FIGURE 1.3-2

1-302 Development Quality / Compliance Division Checklists

The following checklists are being provided as a guideline for those submitting final plans to the City of Scottsdale for permitting. The information contained in the following checklists is general in nature to help promote quality submittals and provide information to the public regarding general development in the City of Scottsdale. These lists are a compilation of the various requirements and policies that govern the development of any property located in a part of the City, and may or may not contain all plan review items required for your unique project. For specific information, please refer to your project's DR, PP, ZN, UP or other applicable case file, or contact your Project Coordinator.

A. General
   1. Cover Sheet Checklist
   2. Typical Sheet Checklist

B. Drainage
   1. Grading and Drainage Checklist
   2. Storm Drainage Checklist

C. Transportation
   1. Paving Checklist
   2. Signing and Pavement Marking Checklist
   3. Signalization Checklist

D. Water
   1. Potable Water Checklist
   2. Non-Potable Water Checklist

E. Wastewater
   1. Wastewater Checklist

F. Planning
   1. Final Plat Checklist
   2. Landscaping Checklist
   3. Tenant Improvement Checklist
   4. Carport Checklist

G. Other
   1. Subdivision Checklist
   2. Golf Course Checklist
   3. Commercial Checklist
   4. Stockpile Checklist

H. Single Family
   1. Single Family Checklist

I. Water or sewer reimbursements
   1. Notification form
   2. Figure 1.3.2-1 – Reimbursement checklist

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
*COVER SHEET CHECKLIST

PROJECT:
_____

CASE NUMBERS: _____ZN___ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.

Comments :

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

For cover sheet format see figure 1.1-1 of DS&PM

1. Title

2. City Name

3. Vicinity Map

4. Legal Description

5. Benchmark per 1988 NAVD datum. Information on revised datum is available on the Internet at City's website at www.ci.scottsdale.az.us or by calling the Field Engineering Dept. at 480-312-5750

6. Additional information. Include the following additional information on the cover sheet. (See Figure 1.1-1 of the DS&PM).

   a. Approval blocks for signatures. (See Figure 1.1-2)

   b. City project number/case number(PP, DR, ZN, UP) & plan check number in the right hand border.

   c. "City of Scottsdale, General Construction Notes for Public Works Construction". (see Figure 1.1-3)

   d. Sheet Index

   e. Utility system ownership's.

   f. Other agency approvals as required.

   g. Engineer, Architect, and/or developer names, contacts, addresses, and telephone/fax numbers.

   h. Provide construction quantities for all work in public rights-of-way or easements. Units to conform with those found in City Code Sec.47-100. (See Encroachment Permit Fee Sheet.)

   i. Zoning as it currently exists on the property.

   j. Legend

   k. "Blue-Stake" note

   L. Key-Map

m. Assessor's parcel number

n. Native plant plan & permit number

o. The plan review fee must be submitted with the first submittal of plans.

Amount Due: $_____

Of sheets paid for: _____

p. Required retention or detention; provided retention or detention in Cubic feet

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
*TYPICAL SHEET CHECKLIST

PROJECT:_____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.

Comments :

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

1. Each sheet in the plan set must have:

   a. Standard title blocks

   b. North arrow (up or to the right)

   c. Graphic scale (horizontal and vertical)

   d. Engineer's seal, signed and dated.

2. Match lines and sheet references must be shown on each sheet and stations if applicable.

3. Plan check number in the right-hand margin.

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
*GRADING AND DRAINAGE CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved master drainage plan? Yes ___ No ___. If yes, give name and date of approval _____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

I. GRADING AND DRAINAGE PLANS

A. GENERAL REQUIREMENTS

1. Cover sheet requirements per Cover Sheet checklist and DS&PM, Section 1-103.D.

2. Basic plan requirements per DS&PM, Section 1-102.

3. All lettering shall meet minimum requirements per DS&PM, Section 1-102.

4. Presentation of design and construction information shall be per DS&PM, Section 1-103.

5. Coordinate plans for this development with all adjacent projects, current and proposed. This includes private developments as well as COS Capital & Improvement Dist. Projects.

6. Provide refuse enclosures as stipulated

7. The grading and drainage plan must encompass the entire development. All lots, tracts and parcels must be shown in their entirety.

8. Show all existing and proposed improvements and utilities on and within 50 feet of this parcel.

9. Provide lot and/or subdivision boundary with bearings and distances.

10. Show all adjacent lots and streets, and identify them by name or number.
    -**NOTE**: The existing topography must be shown by contours. Spot elevations are required when the topography cannot be clearly defined by contours and immediately offsite adjacent to the parcel boundary.

11. Provide Easements Information: (Drainage , PUE, NAOS, Water, VNE, etc.)
    a. Show all existing & proposed tracts and easements on improvement plans.
    b. Provide Dedication documents, Title Report, & Exhibits for all proposed easements.

12. Provide horizontal control for all construction; such as building ties, parking dimensions and aisle widths.

13. Provide volume required (VR) and volume provided (VP) for each retention basin. (As-Built drawings including capacity calculations to be certified by a Registered Engineer at the completion of construction.)

14. A legend identifying the symbols and abbreviations used for the following items must be shown on the cover or detail sheet.

	EXISTING	PROPOSED
a.	Top of Curb	Top of Curb
b.	Ground Elevations	Ground Elevations
c.	Contour Lines	Contour Lines
d.	Flow Arrows	Flow Arrows
e.	Drainage Structures	Drainage Structures
f.	Grade Breaks	Grade Breaks
g.		Pad Elevation
h.		Finish Floor

15. Roadway improvements to be dimensioned per MAG Std Dtl. 112.

16. Provide driveway grades, grade breaks and widths per City standards

17. Provide sections at property lines, retaining walls and retention basins and at all proposed wash crossings.

18. Detail setback of slopes from property lines and buildings

19. Maximum and minimum slope requirements have been met.

20. Erosion protection required
    a. Dimension limits
    b. Show cut off walls
    c. Show rock class
    d. Provide grouting

21. Install fence or wall adjacent to open channel.

22. Install C.O.S. Std. Detail 2508 Handrail as req'd.
    a. At any vertical alignment > 4.0'
    b. At any vertical alignment > 2.5' within 10' of roadway or sidewalk/bikepath.

23. Show emergency overflow path for sump condition.

II. STRUCTURES

A. PAVING

1. Provide two (2) copies of a soils report that recommends construction specifications, recommended grading construction and pavement design sections for proposed roadways, parking spaces, and parking lot aisles.

2. Show all existing and proposed curb(s).
    a. Type of curb.
    b. Curb transitions.
    c. Horizontal & Vertical locations at transitions.

3. Show all existing and proposed pavement striping.

4. Provide thickened edge as req'd per MAG Std Dtl. 201, Type B.

5. Use vertical curbs in the parking area.

6. Show proposed grades.

7. Provide valley gutter

8. Show slope.

9. Identify grade breaks, warps, crests, and low points.

B. DRAINAGE

1. Show all existing structures, buildings and storm drainage facilities, surface water flow paths, storm and irrigation lines, lakes, and water features that affect this development

2. All portions of the development within the FEMA 100 year flood zones must be identified. Provide FEMA information block and statement of certification.

3. Demonstrate conformance with Floodplain and Drainage Ordinances. See Sec. 2.1 Appendix in the DS&PM.

4. Cross sections must be shown for retention basins. Maximum allowable side slope is 4:1. Maximum

allowable depth is 3.0 feet.

5. Show inundation limits of 100-year storm event at and around all entries to pipes, basins, and pavement.

6. No utility lines, fire lines, or service lines are permitted to pass under retention basins.

7. Provide sections and details for drainage swales, ditches, pipe culverts, and drop inlets.

8. Scupper and chute elevations are required.

9. Provide construction details for all retaining walls, block walls/fences, floodwalls, etc..

III. DRAINAGE REPORT

A. PRESENTATION

1. Drainage reports shall be prepared in accordance with DS&PM Section 2.2. Hydrology.
2. Provide all applicable supporting hydrology or hydraulic studies and improvement plans.

3. Provide results of percolation tests.

B. CALCULATIONS

1. Document peak flow calculations.

2. Provide street capacity calculations to ensure that the 10-year storm requirements are met for each street classification.

3. Provide calculations that ensure that the 10- year storm in street does not exceed top of curb, and that for the 100 year storm to remain in the ROW and at a maximum depth of 8" at the gutter flowline.

4. Document pipe capacity calculations.

5. Document inlet capacity calculations and flow-by calculations

6. Document hydraulic gradeline, flow rates, and velocity calculations.

7. Demonstrate compliance with FEMA, City Code and/or an approved master plan for F.F. Elevations.

8. Document Load Factors for all pipe culverts and any structures not COS, MAG, or ADOT standard details.

9. Document retaining wall structural calculations.

10. Document structural calculations for headwalls if not COS, MAG, or ADOT standard details.

11. Detention basin calculations shall demonstrate the required and provided volumes.

12. Show 100-year water surface elevation calculation.

C. EXHIBITS

1. Provide a topographic map showing contributory drainage areas, site or parcel boundary, peak flows (Q100 -existing and proposed) entering and exiting the parcel.

2. Provide an aerial photo (city quarter section aerials) showing site or parcel boundary.

3. The detailed site plan shall show limits of inundation for the 100 yr. event, including Retention/Detention basins & point(s) of storm water outflow.

IV. PERMITS

1. Provide proof of U.S. Army Corps 404 Permit and /or complete Scottsdale 404 Certification form for each project signed by the Owner or Engineer of Record.

2. Provide proof of ADEQ 401 Permit.

3. Provide copy of N.O.I.

4. Provide haul route permit.

5. Maricopa County Dust Control Permit is required

V. MISCELLANEOUS

1. Provide Storm Water Retention Waiver Form.
See DS&PM, Sec. 2.1.

2. Provide As-built Certification Form for Retention/Detention basin(s).

3. Provide In-Lieu Fee Form for Storm Drainage Facilities per DS&PM, Sec. 2.1.

4. Release or abandonment of easements.
   Fee required $_____

5. See Storm Drain Checklist

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
*STORM DRAINAGE CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved master plan? Yes ___ No ___. If yes, give name and date of approval _____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

I. STORM DRAINAGE PLANS

A. GENERAL REQUIREMENTS

1. Cover sheet requirements per cover sheet checklist, and DS&PM, Section 1-103.D.

2. Basic plan requirements met per DS&PM, Section 1-102.

3. Presentation of design and construction information shall be per DS&PM, Section 1-103.

4. All lettering shall meet minimum requirements per DS&PM, Section 1-102

5. Show existing ground surface in profile. Show existing contours and topographic features in plan view.

6. Include drainage structures with stations and offsets.

7. Show street names.

8. Provide construction details for catch basins and drainage structures other than C.O.S., M.A.G., or A.D.O.T. standard details.

9. Catch basins, inlets and outlets shall be compatible with pipe sizes.

10. Show headwall details.

11. Show collar, transition and manhole details.

12. Show design flows (discharge and velocity for 100-year event) at concentration points.

13. Show Easements: Drainage, PUE, Water, NAOS, VNAE, etc.

14. Cross reference sheet numbers to grading plan and street and utility plans.

15. Provide erosion protection.

16. Retention/Detention volume shall be provided. (As-Built drawings including capacity calculations

must be certified by an Engineer Registered in the State of Arizona at the completion of construction.)

17. Provide minimum clearance shall be provided (horizontal & vertical) from other utilities or underground structures. Utilities shown in plan and profile.

18. Exclude storm drain hardscape from calculated NAOS areas. Show adjustments on exhibit.

19. Design must conform with Floodplain and Drainage Ordinances.

20. Provide FEMA information block and statement of certification.(All portions of the development within the 100 yr. flood zones must be identified.)

21. No public utility lines, are permitted to pass under drainage basins

II. STRUCTURES

A. OPEN CHANNEL

1. Provide design/construction details and specifications for drop structures, energy dissipaters, etc.

2. Show flowlines and slope.

3. Provide typical cross sections for each channel reach.

4. Show lining material below design invert

5. Detail all transitional areas.

6. Freeboard shall be provided.

B. BOX CULVERT/BRIDGE

1. Show culvert profile with vertical alignments, stations, elevations, clearances, hydraulic gradeline, existing ground, design flow, frequency event, and headwater elevation.

2. Show culvert size, length, and material.

3. Provide trench and bedding details with reference to MAG specifications 601 as modified by COS.

4. Show proposed finished grade over culvert.

5. Provide structural calculations.

6. Provide cost estimate, certified by Civil Engineer.

7. Provide two (2) additional sets of plans for ADOT bridge maintenance program.

C. PIPE CULVERT

1. Show pipe profile with vertical alignments, stations, elevations, clearances, and hydraulic gradeline.

2. Show pipe size, length, material, class. (Minimum pipe size in R.O.W. or public facility is 18" diameter.)

3. Provide trench and bedding details with reference to MAG specifications 601 as modified by COS.

4. Call out private facilities on the plans.

D. STORM SEWER

1. Show catch basins, scuppers, inlets, and manholes with construction notes, stations, and offsets.

2. Show pipe size, length material, class. (Minimum pipe size for public facility is 18" diameter.)

3. Provide pipe profile with vertical alignments, stations, elevations, clearances, conflicts, and hydraulic gradelines. Show finish grade above pipe.

4. Manholes shall be shown in plan and profile at all junctions and bends. Spacing to be per DS&PM, Section 5.102-E.

5. Catch basins and curb inlets shall be referenced to COS, MAG, ADOT, or COP standards.

E. AT GRADE CROSSING

1. Provide flow capacity under roadway in accordance with City Code 37-42, #3.

2. Show limits of inundation of 100 yr. storm event.

3. Flow depth not exceed maximum allowable for 100 yr. storm event per City Code 37-42. Provide actual depth on plans as well as supporting calculations.

F. DRAINAGE BASINS

1. Provide drainage basin volume required (VR), volume provided (VP) on plans. (Final certification form including capacity calculations to be provided by an Engineer Registered in the State of Arizona.)

2. Demonstrate method of draining basin.

3. Provide overflow channel for drainage structures above grade.

4. Provide 3' maximum water depth.

5. Provide maximum side slope of 4:1.

6. Drainage basins to be located outside of rights-of-way and public easements.

7. Provide easement dedication, legal description, and exhibit for all ordinance basins and access to said basins.

8. Provide cross sections for clarity. See plan for location(s)

III. DRAINAGE REPORT

A. PRESENTATION

1. Drainage report preparations shall be within the guidelines of DS&PM, Section 2.2. Hydrology.

2. Reference all applicable hydrology or hydraulic studies and improvement plans.

B. CALCULATIONS

1. Show peak flow calculations.

2. Provide street capacity calculations.

3. Calculations shall demonstrate that 10- year storm in street does not exceed top of curb, and storm water runoff for 100 year storm to remain in ROW at a maximum depth of 8" above gutter flowline elevation.

4. Provide pipe capacity calculations.

5. Provide inlet capacity calculations and flow-by .calculations

6. Provide computer runs showing hydraulic gradeline, flow rates, and velocity calculations.

7. Provide floodwall structural calculations if applicable.

8. Provide structural calculations for headwalls if not C.O.S., M.A.G., or A.D.O.T. standard details.

9. Provide drainage basin calculations that demonstrate volumes required and provided.

10. Provide 100-year water surface elevation calculation.

C. EXHIBITS

1. *Provide a topographic map showing contributory drainage areas, site or parcel boundary, peak flows (Q100 -pre. and post-development) entering and exiting the parcel.*

2. Provide aerial photo (city quarter section aerials) showing site or parcel boundary.

3. Provide detailed site plan showing Q100 limits of inundation, drainage basins, and point(s) of storm water outflow.

IV. PERMITS

1. Provide proof of U.S. Army Corps 404 permit and/or complete a City of Scottsdale 404 certification form signed by the Owner or Engineer.

2. Provide an ADEQ 401 permit.

3. Provide copy of NOI.

4. Provide haul route permit.

5. Maricopa County Dust Control Permit is required

V. MISCELLANEOUS

1. Storm Drainage Waiver
   a. Provide copy of Approved Storm Drainage Waiver Form
   b. Provide copy of Approved In-Lieu Fee Calculation Sheet(See Sec 2.1)

2. Release or abandonment of easements.
   Fee required $_____

3. See Grading and Drainage Checklist

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
*PAVING CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved traffic study or master circulation plan? Yes ___ No ___. If yes, give name and date of approval
_____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

1. Cover sheet requirements per cover sheet checklist and DS&PM, Section 1-103.D.

2. Basic plan requirements met per DS&PM, Section 1-102.

3. All elevations shown on the plan must be referenced to an approved City benchmark.

4. Provide soils/pavement report indicating required pavement section.
   a. For connecting to existing streets match exist section

5. The pavement cross-section design shown on the plans must comply with City standards.

6. Typical sections for each street to be improved must be shown on the detail sheet. The sections must include the following items:
   a. Right of way width.
   b. Width of sidewalk.
   c. Width of improved surface, see the Street design manual for half street minimum width requirements.
   d. Type of curve and gutter; i.e. roll, vertical, or ribbon.
   e. Pavement cross-section. Include preservative seal coat for local and collector streets per C.O.S. Specifications 321.
   f. Minimum allowable pavement cross slope. (Inverted crowns are not allowed.)
   g. Label private streets as applicable.
   h. Label all easements.
   i. Street names.
   j. Stations.

7. Coordinate plans for this development with all adjacent projects, current and proposed. This includes private developments as well as C.O.S. Capital & Improvement Dist. Projects.

8. When bus bays or deceleration lanes are required, see the City's Street Design Manual for construction details.

9. When acceleration/deceleration lanes are required, design per DS&PM

10. The following utility reference items must be shown on each sheet:
    a. All existing utilities must be shown in plan view.
    b. All proposed utilities must be shown in plan view.
    c. Utility crossings must be shown in profile view.
    d. All manhole and valve box adjustments must be noted on the plan view.

11. The following design items must be shown on each sheet in plan view:
    a. Existing right of way, with width dimensioned.
    b. Existing pavement, with width dimensioned.
    c. Existing curbs including curb type.
    d. Existing sidewalk, with width dimensioned.
    e. Existing sidewalk ramps.
    f. Proposed right of way, with width dimensioned.
    g. Proposed pavement, with width dimensioned.
    h. Proposed curbs, with width dimensioned and reference standard detail.
    i. Proposed sidewalk, with width dimensioned and reference standard detail.
    j. Proposed sidewalk ramps.
    k. Existing items "to be protected in place or relocated" must be noted.
    l. Valley gutters at all locations that storm water will cross the street, with width and standard detail referenced.
    m. Curb transitions, with standard detail number call-out.
    n. Curb/curve data(including curb returns) per City standards.
    o. Survey monuments, with standards detail number call out.
    p. City limits where applicable.
    q. Label street names.
    r. Label streets as "public" or "private".
    s. Call out limits of construction.
    t. Show adjacent grading.
    u. Cross reference adjacent improvement plans by plan check number.
    v. "Screen in" proposed water, sewer, and storm drain facilities if applicable.
    w. Conduit crossings including traffic signal and irrigation.

12. The following design items must be shown on each sheet in profile view:
    a. Existing grade at right curb line.
    b. Existing grade at left curb line.
    c. Existing grade at centerline.
    d. Proposed grade at right curb line.
    e. Proposed grade at left curb line.
    f. Proposed grade at centerline.
    g. Proposed crown transitions at intersections.
    i. The proposed longitudinal grades must be labeled. Longitudinal grades on curves shall be computed based on their true lengths. The longitudinal grades shall comply with city standards, 0.4% minimum.
    j. Storm drain crossings.
    k. Utility and other crossings.
    l. Scupper/curb-cuts with station.
    m. Lowpoints with station.

13. The following geometric design data must be shown on each sheet and must be in conformance with City standards:

a. Station and sheet reference at all match lines in plan or profile.
b. Centerline data.
c. Station all changes in street alignment and all proposed improvements.
d. Gutter and centerline spot elevations at all grade breaks.
e. Gutter spot elevations at all intersections.
f. Centerline spot elevations at all intersections.
g. Show grade breaks in plan.
h. Tangent lengths between curves.
i. Tangent lengths at intersections.
j. Pavement tapers.
k. Intersection angles.
l. Vertical curve lengths.
m. Maximum longitudinal slope changes.
n. Barrier median construction.
o. Driveway type and station.

14. Provide sufficient existing off-site contours and spot elevations required to determine grade and direction of slope.

15. An easement or right-of-way dedication is required by one of the following:
    a. Plat.
    b. Map of Dedication
    c. Separate Instrument.
        i. Dedication Form
        ii. Legal Description & Exhibit
        iii. Title Report (6 months or less)
        iv. Copy of Plat or M.O.D. as required.

16. Provide barricades when applicable.

17. Release or abandonment of easements.

Fee required $_____

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
* SIGNING AND PAVEMENT MARKING CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Scottsdale Revised Code The Manual on Uniform Traffic Control Devices, and A.D.O.T. Standard drawings and Specifications for Traffic Signals and Lighting. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved traffic study? Yes ___ No ___. If yes, give name and date of approval _____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

1. Conform to current "Manual on Uniform Traffic Control Devices".

2. Show existing and proposed pavement markings & signing for dedicated lane movements.

3. Show appropriate regulatory and warning signs.

4. Show appropriate channelizing markings & signs.

5. Show stop signs.

6. Show no parking signs (arterial & collector streets).

7. The following traffic engineering items must be shown in plan view:
   a. Street sign bases.
   b. Traffic control devices.
      1. Stop sign = MUTCD R1-1, 30"x 30".
      2. Speed limit = MUTCD R2-1, 24" X 30", speed per street class.
   c. Temporary turn-arounds at dead-ends streets and at phase lines.
   d. Barricades with 9 red prismatic reflectors on red sheeting MUTCD MI-9R each 10'-12' or barricade is required.
   e. Signing and striping plans for arterials and or special conditions.

8. See stipulations for project specific requirements on pavement marking and striping.

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
*SIGNALIZATION CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Scottsdale Revised Code, Manual on Uniform Traffic Control Devices and A.D.O.T. Standard Drawings and Specifications for Traffic Signals and Lighting. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved traffic impact study? Yes ___ No ___. If yes, give name and date of approval _____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

1. When required, cover sheet requirements to be per cover sheet checklist and DS&PM, Section 1-103.D.

2. Basic plan requirements met per DS&PM, Section 1-102.

3. Contact Traffic Engineering & Project Review to clarify "Signal Operation & Design Requirements".

4. Plan format shall conform to DS&PM, Chapter 3, Section 3.2 - "Standard Traffic Signal Plan."

5. Use A.D.O.T drafting symbols for traffic signal preparation.

6. Include Traffic Signal Notes

7. Locate and identify ALL existing and proposed improvements, above and below ground, within 200' of intersection.

8. Locate all existing and/or proposed pavement marking and signing, include "turn-arrows" for dedicated turn lanes.

9. Locate existing vegetation (trees, etc...) which could impact required signal visibility distances.

10. Provide a "profile layout" where vertical roadway alignments may impact traffic signal visibility requirements (1"=40' scale is acceptable).

11. Install Vehicle-Count Detectors when and where required by Traffic Engineering.

12. Provide bearings for EACH leg of the intersection when deflection is greater than 2o (from 180o or 90o).

13. All traffic signal poles, conduits, and equipment must be located within public right-of-way or easement.

14. Controller and cabinet must be type 170 system with type 330 cabinet.

15. Electric service(meter) cabinet to be MYERS, MEUGL - 100TB(dual) or A.P.S./S.R.P. approved equivalent.

16. Locate signal poles, controller cabinet, electric service cabinet, and telco-intertie by station and offset dimension.

17. Provide address for electric service (meter) cabinet, available through City Records Dept.

18. One traffic signal pole per corner, unless geometrics or other considerations necessitate installation of an additional pole.

19. Provide intertie from Telco-phone-closure (20-gauge, 3 pair communication cable).

20. Provide Emergency Vehicle Signal Pre-emption, using 3M Opticom optical detectors and model 138 detector cable or City approved equivalent.

21. Locate and specify source of electric service.

22. Provide phasing diagrams for initial signal operation and 8f operation, unless otherwise directed by Traffic Engineering.

23. Conductor-schedule shall conform to note 21.

24. Install luminaries on mast arm poles, wherever overhead clearances meet or exceed utility company requirements.

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
*POTABLE WATER CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved water master plan? Yes ___ No ___. If yes, give name and date of approval _____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

1. Cover sheet requirements per cover sheet checklist and DS&M, Section 1-103.D.

2. Basic plan requirements met per DS&PM, Section 1-102.

3. The cover sheet shall have the statement: "Use Mega-Lug restraining joints or COS approved equal at all deflections, bends, tees, crosses, valves and dead-end lines."

4. Acquire Maricopa County Health Department approval and signature.

5. All elevations shown on the plans must be referenced to an approved City of Scottsdale benchmark.(NAV 1988 only) . Provide certification Statement for benchmark adequacy from Registered Engineer.

6. Coordinate plans for this development with all adjacent projects, current and proposed. This includes private developments as well as COS Capital & Improvement District Projects.

7. A portion of the improvements is shown within another jurisdiction. Coordinate and acquire the appropriate permits from said jurisdiction. Indicate the permit number on the cover sheet.

8. A service tap detail is required showing the following items:
   a. Station location of water service.
   b. Minimum 6-foot separation between water and sewer taps.
   c. Standard detail number
   d. Station location of backflow prevention device.
   e. Water meter box to be located at the BACK of the PUE

9. The water line sizes and location must conform to the City's Water Master Plan and to the approved Subdivision Master plan.

10. Show all existing water lines and nearest fire hydrants. Waterlines are required along all frontages

11. Provide station and offsets for all utilities.

12. No public utility lines are permitted to pass under drainage basins.

13. Water lines must be installed in standard horizontal locations, see the DS&PM.
    a. Call out min. vertical clearances for utility crossings in profile.
    b. Provide min. cover per COS standards.

14. Waterline materials shall conform to current COS MAG Supplemental Std Details & Specifications and with the DS&PM.

15. Provide waterline stub-outs for all adjacent properties.

16. All dip sections must be shown in profile view and must conform to COS Supplements to MAG.

17. Reference standard detail for pipe encasement when applicable.

18. Dead-end lines shall be extended beyond paved surfaces and equipped with a curb stop per COS Std. Dtl. 2390-B.

19. Valve locations must comply with DS&PM, Section 4-102.B.

20. Fire hydrant installations must comply with Rural/Metro stipulations & DS&PM requirements.

21. Provide pressure certification & flow test information on cover sheet.

22. Provide PRV detail (to be reviewed by Water Operations). Provide Engineer sealed cost estimate for PRV valve.

23. Provide Booster Pump Station plans designed in accordance with COS standards. (To be reviewed by Water Operations).

24. Provide Waterline Easements.

25. Profile lines 12" and larger.

26. Provide Maintenance and Repair Accessibility.

27. Call-out water utility provider if other than COS.

28. Provide material specifications.

29. Provide electronic locators.

30. D.I.P. required under pavement, concrete/hardscape areas, or when the waterline is not located within the roadway prism

31. Provide special details.

32. Complete Waterline Payback application (OPTIONAL)
    a. Provide Waterline Payback Waiver Form.
       (SEE FIGURES 1.3-1& 1.3-2)

33. Pay amount specified by Waterline Payback #_____.

34. In-Lieu Fee payment required.

35. Per each 300 units or a portion thereof, provide one Water Sampling Station per Sec 4.1.

36. Release or abandonment of easements.
Fee required $_____

37. Provide a drainage report indicating the 100 year storm Q and the velocities over the proposed new pipe installations. If the flow is over 50 CFS , provide 6-foot minimum cover under the wash crossing using a Standard C.O.S. dip crossing. If the flow is Over 600 CFS, provide a scour analysis for the wash crossing. The minimum depth Of cover over the pipe would be the scour depth plus three feet.

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
*NON-POTABLE WATER CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved reclaimed water master plan? Yes ___ No ___. If yes, give name and date of approval
_____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

1. Cover sheet requirements per cover sheet checklist and DS&PM, Section 1-103.D.

2. Basic plan requirements met per DS&PM, Section 1-102.

3. Acquire Maricopa County Health Department approval and signature.

4. Provide documentation of "right-to-connect."

5. All elevations shown on the plans must be referenced to an approved City of Scottsdale benchmark.

6. Coordinate plans for this development with all adjacent projects, current and proposed. This includes private developments as well as COS Capital & Improvement District Projects.

7. A portion of the improvements shown within another jurisdiction. Acquire the appropriate permits. Indicate the permit number on the cover sheet.

8. Minimum 6-foot separation between water and sewer taps.

9. Provide Air-Gap detail separating non-potable and potable water.

10. Non-potable water line sizes must conform to the approved City's Master Plan.

11. Provide station and offsets for all utilities.

12. No non-potable water lines are to pass under drainage basins. This does not apply to irrigation lines downstream of the backflow prevention.

13. Non-potable water lines must be dimensioned from the street centerline.

14. Non-potable water lines must be installed in standard horizontal locations, see DS&PM.
    a. Call out min. vertical clearances for utility crossings in profile.
    b. Provide min. cover per COS standards.

15. Provide connections for non-potable water. All connections to non-potable water shall have stationing.

16. All dip sections must be shown in profile view and must conform to COS supplements to MAG.

17. Reference standard detail for pipe encasement when applicable.

18. All non-potable water line covers and lids to be labeled "Non-Potable Water".

19. Dead-end lines shall be extended beyond paved surfaces and be equipped with a corp. stop per COS Standard Detail 2390-B.

20. Valve locations must comply with DS&PM, Section 4-102.B.

21. Provide PRV detail as necessary.(to be reviewed by Water Operations) Provide Engineer sealed cost estimate for PRV valve.

22. Provide Booster Pump Station plans designed in accordance with COS standards. (To be reviewed by Water Operations).

23. Provide non-potable waterline easements as required.

24. Profile lines 12" and larger.

25. Provide Maintenance and Repair Accessibility.

26. Provide material specifications.

27. Provide longitudinal locator tape.

28. Provide electronic locators.

29. D.I.P. required under pavement, concrete/hardscape areas, or when the waterline is not located within the roadway prism.

30. Provide special details.

31. Complete Waterline Payback application (OPTIONAL)
    a. Provide Waterline Payback Waiver Form. (SEE FIGURES 1.3-1 & 1.3-2)

32. Pay amount specified by Waterline Payback. #_____.

33. In-Lieu Fee payment required.

34. Per each 300 units or a portion thereof, provide one Water Sampling Station per Sec 4.1.

35. Release or abandonment of easements.
    Fee required $_____

36. Provide a drainage report indicating the 100 year storm Q and the velocities over the proposed new pipe installations. If the flow is over 50 CFS, provide 6-foot minimum

cover under the wash crossing using a Standard C.O.S. dip crossing. If the flow is over 600 CFS, provide a scour analysis for the wash crossing. The minimum depth of cover over the pipe would be the scour depth plus three feet.

CITY OF SCOTTSDALE
DEVELOPMENT QUALITY / COMPLIANCE DIVISION
*WASTEWATER CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved wastewater master plan? Yes ___ No ___. If yes, give name and date of approval
_____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

I. WASTEWATER PLANS

A. GENERAL REQUIREMENTS

1. Cover sheet requirements per cover sheet checklist and DS&PM, Section 1-103.D.

2. Basic plans requirements met Per Section 1-102.D of DS&PM

3. Acquire Maricopa County Health Department approval and signature.

4. The following City standard notes must be shown, or corrected, on the cover or detail sheet:
   a. General notes

5. All elevations shown on the plans must be referenced to an approved City benchmark.(NAV 1988)

6. Coordinate plans for this development with all adjacent projects, current and proposed. This includes private developments as well as COS Capital & Improvement District Projects.

7. A portion of the improvements shown is within another jurisdiction. Coordinate and acquire the appropriate permits from said jurisdiction. Indicate the permit number on the cover sheet. NOTE: Provide a Monitoring Manhole at all entrances into COS system

8. Provide service to all lots/ parcels / tracts. Provide stationing for all services.

9. Minimum 6-foot horizontal separation between water and wastewater taps.

10. The wastewater line sizes must conform to the City's Wastewater Master Plan, for both size and depth.

11. Wastewater lines must conform to the approved development Wastewater Master Plan for both size and depth.

12. All existing wastewater lines being tied into must be shown in both plan and profile views.

13. All proposed wastewater lines must be shown in both plan and profile views.

14. Match lines and sheet references must be shown on each sheet and stations if applicable.

15. Dimensional ties must be provided for all existing wastewater lines being tied into. This requirement is usually satisfied by providing both a station number and a dimensional tie to the street centerline.

16. Wastewater lines shall be installed in standard horizontal locations, see DS&PM.

17. A Monitoring Manhole shall be provided on the sewer lateral. (AS APPLICABLE)

18. A Grease and Oil Interceptor shall be provided on the sewer lateral. (AS APPLICABLE)

19. The following items must be noted on the plans:
    a. Rim elevations on existing manholes.
    b. Rim elevations on proposed manholes.
    c. Invert elevations on existing manholes.
    d. Invert elevations on proposed manholes.
    e. Station numbers on existing manholes.
    f. Station numbers on proposed manholes.
    g. Offset from the street centerline to existing manholes.
    h. Offset from the street centerline to proposed manholes.
    i. Distance between manholes and/or cleanouts.
    j. Provide sequential numbering for all manholes and cleanouts.
    k. Standard detail numbers for manholes and cleanouts.
    l. Bearings on street centerlines.

20. The minimum allowable cover for a wastewater line is 4 feet.

21. Manhole and cover sizes must conform to MAG, COS, and the following standards and specifications:
    a. Invert depth 10 feet or less: 4 feet diameter manholes with 24-inch diameter covers.
    b. Invert depth greater than 10 feet: 5 feet diameter manholes with 30-inch diameter covers.

22. Bedding shall be in conformance with MAG and COS standards and specifications.

23. The wastewater line slope must be shown and must meet minimum velocity, see DS&PM.

24. Changes in slope or alignment are permitted only at manholes.

25. The maximum distances between manholes and manholes/ cleanouts must comply with the following:
    a. 15" line size or less-Manhole spacing at 500'.
    b. 18" to 30"line size-Manhole spacing at 600'.
    c. 36" to 60" line size-Manhole spacing at 800'.
    d. 60" or greater line size-Manhole spacing at 1300'.

26. All existing or proposed utility crossings must be shown in both plan and profile views. This includes water, sewer, telephone, electric, and any other buried utility lines. Minimum clearances shall be called out at all crossings.

27. Encasement shall be required, as applicable, see MAG standard detail 404.

28. All abandoned wastewater service lines must be capped.

29. A wastewater service line shall be provided for each lot with stationing.

30. A wastewater stub-out must be shown at each manhole adjacent to undeveloped property, unless otherwise justified. Wastewater stub-outs must be shown for all adjacent undeveloped property, unless otherwise justified. Wastewater stub-outs must also be provided for all major parcels within, or adjacent to, the development. Provide wastewater stub-outs for all potential extensions of system.

31. Provide a manhole service tap detail on the cover or detail sheet. A maximum of 4 wastewater laterals per manhole is permitted.

32. An easement or right-of-way dedication is required by separate instrument. Please provide the following exhibits and/or information as applicable with the completed dedication form:
    a. Subdivision name.
    b. Type of easement/right-of-way.
    c. Legal description and exhibit with RLS certification.
    d. Exhibit showing the easement/right-of-way alignment with dimensions and bearings, true point of beginning, section, township, and range.
    e. Current title report.
    f. Recording Fee? $_____

33. Provide Maintenance and Repair Accessibility.

34. Lift Station and Force Main with Maintenance Statement Reviewed by Water Ops.

a. Public lift stations and force mains shall be designed in accordance with most current water resources standards and requirements.
b. Private lift stations and force mains shall be maintained by a Home Owners Association as stated on the final plat
c. Label liftstations and force mains as public or private and indicate who is responsible for maintenance.
d. Indicate size and material of force main.

35. Provide Material Specifications.

36. Provide Special Details Required.

37. Complete Wastewater Line Payback application. (OPTIONAL)
    a. Provide Wastewater Line Payback Waiver Form
       (SEE FIGURES 1.3-1 & 1.3-2)

38. Pay amount specified by Payback #_____-

39. Release or abandonment of easements.
    Fee required $_____

40. Provide a drainage report indicating the 100-year storm Q and the velocities over the proposed new pipe installations. If the flow is over 50 CFS, provide 6 foot minimum cover under the wash crossing using a Standard C.O.S. dip crossing. If the flow is over 600 CFS, provide a scour analysis for the wash crossing. The minimum depth of cover over the pipe would be the scour depth plus three feet.

1-302.F.1 – Final Plat Checklist

Plats shall comply with Section 6.1 "Subdivision Plats" of the City's
Design Standards and Policies Manual

A. COVER SHEET

1. Civil
   a. Vicinity Map.
   b. Legal Description and Township/Range.
   c. Dedication language and ratification.
   d. Notary Acknowledgement.
   e. Signature block form.
   f. Proper signatures.
   g. Warranty note.
   h. Airport Proximity notes.
   i. Assured Water Supply notes.

2. Planning
   a. Zoning
   b. Subdivision name
   c. Gross area of subdivision, minimum and average lot size
   d. Typical lot setbacks discouraged; if necessary, absolute accuracy.
   e. NAOS and/or HC dedication language.
   f. Legend or Key of Abbreviations (Completeness).

B. GENERAL

1. Civil
   a. Conformance with preliminary plat stipulations.
   b. Scale: 1" = 100' or 1" = 50', if less than 10 acres.
   c. Sheet size 24" x 36".
   d. Seal and signature of state registered Engineer/Surveyor, including standard note.
   e. Subdivision ties to fractional corners.
   f. Exception areas labeled "Not part of this plat".
   g. All existing dedications and easements labeled with Maricopa County Recorder's Book-Page and Docket No.
   h. All adjacent dedications labeled and identified.
   i. Street names shall conform to MAG Standards.

2. Planning
   a. Conformance with preliminary plat and zoning stipulations.
   b. Conformance with the approved preliminary plat layout.
   c. Property lines and dimensions of all areas.
   d. Lot area and width complies with development standards.
   e. All lots shall have legal access.

C. IDENTIFY ON PLAT

1. Civil
   a. Right-of-way lines.
   b. Bearings and distances of all property lines and street courses.
   c. Width/dimensions of all streets, alleys, easements, etc.
   d. Points of tangencies, central angles of all curvilinear streets, and radius of all rounded street line intersections.
   e. Note maintenance responsibilities of all tracts and easements.
   f. Lots numbered in consecutive order.
   g. Corners set or found.
   h. NOTE: Construction within public utility easements shall be limited to wood, wire, or removable section type fencing.

2. Planning
   a. The use and maintenance of tracts and any land not used for residential lots.
   b. Required trail easements.
   c. Required site distance easements at intersections.
   d. NOTE: homeowners Association responsible for maintenance of exterior perimeter walls.

D. SUPPLEMENTAL REQUIRED INFORMATION

1. Civil
   a. Title Report.
   b. Results of Survey.
   c. Resolutions/partnership exhibits.
   d. Streetlight Improvement District layout.
   e. Streetlight Improvement District petition.
   f. PMT (Photo-Mylar Transparency) on 8.5" x 11".

2. Planning
   a. Detailed NAOS calculations and exhibit on separate sheet (24”x36”.)
   b. List of area amounts in lots and tracts minus NAOS on 8.5" x 11".
   c. Table of on-lot NAOS requirements on 8.5" x 11", if applicable.

1-302.F.2 – Landscaping Checklist

1. Comply with the applicable Zoning, Preliminary Plat, Development Review Board, Use Permit, and/or Staff Approval stipulations.

2. Comply with the requirements of Article 10 of the Landscape Ordinance.

3. Submit on 24"x36" sheet.

4. Minimum 12 pt. type.

5. Note on plans in the bottom right corner all applicable case application numbers. (I.e.: Development Review, Use Permit, Staff Approval, plan check number.)

6. Note native plant permit number and native plant case file number.

7. City of Scottsdale Landscape Approval block (see Figure 1.1-4.)

8. City of Scottsdale Landscape Maintenance block (see Figure 1.1-5.)

9. Plant palette (type, size, and quantities).

10. Retention/Detention basin depth shall be measured to top of existing slope. Maximum 3-foot water depth is allowed. Greater depth shall require Community Development Division staff approval.

11. Maximum 10:1 width to depth ratio with a 4:1 maximum slope for retention/detention basins. Depth ratios and slopes greater than this require Community Development Division staff approval.

12. Perimeter wall elevations depicting height, color, and material type of walls. Walls shall be 6" or 8" masonry block and shall match building texture and color, both sides.

13. Provide sign elevations as approved by the Development Review Board. Add note: “SIGNS REQUIRE SEPARATE PERMIT AND APPROVAL.”

14. Show location of landscape lighting and provide details on plans.

15. All plant materials in the public right-of-way shall be on the Arizona Department of Water Resources low water plant list for the

Phoenix Active Management Area (AMA). No turf is allowed in public rights-of-way.

16. Areas of decomposed granite without plant materials/groundcovers shall not exceed 7 feet in any direction, measured between plant canopies and/or coverage.

17. Sight distance triangles shall be shown on landscape plans where driveways intersect public right-of-ways. Area within the safety triangle shall be clear of landscaping, signs or other visibility obstructions with a height greater than 2 feet. Trees within the safety triangle shall have a canopy of not less than 7 feet in height at the time of installations. All heights are measured from nearest street line elevation.

18. Show paths designed per Section 3.4 of the City of Scottsdale Design Standards and Policies Manual.

19. Show trail improvements designed per Section 7.3 of the City of Scottsdale Design Standards and Policies Manual.

20. Show all proposed Natural Area Open Space areas.

21. Provide 8% slope away from walk or curb for 5'-0" along all streets.

22. Setback all spray and stream type irrigation heads 1'0" from back of curb or sidewalk to reduce overspray, or provide design alternatives to achieve similar results to be approved by Development Quality / Compliance Division staff.

23. Identify location of reduced pressure backflow preventor and provide method for screening the device. Verify compliance of backflow device to City of Scottsdale Standard Detail 2354.

24. If applicable, provide temporary irrigation methodology for revegetated Natural Area Open Space.

1-302.F.3 – Tenant Improvement Checklist

1. Comply with the applicable Zoning, Development Review Board, Use Permit and/or Staff Approval stipulations.

2. Note the current zoning of the property.

3. Provide a vicinity map.

4. Note the previous and proposed use of the facility. If the proposed use is a conditional use, acquire a Use Permit prior to submittal of construction documents. Note the “UP” case number on the plans.

5. Note in the bottom right corner all applicable application numbers. (i.e.: Development Review, Use Permit, Staff Approval).

6. Provide parking calculations, required and provided. Indicate if project is located within a parking district or parking master plan. Parking calculations shall include number of handicap stalls and note the number of van accessible stalls.

7. All exterior mechanical and communications equipment shall be screened from offsite viewing. Ground mounted equipment, including communications equipment shall be screened a minimum of 1'- 0" above the top of the highest point of the equipment. Roof mounted equipment shall be located within roof structure or behind parapet wall at least equal in height to the top of the equipment. Material and colors of screening material shall be compatible with the building. Plans should indicate the method of screening described above.

8. Tenant improvements usually do not include exterior modifications, with some exceptions. If exterior modifications are proposed, Staff Approval or Development Review approval is required. Provide documentation and case numbers.

1-302.F.4 – Carport Checklist

1. Comply with applicable zoning, Development Review Board, and/or Staff Approval stipulations.

2. Vicinity Map.

3. Note setback of carports from structures and property lines. Carports shall have a minimum setback of 3'- 0" from the property line.

4. Carports shall be a minimum of 6'-0" from any other structure including buildings, other carports, and stairwells.

5. Roof decks shall be non-reflective and pre-finished. They shall have a minimum 4" facia on all sides.

6. Colors shall be compatible with the building.

7. Light plans/cut sheets are required. Lighting fixtures are to be fully recessed under the fascia of the canopy roof.

CITY OF SCOTTSDALE
PLANNING AND DEVELOPMENT DEPARTMENT
*SUBDIVISION CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Are there approved master plans? Yes ___ No ___. If yes, give name and date of approval _____.
Is construction going to be phased? Yes ____ No ____.
Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

1. Cover sheet requirements per cover sheet checklist and DS&PM, Section 1-103.D.

2. Basic plan requirements met per DS&PM, Section 1-102.

3. A complete submittal of improvements is required including:
   a. Grading and Drainage
   b. Water
   c. Wastewater
   d. Paving
   e. Traffic
   f. Landscape
   g. Final Plat
      NOTE: See Development Review shopping list for this project.

4. The development is adjacent to a current City Project/Improvement District. Coordinate your plans with the City Project/Improvement District.

5. Portions of the improvements shown are within another jurisdiction. Coordinate and acquire the appropriate permits from said jurisdiction. Indicate the permit number on the cover sheet.

6. The development is within a proposed freeway corridor. Please coordinate the development with ADOT.

7. All dedications must be shown on the improvement plans. (R.O.W., Tracts, & Easements.)

8. A request for abandonment of existing easements and R.O.W. must be approved by Project Review. Submit Application, Utility Release of Easement form, and Legal Descriptions and Exhibits

9. All overhead utility lines must be placed underground.

10. Request for phasing shall be made in writing and shall include detailed phasing information, proposed timing of phased improvements, and any interim measures required.

11. The following requirements apply to the proposed phasing:
    a. Any proposed phasing of construction improvements shall require the approval of the Engineering Coordination Manager.
    b. All required off-site improvements should be constructed with Phase I. Deferral may require agreements and financial assurance.
    c. Interim conditions shall be designed for each phase.
    d. 100yr. access must be maintained to all phases of the development at all times.
    e. A temporary turnaround is required. It must comply with Rural Metro requirements.
    f. The wastewater system must be adequate to serve each phase.

g. The water system must be looped with each phase.
h. If a model home phase is planned, it must be identified as the first phase.

12. Improvement plans must conform to the following:
    a. ZN case stipulations.
    b. PP " " .
    c. DR " " .
    d. Final Plat requirements:
        i. The Final Plat shall be submitted with improvement plan submittal
        ii. Improvement plans must be submitted prior to Final Plat being scheduled for Council Action.
        iii. Improvement plans must be approved prior to Final Plat recordation.
    e. Master Plans:
        i. Drainage.
        ii. Water.
        iii. Wastewater.
        iv. Circulation.

    f. Other Checklists:
        i. Grading and Drainage.
        ii. Paving.
        iii. Signing and Pavement Marking.
        iv. Water(Potable and Non-Potable).
        v. Other:

        _____

        _____

        _____

        _____

        _____

13. Add the following note to the cover sheet & Grading and Drainage plans.:
    a. Pre-engineered lots with Standard House Plans.
    b. Custom homes on custom lots.
    c. Custom homes on pre-engineered lots.

14. The maintenance of landscaping within the public right-of-way shall be the responsibility of the adjacent lot owner or the Homeowners Association and shall be stated as such on the Final Plat.

15. The maintenance of retention basins shall be the responsibility of the Homeowners Association and shall be dedicated as such on the Final Plat.

CITY OF SCOTTSDALE
PLANNING AND DEVELOPMENT DEPARTMENT
*GOLF COURSE CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved master community or drainage plan? Yes ___ No ___. If yes, give name and date of approval
_____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

I. GOLF COURSE PLANS

A. ENGINEERING REQUIREMENTS

1. Cover sheet requirements per cover sheet checklist DS&PM, Section 1-301.D

2. Basic plan requirements met per DS&PM, Section 1-102.

3. Presentation of design and construction information shall be per DS&PM, Section 1-103.

4. All lettering shall meet minimum requirements per DS&PM, Section 1-102.

5. Scale shall be a 1"= 100' scale minimum unless approved in advance and shall be governed by the legibility of reduced plan sets. Any areas that require more detail shall be presented at a size where detail is adequately expressed.

6. Horizontal boundary control shall be provided

7. Q100 flows that enter and exit the golf course will be identified and shall show limits of high water elevation and the pre and post development flows.

8. A drainage report shall provide hydrologic and hydraulic information in support of the plans, provide retention calculations, size facilities, etc.

9. All retention basins shall be contained within drainage easements.

10. All water and sewer utility crossings shall be contained within water and/or sewer easements, which shall be 20' min. width.

11. Irrigation, electrical or other conduits crossing private or public ROW will cause the agreement called "Private facilities in public ROW" to be required with legal descriptions, Exhibits, and other documentation as needed.

    A Map of Dedication shall be required to dedicate all proposed easements and maintenance responsibilities. These could include, blanket drainage easements, scenic corridors, NAOS, utility easements, perimeter wall easements, retention basin easements, slope easements, public trails/multi-use trail easements, etc.

13. Internal localized golf course drainage facilities shall be maintained by the Golf Course and do not need to be shown in detail on the grade plans.

14. Show all adjacent parcel names and land uses. Show all ROW or adjacent street improvements, existing utilities, or other adjacent information.

15. Rectified aerial photos will be required by the City at project completion and prior to final Certificate of Occupancy. Verification (as-building) is required to verify all NAOS calculations, turf areas, retention basin sizing, and other calculated variables which may have been field revised. See Section III of this checklist for As-built requirements.

II. PLANNING REQUIREMENTS

A. NAOS AREAS

1. A Native Plant Permit is required in ESL areas. A plant inventory shall be provided for review by Project Review. A field inspector will be scheduled to walk the site to review the native plants.

2. An NAOS exhibit shall be made a part of the grading plan.

3. Rectified aerial photos will be required by the City at project completion and prior to the issuance of a Certificate of Occupancy (C. of O.). Verification (as-building) is required for all NAOS calculations, turf amounts, retention basin sizing, and other calculated variables which may have been field revised.

4. An NAOS letter stating the means of protection for NAOS areas will be submitted prior to construction.

5. Irrigation and landscape plan submittals are required.

III. AS-BUILT PLANNING REQUIREMENTS

1. Provide one set of bluelines of the rectified aerial photographs of the finished course.

2. Provide two sets of bluelines that show as-built area calculations for NAOS, revegetated areas and turf/hardscaping. In addition, depict revegetated areas versus undisturbed NAOS with the deletion of all hardscaping elements.

3. Have a Final Inspection with your Native Plant Inspector to sign off on the project and contact Planning to release the golf course.

4. Walk the site with the Project Coordinator to go over field changes and final configurations.

. AS-BUILT ENGINEERING REQUIREMENTS

1. The engineer shall certify that:
   a) The As-Builts represent the final field condition and have been field verified.

b) All utilities are located within dedicated Public Utility or sewer/water easements.
c) All retention basins are within dedicated drainage easements.
d) All drainage concepts and assumptions have not changed from the original approval and are in conformance with all state and local agency requirements.
e) The total retention requirements have met or that they exceed requirements from the approved master plan and/or the originally approved plan set.
f) Final map of dedication or dedications is corrected and in final form and recorded prior to final Certificate of Occupancy (C of O) release.

2. The engineer has signed and stamped all certifications.
   a.) If in any case, any of the above are not certifiable, revisions must be made accordingly to the plats, MOD, and/or separate instruments so they are in conformance and to correct for all field changes.
   b.) When all items have been completed, Final Plans will send a memo to Inspection Services and the Golf Course will be released for operation.

CITY OF SCOTTSDALE
PLANNING AND DEVELOPMENT DEPARTMENT
*COMMERCIAL CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved master plan or plat? Yes ___ No ___. If yes, give name and date of approval _____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

1. See Cover Sheet Checklist.

2. See Typical Sheet Checklist.

3. See Grading and Drainage Checklist.

4. See Storm Drainage Checklist.

5. See Paving Checklist.

6. See Signing and Pavement Marking Checklist.

7. See Signalization Checklist.

8. See Potable Water Checklist.

9. See Non-potable Water Checklist.

10. See Wastewater Checklist.

11. See Landscape Checklist.

12. See Waste Management Checklist.

13. Provide the location on the civil drawings of all large transformers Locations, cable boxes, gas services and electrical service lines. These facilities should not interfere with any onsite retention/detention basins, landscape requirements and calculations or NAOS areas. Clearly leave 2' construction space around the transformer pads for disturbance. Clearly indicate trench widths and disturbed areas in NAOS.

14. UNDERGROUND STORAGE
    a. Provide underground stormwater storage tank approvals and paperwork at first submittal to project review.
    b. Provide oil and sand separator prior to storage tank discharge.
    c. Post signage indicating "Underground Storm Water Storage Tanks" at the installation location.
    d. Provide access Manhole to underground storage tank via easement or grading.
    e. Provide wet well pump detail and specifications on the plans.

CITY OF SCOTTSDALE
PLANNING AND DEVELOPMENT DEPARTMENT
*STOCKPILE CHECKLIST

PROJECT: _____

CASE NUMBERS: _____ZN____ _____PP___ _____DR___ _____ E___

1- REQUIREMENT SATISFIED
0 - REQUIREMENT NOT SATISFIED
? - STATUS NOT DETERMINED
+ - MORE INFORMATION REQUIRED
X - NOT APPLICABLE

1_____ **Date** _____

2_____ **Date** _____

3_____ **Date** _____

4_____ **Date** _____

* The requirements can be found in the above case numbers, the Design Standards and Policies Manual, the Scottsdale Zoning Ordinance, the Floodplain and Drainage Ordinance, and the Scottsdale Revised Code. Due to the varying nature of each project, this is only a partial checklist.
Is there an approved master drainage plan? Yes ___ No ___. If yes, give name and date of approval
_____.

Comments:

RETURN THIS CHECKLIST WITH THE NEXT PLAN SUBMITTAL

1. Provide a written letter requesting permission for a temporary stockpile.

2. Indicate a specific length of time that the stockpile is required.

3. Indicate that dust will be controlled, by whom and by what method.

4. Indicate that the stockpile(s) will not occur over any existing utility lines or within any existing easements.

5. Provide a scaled drawing indicating the location of the proposed stockpile.

6. Provide max. height of stockpile.

7. Provide volume of stockpile in cubic yards.

8. Address native plants in the stockpile area.

9. Provide details on the proposed haul route(s).

10. Provide a reproducible format for sign-off by City.

1-302.H.1 – Single Family Checklist

THE ITEMS ON THIS CHECKLIST ARE THE MINIMUM REQUIREMENTS FOR A SINGLE FAMILY PLAN SUBMITTAL. BECAUSE ALL PLANS ARE UNIQUE, THE PLAN REVIEWER MAY REQUIRE ADDITIONAL INFORMATION.

A.ENGINEERING

1) Plan sheet size 24” x 36” only
2) Scale
   a) Written
   b) Graphic
3) Acceptable Plan Scales
   a) 1”=10’
   b) 1”=20’
   c) 1/8”=1’
4) Vicinity Map
   a) North arrow
   b) 2 major cross streets
5) North arrow orientation to top or right-hand side of sheet
6) Legal Description
   a) Subdivision (Maricopa County Record (MCR) Number, Book, Page)
   b) Metes and Bounds (full legal description)
   c) Assessor’s Parcel Number (APN)
7) Site address
8) City of Scottsdale Quarter Section Number
9) Parcel Zoning
10) Name, address, and phone number for
    a) Owner
    b) Designer or Architect
    c) Engineer
11) Legend
    a) Symbols
    b) Abbreviations
12) Blue Stake Note
13) Benchmark per City of Scottsdale Database (link to web address)
14) Lot dimensions and bearings
15) Show all existing
    a) Right of Ways
    b) Easements
16) Show all proposed
    a) Right of Ways
    b) Easements
    c) Provide legal description
    d) Provide legal graphic
    e) Provide signed and notarized dedication form(s)
    f) Title report dated within 3 months
    g) Consent to Easement form, notarized and signed
17) Flood Zone Information
    a) FEMA block (on ALL plans)
    b) Engineer’s Certification Statement (if any lowest floor elevations are being set by the plan).
18) Seal, signature, and date on all sheets provided by an Arizona registered

a) Civil Engineer for grading and drainage plans
b) Architect for site plans where major grading, pad elevations, and lowest floor elevations were set by a subdivision grading and drainage plan.

19) Show existing topography
a) Show 2' minimum interval contours for lots with more than 2' of fall across lot
b) Show top of curb, back of curb, or edge of road elevations at lot corners for lots with less than 2' of fall across lot

20) Show proposed grading on all plans (**pre-graded lots still require fine grading**)
a) Flow lines
b) Slopes
c) Breakpoints
d) Positive drainage away from structures

21) Show lowest floor elevations for all areas of all structures.
a) For subdivisions with grading and drainage plans for lots, the elevations have been approved on the subdivision plan.
b) For custom lots or metes and bounds, must be set and certified by a civil engineer or architect.
c) List as $L.F._{88}$ for lowest floor in relation to the 1988 North America Datum (NAD 88)
d) Positive Drainage away from structures (5% min. for 10 feet)

22) Drainage report required for
a) Metes and Bounds
b) Special drainage features on the lot (pipes, culverts, channels)
c) Grading in a wash
d) Areas where no drainage study has been done
e) Verification of Q 100 shown on plans. Provide calculations.
f) Other_____

23) Show the following drainage information on the plan
a) Show Q_{100} (flow rate) and ν_{100} (velocity) for all channels entering and leaving the lot
b) Velocities over 5 fps require that the channels be protected from erosion
c) Show washes dedicated as Drainage Easements.
   i) Washes with >50 cfs capacity and north of the Central Arizona Project canal
   ii) Washes with >25 cfs capacity and south of the Central Arizona Project canal
d) Use arrows to show lot drainage direction on entire parcel for lots less than 2.5 acres IN ADDITION to contours or topography
e) Show cross sections for drainage ways
   i) Dimension to footings, walls, structures
   ii) Show proposed and existing 100 year high water elevation (HWE)
   iii) To show clearly how to construct this feature
f) Show weep holes or drainage openings in walls

24) Complete and submit Section 404 Certification Form
a) To be signed by engineer if plan is prepared by an engineer
b) To be signed by owner if plan is not prepared by an engineer
   i) Often applies to pre-graded lots where site plan is prepared by an architect
   ii) Often applies to additions or accessory buildings on flat lots where plan is prepared by an architect or the owner

25) Water and sewer mains
a) Show and label existing mains with size and location
b) Show and label proposed mains with size and location
   i) To be reviewed and approved by a separate Civil Review plan (show cross referenced plan review number on SFR plan and main ext. plan)

26) Water and sewer service
a) For existing water meter and sewer tap show, label and dimension to lot corner

b) For proposed water meter and sewer tap show, label and dimension to lot corner, call out Mag installation details

27) Show manholes with rim elevations
   a) Upstream from sewer tap
      i) If rim elevation is lower than lowest floor elevation a backwater device is required on the sewer service line.
   b) Downstream from sewer tap

28) Show location of septic system, leach fields, and other facilities
   a) To be located 25' away from drainage easements and the 100 year high water level of washes
   b) To be located in frontage or to side of lot for future connection to sewer
   c) May not be located within Natural Area Open Space (NAOS) area.
   d) Must submit approval page from Maricopa County Health Department
   e) Note on plan: *Septic System Per Maricopa County Health Department Permit # X.*

29) Show and dimension to nearest fire hydrant in all cases

30) Driveways
   a) Show and label 50' minimum distance from centerline to centerline for return-type driveways
   b) Show and label 50' minimum distance from centerline of driveway to projected right-of-way line (applies to lots at corners and "T" intersections)
   c) Show and label 5' minimum from edge of driveway to property line at right-of-way
   d) Driveways greater than 150' in length require a special turnaround for fire trucks or approval from Rural Metro
   e) Maximum slope on driveways is 12%
   f) Maximum width at right-of-way is 16' for
      i) all front entry garages with a setback greater than 40'
      ii) all side entry garages
   g) Maximum driveway width at right-of-way is 24' for
      i) 2 car front entry garages with a setback between 20' and 40'
      ii) 3 car front entry garages with a setback between 30' and 40'
   h) Maximum driveway width at right-of-way is 30' for
      i) 3 car front entry garage with a setback between 20' and 30'

31) Retaining Walls
   a) Submit structural calculations/wall detail if retaining 3 feet or more
   b) Show detailed cross section with dimensions and specs. for steel with adjacent topography and related drainage features
   c) Show top of wall elevations and top of footing elevations
   d) Show pool retaining wall calcs. And details if different than other walls. Clearly show which walls are to be constructed in each case.
   e) Cross reference architectural wall detail and sheet number on civil plans. Attach architectural sheet for reference.
   f) Provide a copy of the soils report used for wall design
   g) Provide a letter from the soils engineer to approve the location of storm water against wall and footing
   h) If this is a reapproval for wall installation only, use the original approved plan and use delta and clouds to show the added features

   Fence walls

   a) Show all fence walls clearly. (Note: Fence walls cannot be built on-site without drainage review and proper permitting.)

32) Slope Stability
   a) Submit soils report for slopes greater than 4:1
   b) Show and label erosion protection

33) When submitting a plan for re-approval

a) “Cloud” area where revision is on the plan
b) Use a delta symbol to label the revision number and describe the revision

B. PLANNING

1. State project data for site:
   a. Zoning
   b. Net lot area
   c. % Of slope on lot
   d. Sq. ft. required and proposed NAOS, including revegetation calculation

2. Small scale site location map.

3. North arrow.

4. Written & graphic scale (1"=20' or 1"=10').

5. Name, address, & phone # of engineer/architect and owner.

6. Lot dimensions AND complete legal description and address.

7. Topography: Provide 2' contours existing & proposed.

8. Show finished floor elevations.

9. Call out elevation of roof parapet or ridge above existing natural grade.

10. Show existing and proposed ROW and easement dimensions and improvements.

11. Show all applicable utility locations & service connections from source to House including sewer, water tap locations, & septic (NOT TO BE WITHIN NATURAL AREA OPEN SPACE EASEMENT.)

12. Show required and proposed building setbacks from property line.

13. NOTE: Pool secured from unwanted access and approved through separate permit.

14. NOTE: All mechanical equipment (air conditioner, pool equipment, etc.) shall be screened a minimum of one (1) foot higher than the highest portion of the equipment, and shall be compatible with the adjacent main building. Show location of equipment on site plan & building elevations.

15. NOTE: Guest house will not provide cooking facilities & will never be offered for rent.

16. Comply with C.O.S. native plant ordinance. Show location of all protected species on the site plan. Note plant type and size (tree trunk diameter and cactus height). Indicate total # of plants disturbed by construction. Call out name of salvage contractor on plan and submit proposal for preservation of plants disturbed by construction.

17. Provide spot curb elevations (if no curb exists, provide top of pavement elevations).

18. Provide periodic top of wall and retaining wall elevations for all proposed walls. The reviewer may request existing wall elevations if warranted.

HILLSIDE AND ESLO

19. Show all areas provided to meet natural area open space dedication requirements. Note percentage and SF of natural area open space required and provided. Show location on site plan.

20. Provide legal description and graphic of natural area easement stamped by Registered Engineer/Surveyor. 8 «" x 11" size.*

21. Natural Area Easement: Form attached - to be signed by owner(s) and notarized. Return notarized original.*

22. Return notarized original Consent to Easement form attached if there is a lien/ loan or beneficiary on the property.*

23. Provide policy of title insurance to show proof of ownership and any liens/encumbrances.

24. Include Environmentally Sensitive Lands Ordinance (ESLO) criteria in ESL Upper Desert & Hillside.

25. Provide letter from engineer/surveyor stating NAOS to be field staked and secured prior to ANY site work and indicate how NAOS will be secured prior to ANY construction.

26. Landform classification (Lower Desert, Upper Desert, or Hillside).

*(Maricopa County Recorders Standards) Documents to maintain one-half inch clear margins on all sides, On 8« X 11, No faxes or copies, 10 point min type, The only person / people who can sign the dedication form are those on the most recent title report.

POSSIBLE WATER AND SEWER REINBURSMENT NOTIFICATION
Date: Civil Plan #_____

Re: Property Address_____

Tax Parcel Number_____

NOTE: THIS IS NOT THE REIMBURSEMENT AGREEMENT

Dear:

As the owner of the above referenced property, the City of Scottsdale wishes to inform you of the City's Ordinance which allows a person who has installed either a water or sewer line to be reimbursed a portion of the cost by those who later tap into the line.

IF YOU ARE A PERSON WHO IS INSTALLING A WATER OR SEWER LINE to which others may make a direct service connection, in order for you to get reimbursed, you must execute an agreement with the City of Scottsdale within 60 (sixty) days after the line has been accepted by the City. You must furnish the City of Scottsdale Project Review Dept. with the following, in order for the agreement to be executed.

1. Provide a diagram of all properties that will benefit by any main or trunk to be installed.

2. Evidence of the maximum reimbursement to you for the cost of the main or trunk installed by you.
This will be based on actual engineering and construction costs to install the main or trunk. Copies of paid receipts must be turned in to prove payment.

3. An administration fee in the amount of five percent (5%) of the construction and engineering costs, based on the actual costs furnished in step #2, above, for the portion of the mains/trunk from which persons other than you will be served.

You understand that the Agreement for Reimbursement of you, the owner, will run for a maximum period of ten (10) years after the date of execution of the agreement. At the point of the ten (10) year period, you will not be entitled to collect reimbursement from the other property owners. You also understand that the City of Scottsdale will acquire ownership of any main or trunk installed by you upon completion and acceptance of the work by the City, and the City's cost for inspection of the work will be paid by you through the issuance of any encroachment permit.

I have read and understand the above information.
____I choose to participate
____I do not choose to participate

_____
_____
Signature of property owner* Date

STATE OF ARIZONA)
) SS.
County of Maricopa)

SUBSCRIBED AND SWORN to before me this
_____day_____
19_____by_____
_____

_____
Notary Public
My commission Expires _____
*The property owner, not his/her agent, must execute this letter. It must be signed in front of a Notary Public.

Figure 1.3.2 -1

INCOMPLETE SUBMITTALS WILL NOT BE ACCEPTED

City of Scottsdale

Water and Sewer
Reimbursement checklist

To initiate the submittal of reimbursement with the City of Scottsdale, the items listed below are the responsibility of the individual(s) to be submitted per C.O.S. Revised Code, Sec 49-215. Upon acceptance of the items by the City, a 5% administration fee will be collected at that time, of the estimated payback amount, and that **no refund** will be issued if the individual declines to initiate the reimbursement agreement.
When the City has completed verification of expenses and the agreement is ready for signature of owner(s), a final 5% administration fee will be adjusted, and if there is an over/under payment, the difference will be adjusted at that time.

Following Items to be submitted:

- Letter of Acceptance from Inspection Services
- Water/Sewer quarter section with water/sewer improvement(s) redlined
- County assessor map with parcel numbers clearly shown
- 12x18 reduced set of "approved" improvement plans with any changes redlined on the plans.
- Copy of paid receipts and invoices for work associated with main extension only which would include items listed below:

PREPARATION OF CIVIL ENGINEERING PLANS

Survey
Flow test
County Health Dept. review
Encroachment permits
Plan review fee's
Cost of installation of main extension (itemized break down of unit cost required)

When the above items have been completed for submittal, contact Bob Jorgensen, Civil Plans Reviewer at (480) 312-7066 to schedule a meeting to initiate the process or for any questions you may have.

Figure 1.3.2 -2

Chapter 2

Drainage
Design Standards and Policies
Revised December 1999

Chapter 2, Drainage, contains supplemental information to Chapter 37 of the Scottsdale Revised Code, otherwise known as the Floodplain and Drainage Ordinance. This chapter also describes the City's policies regarding hydrologic analysis procedures to be used in the City of Scottsdale for the planning and design of drainage and flood control facilities and the preparation of accompanying drainage reports. Furthermore, Chapter 2 contains clarifications or modifications to the design criteria and guidance contained in the current Drainage Design Manual for Maricopa County, Volume II Hydraulics.

Section 2.1

POLICIES
DESIGN STANDARDS AND POLICIES
REVISED DECEMBER 1999

CHAPTER 2
DRAINAGE

POLICIES

CONTENTS

SECTION	PARAGRAPH TITLE	PAGE
2-101	**GENERAL**	**1**
	A. Definitions	**1**
2-102	**GENERAL DRAINAGE POLICIES**	**2**
	A. Drainage Easements	**2**
	B. Subdivisions	**3**
	C. Storm Drains and Natural Washes	**4**
	D. Culverts	**4**
	E. Open Channels	**4**
	F. NPDES	**5**
2-103	**DOWNTOWN DRAINAGE POLICY**	**5**
	A. Definitions	**6**
	B. Requirements	**6**
2-104	**ALLUVIAL FAN DEVELOPMENT POLICY**	**7**
	A. Introduction	**7**
	B Development Requirements	**7**
	C. Property Adjacent to City's Proposed Desert Greenbelt Project Channels	**9**
2-105	**STORMWATER STORAGE POLICY**	**9**
	A. Introduction	**9**
	B. Storage Requirements	**10**
	C. Storage Facilities	**10**
2-106	**WAIVER OF STORMWATER STORAGE REQUIREMENTS**	**11**
	A. Introduction	**11**
	B. Waiver Requirements	**11**
	C. Waiver Process	**12**
	D. In-Lieu Fees	**12**
2-107	**50 C.F.S. CAPACITY WASHES WITHIN ESL AREAS**	**12**
	A. Introduction	**12**
	B. Requirements for Projects within the ESL Area	**12**
	C. City Maps of 100-Year Floodplains of 50 c.f.s. Washes	**13**
	D. Detailed Mapping of 50 c.f.s. Floodplains	**13**
	E. Maintaining Washes in Natural State	**13**
2-108	**SECTION 404 OF THE CLEAN WATER ACT**	**13**
	A. Regulated Activities	**13**
	B. Compliance Requirements	**13**

SECTION	PARAGRAPH TITLE	PAGE
Appendix A	Chapter 37 of Scottsdale Revised Code, Floodplain and Drainage Ordinance	**14**
Appendix B	Application to Release Existing Drainage Easement	**34**
Appendix C	City of Scottsdale Section 404 Certification Form	**37**
Appendix D	Request for Stormwater Storage Waiver Form	**39**

SECTION 2.1
POLICIES

2-101 GENERAL

The policies contained herein were written to supplement Chapter 37 of the Scottsdale Revised Code (Code)(Code 1972, §5-611; Ord. No. 1993, 2/29/1988), otherwise known as the Floodplain and Drainage Ordinance. The information included in the sections to follow is intended to serve as a guide, to assist in the implementation of the requirements of the ordinance. These policies must be followed and will be enforced as written unless adequate documentation is submitted to and approved by the city's Floodplain Administrator. The documentation must demonstrate that the intent and requirements of the ordinance will still be met. A copy of the Floodplain and Drainage Ordinance (Drainage Ordinance) is included as Appendix A of this section.

A. Definitions

Unless specifically defined in Section 37-17 of the Drainage Ordinance or stated below, words or phrases used in this article shall be interpreted as the meaning they have in common usage and that gives this article its most reasonable application. The definitions in Arizona Revised Statutes Section 48-3601shall also apply.

50 cubic feet per second (c.f.s.) capacity means the active stream channel can contain a 50 c.f.s. flow within its cross section, as measured from top of bank, or bankfull. Figure 2.1-1 illustrates the cross section of the active stream channel in relation to the 100-year floodplain.

The 100-Year Flood is a flood with a one percent chance of being equaled or exceeded in any given year. Throughout the United States, the standard for floodplain management is protection from flooding up to and including the 100-year flood event.

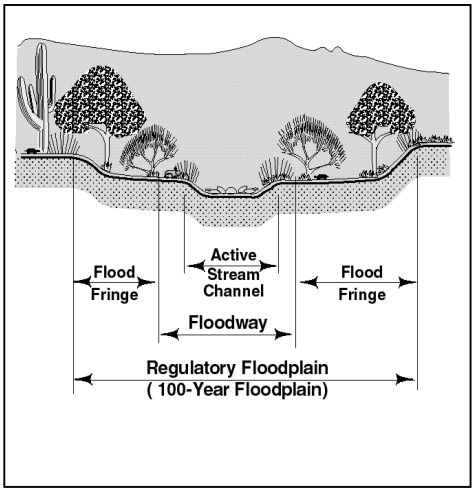


Figure 2.1-1. "Capacity" is Defined as the Bankfull of the Active Stream Channel

In hydrology the 100-year flood is determined statistically from long term records of streamflow or rainfall data. The availability of useful streamflow data for estimating the 100-year flood in most parts of Arizona is very limited. Therefore, the value is generally estimated from rainfall records. Statistical methods are used to predict the 100-year rainfall amount that is then input into hydrologic watershed models. The hydrologic model then predicts the peak rates of runoff for that amount of rainfall. This approach assumes that the 100-year rainfall produces a 100-year flood and all assumptions in the model are correct and that they remain constant over time.

Inherent in the statistical estimating procedure is that as longer periods of record become available and are added to the database the estimated size or frequency of a specific flood can change. The often-heard comment that "two or three 100-year storms occurred last year" is actually possible because natural events in the desert are unpredictable and because statistics can change with one or two additional flood events added to the database. Rainfall and runoff events are infrequent and highly variable in the desert and, therefore, much more difficult to measure and predict than in the more humid regions of the country.

Adjacent Grade means the elevation of the ground, sidewalk, patio, deck support, or basement entryway immediately next to the structure*.(FEMA Form 81-31, May 93)*

Floodway means a part of the floodplain which, to facilitate the passage of floodwater, is kept clear of encumbrances (USGS WSP 1541-A, 1960). The channel of a river or stream and those parts of the flood plains adjoining the channel, which are reasonably required to carry and discharge the floodwater or flood-flow of any river or stream (Erbe and Flores, 1957). The channel of a river and the adjacent floodplain that must be reserved in an unobstructed condition in order to discharge the base flood without increasing flood levels by more than one foot (FEMA FIA-2, 2/1990).

2-102 GENERAL DRAINAGE POLICIES

A. Drainage Easements
Continuous drainage easements are essential to the protection and proper operation and maintenance of wash corridors and floodplains.

1. Acquisition
Drainage easements should be identified and dedicated to the city as early as possible in the development process. Per ordinance, within the Environmentally Sensitive Lands (ESL) area of the city, all washes with a 50 c.f.s. or greater capacity must remain in their natural state and their 100-year floodplain dedicated as a drainage easement. In all other areas of the city, a drainage easement must be dedicated to the extent of the 100-year flood for all washes with a 25 c.f.s. or greater capacity. It is also city policy to require a drainage easement for washes with a 100-year discharge of 50 c.f.s or greater.

City staff shall check both existing and proposed drainage easements in the area of the proposed development to avoid discontinuous drainage easements and assure that the developer provides all necessary drainage easement segments at the time each property develops.

Whenever possible, lot lines should end at the edge of the wash floodplain (see Figure 2.1-1). If this isn't possible, lot lines should end at the following locations in

this order of preference: 1) at the edge of the floodway; 2) at the top of the near bank of the active channel; 3) at the centerline of the active channel; or 4) at the top of the opposite bank. Preferably, floodplains should be set aside in common area Tracts or in dedicated drainage easements. Building envelopes can be useful in identifying the limits of construction on individual lots to avoid the disruption of natural flow paths. Building envelopes shall clearly define the limits for the construction of any walls, fences or structures that would obstruct the natural flow of water, and shall be shown on the Grading and Drainage (G&D) Plan.

2. Maintenance
   City policy is that maintenance of drainage facilities is generally the responsibility of the individual property owner or the Homeowners Association upon whose property the facility is located. This is the case even though the facility is located within a drainage easement dedicated to the city. The recorded plat and grading and drainage plan shall specify maintenance responsibility.

3. Release
   The release or modification of a drainage easement is possible but only if one of the following special circumstances can be documented:
   - Upstream flows have been physically cut off or diminished;
   - More detailed topographic mapping and aerial photography has shown the original dedication to be incorrectly located; or
   - The original hydrology was found to be out of date or in error.

   Boundary modifications must meet in a smooth transition, with upstream and downstream boundaries on adjacent properties. When the alteration of a watercourse is proposed, a registered civil engineer in the state of Arizona must certify that the alterations will not increase flood levels, and will not increase flooding hazards within, upstream or downstream of the altered portion of the watercourse (Floodplain and Drainage Ordinance, Section 37-41 (a)).

   The *Application to Release Existing Drainage Easement* (see Appendix B for form) must be completed and submitted with the required documentation. After staff review and approval, the city's Development Quality/Compliance Director and Floodplain Administrator must both sign for final approval to modify or abandon an easement.

B. Subdivisions

1. Proposed subdivisions must develop a comprehensive drainage plan that addresses the drainage for the entire project site. Individual lot grading plans shall not alter the approved comprehensive G&D subdivision plan.

2. Lot Layout: Watercourses shall be identified and their floodplains mapped before lot layout begins. Lot lines should end at the edge of a watercourse's 100-year floodplain (see Figure 2.1-1). If this isn't possible, lot lines should end at the following locations in this order of preference: 1) at the edge of the floodway; 2) at the top of the near bank of the active channel; 3) at the centerline of the active channel; or 4) at the top of the opposite bank.

3. Maintenance of common subdivision or neighborhood drainage facilities shall not be made the responsibility of an individual property owner. Drainage facility(s) shall be placed in a common Tract or a dedicated drainage easement. Common drainage

facilities should overlap more than one lot and be located outside the building envelope. Maintenance responsibilities shall be clearly identified on the grading and drainage plan and on the recorded plat.

C. Storm Drains and Natural Washes

1. Within the ESL area, intercepting a natural wash with a capacity of 50 cfs or greater, and directing it into an underground storm sewer system, is prohibited (see City Code, Section 37-42 (14) a.).

2. Intercepting a natural wash and piping it underground is strongly discouraged in any area of the city for any size wash. Most natural washes and constructed channels in Scottsdale transport a significant amount of sediment, trash, and debris. If there is no alternative to the routing of an open channel into a piped system, water should be first routed into a sediment or debris basin. Periodic maintenance of the basin will be necessary in order to maintain its effectiveness. Maintenance is generally the responsibility of the homeowner or the HOA, and shall be clearly specified on the final plat and/or noted in the easement dedication.

D. Culverts

1. The culvert invert shall be as close as possible to the natural stream bed. Any culvert having an invert elevation more than six inches below the natural stream profile shall be assumed to have only the waterway opening above the stream bed profile for hydraulic capacity calculations.

2. Private culverts/bridges that carry flows that originate off-site or off-lot, should be designed by a qualified professional. Solutions such as dip crossings or free span bridges that do not constrict the wash or channel capacity are preferred. Development and/or proposed improvements shall not hamper the ability of the wash or channel to convey the pre-development or post-development flows, whichever is greater.

E. Open Channels

1. Within ESL areas of the city, natural watercourses of 50 c.f.s. capacity or greater are intended to be maintained in their natural state. (See Section 2-107 for more information.) In all areas of the city, diversions of natural washes or changes in a channel's profile should be avoided whenever possible.

2. No person in the city shall either obstruct or reduce the capacity of a watercourse (Section 37-44). Construction of any kind in a dedicated drainage easement requires a City Encroachment Permit.

3. Channel lining material shall be inlaid or placed below the design invert (bottom) of the channel. Do not place lining material on top of the designed finished grade of the channel. This may severely reduce and/or eliminate the ability of a channel to convey flow, causing ponding and backwater problems on streets and adjacent properties. See Figure 2.1-2 below to see how to correctly line a channel.

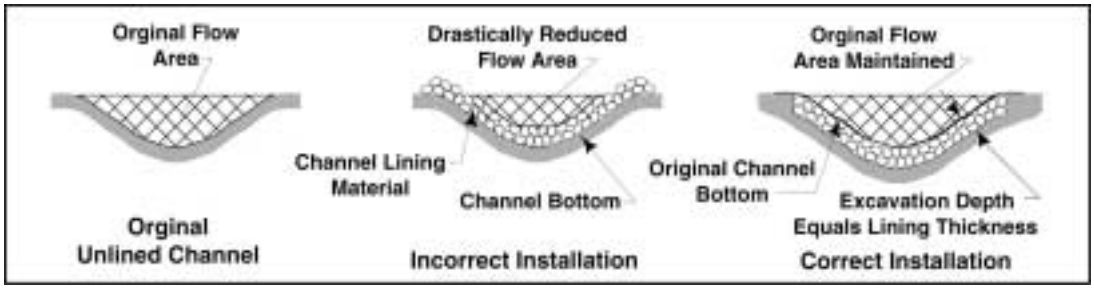


Figure 2.1-2. How To Correctly Line a Channel

4. The channel surface material (roughness coefficient), cross sectional area, or alignment shall not be changed without a plan revision and re-approval by city Staff.

5. When only lining the channel sides or banks, lining material must extend down below the channel invert to the estimated scour depth.

6. Extending lot lines or building envelopes across a natural wash or its floodplain or a drainage easement should be avoided whenever possible. The wash area and floodplain or drainage channel should be dedicated in a separate common area tract and dedicated as a drainage easement.

7. Channels shall not be designed or located within walled in back yards that go from yard to yard under or through walls. Wall openings commonly catch debris, clog, and block or divert flow and homeowners often block off or plug these openings. These channels are practically impossible to inspect or access for maintenance.

8. Walls, fences and other permanent structures should not be located within a designated drainage easement, a watercourse or its floodplain.

F. NPDES

Since October 1, 1992, the National Pollutant Discharge Elimination System (NPDES) General Permit for stormwater discharges required all owners/operators of construction projects disturbing five or more acres to prepare a Storm Water Pollution Prevention Plan (SWPPP) and file a Notice of Intent (NOI). A revision to the law dated October 29, 1999 reduced the five-acre requirement for SWPPPs and NOIs to one acre or more. The city of Scottsdale received its Municipal Separate Storm Sewer System (MS4) NPDES permit (number AZS000020) on August 26, 1999 and is required to have the opportunity to review all SWPPPs and NOIs. The NOI must be sent to the United States Environmental Protection Agency with a copy of the SWPPP and NOI to the city of Scottsdale 72 hours before construction begins. (The city must have evidence of this permit before a development permit will be issued). The goal of this NPDES storm water permit for construction activities is to control pollutants in storm water discharges to the maximum extent practicable by reducing erosion potential, minimizing sedimentation, and eliminating non-stormwater discharges from construction sites.

2-103 DOWNTOWN DRAINAGE POLICY

This section describes drainage policies specific to Downtown Scottsdale. Downtown Scottsdale refers to the study area defined by the City of Scottsdale Downtown Infrastructure Master Plan (DIMP) prepared by Boyle Engineering Corporation in December of 1986, otherwise referred to as the DIMP Report.

A. Definitions

The definitions contained below are applicable to this section only.

Lateral refers to that part of the stormdrain system that collects surface runoff and transmits it to the Infrastructure System.

DIMP Report refers to the City of Scottsdale Downtown Infrastructure Master Plan which is the planning guide used to determine the Baseline Runoff rate that the subject property may contribute to the Infrastructure System (System) without additional cost to the Owner.

Property Owner or Owner refers to actual owner or the person or persons who have a financial interest in the subject property.

Infrastructure System or System refers to the main trunk line of the stormdrain system that transmits the runoff to the point of outfall (i.e., the Indian School Road Stormdrain).

Proposed Intensity refers to the percentage of impervious area proposed for the subject property.

DIMP Report Intensity refers to the percentage of impervious area used in the DIMP Report for the subject property.

Proposed Runoff refers to the runoff calculated using the Proposed Intensity.

Baseline Runoff refers to the runoff calculated using the DIMP Report Intensity.

Excess Runoff is the Proposed Runoff, less the Baseline Runoff. (If the Proposed Runoff is less than the Baseline Runoff, then the Excess Runoff shall be zero.)

B. Requirements

Development proposed in Downtown Scottsdale shall plan to accommodate drainage by meeting the following policies:

1. The Owner shall be responsible for the cost or installation of the Lateral(s) necessary to transmit runoff from the subject site. If the capacity of the Lateral must be increased to accommodate runoff from other properties, then the owner shall contribute a pro-rata share of the cost of the Lateral. This pro-rated cost shall be determined by the ratio of the Proposed Runoff divided by the total capacity of the Lateral. All Laterals shall be designed and constructed in accordance with current city of Scottsdale standards.

2. The release of excess runoff from the subject property will require that the Owner participate in the cost of the System. This shall be a pro-rata cost participation, and shall be based on the ratio of the excess runoff divided by the capacity of the System. This adjusted ratio shall apply to the costs of the System from the point at which the excess runoff enters the System to the outfall point.

3. If the capacity of the System must be increased to accommodate Excess Runoff, the cost participation ratio shall be refigured using the cost of the larger system in the calculation.

2-104 ALLUVIAL FAN DEVELOPMENT POLICY

A. Introduction

Over fourteen square miles of land north of the Central Arizona Project (CAP) Canal falls within designated special flood hazard areas. These areas were mapped by the Federal Emergency Management Agency (FEMA) and identified as alluvial fan flood hazard areas. This designation is identified by the symbol “AO” on the Flood Insurance Rate Maps (FIRMs). In addition to this mapped area, there are several other large, unmapped areas in north Scottsdale that are also subject to similar alluvial fan flood hazards. Since it is essential that the special requirements which must be met to develop on an alluvial fan are clearly understood and followed, the policies in this section are meant to clarify these special requirements and important development issues.

Developing on an alluvial fan must be carefully planned, designed and constructed in accordance with FEMA and COS regulations so that the hazards inherent in this practice can be mitigated or eliminated. These hazards are associated with the following flow characteristics found on alluvial fans:

- Flashflooding and large peak discharges,
- Transport of debris (i.e., rocks, branches, logs, weeds, trash),
- Erosion and scour,
- Transport and deposition of large sediment loads,
- Steep slopes and shallow high velocity flows,
- Unpredictable distribution of flow, and the potential relocation of the flow paths anywhere on the fan (the characteristic that makes it alluvial fan type flooding).

There are two primary concerns in the planning and design of any development on an alluvial fan. The first concern is the safety and protection of the residents and property on the fan area. The second concern involves any adverse effects to adjacent property owners, which could be created, either upstream or downstream, by improper development on the fan.

B. Development Requirements

The following information regarding development on alluvial fans is based on the city's Floodplain and Drainage Ordinance, common drainage law, FEMA rules and regulations and the city's Desert Greenbelt Project. This section does not necessarily include all of the applicable Federal, State or local laws or regulations. None of the requirements mentioned here eliminates the need to comply with any laws or regulations not specifically mentioned herein. Following these requirements is also not a guarantee against flooding. Floods larger than the design flood addressed in this policy can and will occur from time to time.

In order to develop in this special flood hazard area one of two approaches can be used. Method 1 involves developing in the mapped AO Zone flood hazard area and leaving the FEMA designation unchanged. This is possible if specific flood protection measures required by FEMA are incorporated into the design of the structure or development, however, flood insurance is still required. Method 2 involves removing the entire property from the AO Zone. This requires major structural flood control measures that must meet rigorous FEMA design requirements and an actual map revision must be obtained from FEMA. This would remove the AO Zone designation entirely and eliminate the need for flood insurance and the specific development requirements listed below under Method 1.

The following sections include detailed explanations and requirements of each of these methods.

1. Method 1 - Developing Without a Map Revision
   This method for developing in an AO Zone is a reasonable approach for low density developments, small properties and individual residences. It allows single lot owners to develop their property without constructing major, structural, flood control measures. This method does not require approval from FEMA, however, it does require review and approval by the city for compliance with FEMA requirements. Under this approach, homeowners are still required to buy flood insurance if they have a mortgage. The requirements are listed below.

   a. Proposed building sites (single family residence or subdivision) must be reasonably safe from runoff produced by the 100-year storm.

   b. Residential structures shall have the lowest floor (including basement or sunken living room) elevated above the highest adjacent grade at least as high as the depth number specified in feet on the FIRM. If no depth is specified on the FIRM a minimum of two feet above the highest adjacent grade is required.

   c. Site design and grading shall include adequate drainage paths around structures on slopes to guide floodwaters away from proposed structures. Structures should not be placed in low spots or block active channels or flow paths on the fan.

   d. The proposed development must address the impact(s) the project will have on flood hazards in the flood hazard area (other areas of the fan), as well as adjacent or downstream areas beyond the mapped AO Zone.

   e. Any property located below an alluvial fan apex, that has not been structurally contained, must protect its upstream perimeter with structural flood control measures. As a minimum, these measures shall be designed to withstand the entire flow quantities originating from the apex, plus any tributary flows, based on existing watershed conditions. This criterion assumes that runoff from the upstream watershed will not increase in the future.

   f. Flow quantities used to design the perimeter flood control measures may be adjusted if it can be demonstrated by sound engineering analyses that the actual quantities that could reach the perimeter are different from those at the apex. City drainage planning staff guidance and approval must be obtained if less than the full apex flow is used.

2. Method 2 - Removing the Property from the AO Zone
   The removal of any property from the AO Zone requires obtaining a map revision from FEMA. According to FEMA, the <u>only</u> basis for securing a map revision requires the construction of "major, structural, flood control measures." The city's proposed Desert Greenbelt Project (DGBP) Channels is an example of a major, structural, flood control measure, which is being planned and designed to meet FEMA's requirements. The design and construction must be supported by sound engineering methods that demonstrate how the measures will effectively eliminate the alluvial fan flood hazards. Map Revisions based on fill only are not accepted by FEMA on alluvial fans.

The main difficulties associated with this method are that major, structural, flood control measures take years to plan, design, fund, review, permit, and construct. They are generally only achieved via large regional solutions that are very expensive and encompass multiple land owners and agencies. The benefit of a Map Revision is that the flood hazard is completely removed and property owners will no longer be required to purchase flood insurance once the property is removed the from the AO Zone.

In order to obtain a Map Revision, the following requirements listed below, must be met:

a. FEMA requires a thorough engineering analysis, which quantifies the peak discharge, volume of water, debris characteristics and sediment loads produced by the runoff from a 100-year storm. This must be done at the alluvial fan apex under current and potential adverse (i.e., fully developed) watershed conditions. It must be shown that the proposed flood control measures will effectively eliminate alluvial fan flood hazards from the fan area.

b. The minimum FEMA freeboard requirement for flood control structures on an alluvial fan is three to four feet, depending on the proximity to bridges, etc. A lesser freeboard is possible; however, FEMA will not accept a freeboard of less than two feet. The city will require an engineering analysis that demonstrates to FEMA's satisfaction, that adequate freeboard is provided.

c. FEMA requires the city of Scottsdale to assume ultimate responsibility for all operation and maintenance activities for major, structural, flood control measures. The actual activities could be accomplished in a variety of ways, including utility or improvement districts, delegation to homeowner's associations or contracting through the Flood Control District of Maricopa County (FCDMC), all of which require legal agreements adopted by City Council.

d. The proposed development must address the impact(s) the project will have on flood hazards in the flood hazard area (other areas of the fan), as well as adjacent or downstream areas.

C. Property Adjacent to City's Proposed Desert Greenbelt Channels
A parcel of property which contains any portion of one of the proposed Desert Greenbelt (DGB) channels, that develops prior to the construction of the greenbelt, shall, as part of their development costs, construct or contribute funds to that portion of the DGB.

2-105 STORMWATER STORAGE POLICY

A. Introduction
The current city of Scottsdale's stormwater storage requirements are contained in Section 42-(12) in Chapter 37, “Floodways and Floodplains" of the Scottsdale Revised Code, referred to as the city's Floodplain and Drainage Ordinance.

The requirement to store stormwater runoff has been in place since February 29, 1988, with the adoption of Ordinance No. 1993. The city continues to uphold its obligation and responsibility to its residents and neighboring communities by maintaining the current stormwater storage requirements. These requirements are derived from the Uniform Drainage Policies and Standards (Resolution FCD 87-7) developed for use throughout

Maricopa County. The Maricopa County Board of Supervisors approved this Resolution on April 20, 1987.

This section contains the city's policy regarding stormwater storage requirements. Stormwater storage facilities are normally detention facilities and in rare cases, with appropriate city approval, they may be retention facilities.
Section 2.3 of this Chapter contains policies for the actual design of storage facilities. The following policy statements are intended to clarify and assist in the implementation of the ordinance requirement.

B. Storage Requirements

1. "As a minimum, all development will make provisions to store runoff from rainfall events up to and including the one-hundred-year two-hour duration event."

2. The storage requirement applies to the total disturbed area within the development to the property lines including streets, alleys, easements and rights-of-way. The disturbed area includes any man-made change, such as, but not limited to construction, mining, excavation, filling, grading, or paving. The volume of storage provided onsite must equal the total runoff volume generated from all the disturbed area within the site for fully developed conditions.

3. The storage requirement is not applicable to undisturbed, natural areas. Any portion of the site that remains in its natural state, may be excluded from the amount of land area used in the storage requirement calculation.

4. Pre-development versus post development comparisons is not applicable in computing required storage volumes, the standard formula in Chap. 2.2, Sec. 2-204 must be used.

5. <u>Stormwater Storage Volume Certification</u>: The property owner will provide the city with certified as-built dimensions of the basins and the actual volume of storage provided. This must be based on "as built" topographic surveys made by either a civil engineer or land surveyor who is registered to practice in the state of Arizona. These as-built volumes must reflect permanent finished landscaping in place. The volumes shall be certified by the Design Engineer whether the volume provided meets or exceeds the required design volumes per COS Ordinance and the approved Drainage Plan. The volume of storage provided must equal or exceed the approved design volumes before the city will issue Letters of Acceptance for maintenance of any public facilities.

C. Storage Facilities

1. Offsite washes should not be routed into or through onsite stormwater storage basins. Basins located on-stream interrupt the natural flow regime of the wash and can create a continual debris and sediment maintenance problem.

2. Storage basins should whenever possible be designed with a positive gravity drain system. See Chapter 2.3 Sec. 2-308 D. for other acceptable methods of draining. Dry wells may only be used as a last resort (see City Code Section 37-42 (12) a.).

3. All storage basins must have an emergency spillway that will direct any overflow safely into a recognized watercourse.

4. Above ground storage basins contained by an earth fill dam or levee are prohibited unless the fill is part of an approved street or road design.

5. Storage facilities on individual residential lots are generally prohibited and only allowed in specific special circumstances that must be approved in advance by city staff.

   Onlot storage will only be permitted when unobstructed access from a public rights-of-way can be provided. Homeowners traditionally fill the basins in and the runoff often ends up in their house, pool, in a neighbor's property, or in a city alley or street.

6. Storage water shall be designed to drain to a recognized watercourse. Water may not be discharged onto a city street, gutter or alley. Specific special prior staff approval would be required to discharge water into a street, alley, or gutter.

7. All storage facilities shall be designed such that the stored runoff shall be discharged completely from the facility within 36 hours following the storm event. This is a city Ordinance requirement related to County Health Department Standards.

8. Drain time should not be less than 24 hours to ensure the effectiveness of the basin. Discharge from the basin can be regulated with an orifice plate over the entrance of the outlet pipe, as long as the outlet pipe meets the minimum size pipe requirements.

2-106 WAIVER OF STORMWATER STORAGE REQUIREMENTS

A. Introduction

Under the Floodplain and Drainage Ordinance, stormwater storage requirements may be waived if a project meets one or more of the specific criteria listed in the Code. Meeting the waiver criteria, however, does not necessarily mean a waiver will be automatically granted. City staff will process the request and if it is in the best interest of the public, the waiver will be granted. It is not appropriate to automatically assume stormwater storage is not necessary because a project area is small relative to the entire watershed; or because a project is at the very downstream end of the watershed. The cumulative effects on the entire upstream and downstream watershed shall be considered. It is a common misconception that a small project is insignificant in a large drainage area. Typically this is only valid if the remainder of the watershed is already fully developed, and if downstream receiving channels and or storage facilities have adequate additional capacity. If not, the cumulative effects of waiving retention on many small individual projects within the same watershed can result in major downstream impacts.

B. Waiver Requirements

1. All onsite storage requirements may be waived if a site can drain directly into an existing regional drainage system designed and constructed to contain or convey the additional runoff.

2. Most often, however, a development must, as a minimum, store the runoff volume necessary to maintain pre-development flow conditions.

3. A wavier approval of any kind is not authorization by the city for the developer to increase runoff or change drainage characteristics to the detriment of any other property owner.

4. A waiver approval does not relieve the developer of liability if the project causes increased flood damage on any other property.

C. Waiver Process

1. To obtain a waiver, the developer must submit a Request for Stormwater Storage Waiver Form with completed In-Lieu Fee Calculations to the city for review. See Appendix D for the *Request for Stormwater Storage Waiver Form* which includes the *In-Lieu Fee Calculations sheet*.

2. After staff's review is complete, the applicant will receive a copy of the processed Waiver Form, which will indicate: additional information needed, approval, or denial of the request.

3. Project Review will not accept final improvement plans for review without a copy of the approved Waiver Form if the project design is based on providing anything less than the full ordinance storage requirements.

4. The completed Waiver Form with the In-Lieu Fee Calculations shall be included in the drainage report. Approved copies of both shall be attached to the final approved Drainage Report.

D. In-Lieu Fees
If storage is waived, the Drainage Ordinance requires the development to contribute to the cost of drainage works. In-lieu contributions will be applied to drainage improvements throughout the city. The developer shall estimate the in-lieu contribution and submit it to the city for review and approval.

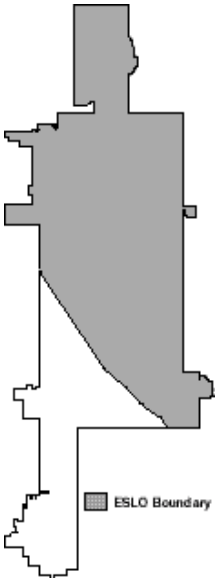


Figure 2.1-3.
ESLO Area

2-107 50 C.F.S. CAPACITY WASHES WITHIN ESL AREAS

A. Introduction
The Floodplain and Drainage Ordinance identifies special considerations within the Environmentally Sensitive Lands (ESL) areas. In particular, it requires that washes within the ESL area (see Figure 2.1-3) that have a 50 cubic feet per second (c.f.s.) or greater capacity be maintained in their natural state and their 100-year floodplains be dedicated to the city as drainage and flood control easements. Preserving these continuous drainage corridors will help to safely convey floodwaters and stormwater runoff, protect city residents and their property, reduce costs for solving drainage problems, and maintain the natural and beneficial values of floodplains.

B. Requirements for Projects within the ESL Area

1. Identify washes on the project site with a capacity of 50 c.f.s. or greater and map their 100-year floodplains. (See Section 2-101 A. for the definition of a 50 c.f.s. capacity wash and Figure 2.1-1 for a wash cross section.)
2. Maintain washes with a capacity of 50 c.f.s. or greater in their natural state.
3. Dedicate a drainage and flood control easement to the city to the limits of inundation for the100-year flood.

C. City Maps of 100-Year Floodplains of 50 c.f.s. Washes

1. City staff is in the process of identifying these washes and mapping their 100-year floodplains as a layer within the city's GIS–based Land Information System (LIS). Check with city staff to see if the 100-year floodplains have been mapped for the area you are interested in.

2. The city mapped floodplain boundaries in the LIS are based on approximate methods and represent an estimate of the limits of inundation.

D. Detailed Mapping of 50 c.f.s. Floodplains
The developer may choose to have the floodplains analyzed in more detail, using HEC-2 or HEC-RAS. Floodplain mapping refinements must be done by a registered civil engineer and submitted to the city's Floodplain Administrator for review and approval.

E. Maintaining Washes in Natural State
Roads are permitted to cross washes, however, approval is required from the Project Review Director if disturbance of the natural channel extends beyond the right-of-way.

2-108 SECTION 404 OF THE CLEAN WATER ACT

The Code of Federal Regulations requires that if a community wants to participate in the national flood insurance program, it has to assure that developments within its boundaries comply with Section 404 of the federal Clean Water Act.

A. Regulated Activities
Section 404 is administered by the U.S. Army Corps of Engineers and regulates the discharge of dredged or fill material into a wetland, lake, (including dry lakes), river, stream (including intermittent streams, ephemeral washes, and arroyos), or other waters of the United States. Activities that result in a discharge to a watercourse, such as fill for construction activities, most likely will require a Section 404 permit. Utility and road crossings, bridges, bank protection, sand and gravel mining, and fill associated with residential and commercial development are typical activities which require Section 404 permits.

B. Compliance Requirements
The city of Scottsdale requires the completion of the *City of Scottsdale Section 404 Certification Form* as assurance that a development project complies with Section 404 of the federal Clean Water Act. Before the city may issue development permits for a project, this form must be completed and submitted with improvement plans to Project Review staff. Developers are advised to apply to the Corps as early as possible for a Section 404 permit and allow for the necessary processing time to prevent delays in obtaining development permits from the city of Scottsdale. The *City of Scottsdale Section 404 Certification Form* is included as *Appendix C* of this section.

APPENDIX A

Chapter 37 of Scottsdale Revised Code, Floodplain and Drainage Ordinance

(Check the city's Ordinance Webpage for the most current version of the Floodplain and Drainage Ordinance and download a copy from there.)

© Copyrighted. Municipal Code Corp., affiliated Municipality. 1998.

Chapter 37 FLOODWAYS AND FLOODPLAINS*

***Charter reference(s)--**General power of city over floodways, etc., art. 1, § 3.

Cross reference(s)--Buildings and building regulations, Ch. 31; planning and development, Ch. 46; subdivisions, Ch. 48; basic zoning ordinance, App. B.

Art. I. In General, §§ 37-1--37-15
Art. II. Floodplain Developments, §§ 37-16--37-57
Div. 1. Generally, §§ 37-16--37-40
Div. 2. Regulations, §§ 37-41--37-48
Div. 3. Drainage Facility Development Fees, §§ 37-49--37-57

ARTICLE I. IN GENERAL

Secs. 37-1--37-15. Reserved.

ARTICLE II. FLOODPLAIN DEVELOPMENTS

DIVISION 1. GENERALLY

Sec. 37-16. Purpose; title.

(a) It is the purpose of this article to establish requirements and regulations pertaining to the use and development of land in the city which will minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding caused by the surface runoff of rainfall.

(b) This article may be referred to as "the floodplain and drainage ordinance."

(Code 1972, § 5-611; Ord. No. 1993, 2-29-88)

Sec. 37-17. Definitions.

Unless specifically defined below, words or phrases used in this article shall be interpreted so as to give them the meaning they have in common usage and to give this article its most reasonable application. The definitions in Arizona Revised Statutes section 48-3601 shall apply.

Appeal means a request for a review of the floodplain administrator's interpretation of any provision of this article or a request for a variance.

Area of shallow flooding means a designated AO and/or AH zone on the flood insurance rate map (FIRM). The base flood depths range from one (1) to three (3) feet, a clearly defined channel does not exist, the path of flooding is unpredictable and indeterminate, and velocity flow may be evident.

Base flood means the flood having a one-percent chance of being equalled or exceeded in any given year. This is also called a one-hundred-year flood.

Base flood water surface elevation means the following:

(1) In regulatory floodways and special flood hazard areas as shown on the firm or on other maps adopted by the floodplain board, the base flood water surface elevations shall be those elevations shown on the FIRM or adopted maps. For the floodways; however, when the city floodplain administrator determines that more accurate base flood water surface elevation data is available, than the data shown on the FIRM's, the more accurate data shall be used.

(2) In special flood hazard areas adopted by the floodplain board, the base flood water surface elevations shall be those elevations established in accordance with paragraph 37-18(c)(2).

(3) In a regulatory floodway not shown on the FIRM, the base flood water surface elevations shall be those elevations established in accordance with paragraph 37-18(c)(2).

(4) For those areas of the city which are not within a regulatory floodway or a special flood hazard area, the base flood water surface elevations shall be those which are established by a drainage report submitted in accordance with the criteria contained herein.

Basement means the lowest level or story of a structure which has its floor subgrade on all sides.
Breakaway wall means a wall that is not part of the structural support of the foundation and is intended through its design and construction to collapse under specific lateral loading forces, without causing damage to the elevated portion of the building support or foundation system.
Construction means new construction of or substantial improvements to a structure.
Critical feature means an integral and readily identifiable part of a flood protection system without which the flood protection provided by the entire system would be compromised.
Depressed floor area is a portion of the first floor of a residential structure, such as a sunken living room or a conversation pit, which is lower than the surrounding floor area, and which has no floor-level access to areas outside the structure. (This is not a multilevel first floor which is stepped to conform to site slope conditions).
Detention basin means a hydraulic structure similar to a reservoir that intercepts and retards or detains storm water and is specifically designed to attenuate or dampen peak discharge rates.
Development means any man-made change to improved or unimproved real estate, including, but not limited to, construction, mining, excavation, filling, grading, or paving.
Environmentally sensitive lands means environmentally sensitive lands as defined in Ordinance Numbers 1881 and 1883.*

***Editor's note--**Ordinance No. 1881 is included in this Code as Ch. 46, Art. III, Div. 1, §§ 46-61--46-65; Ord. No. 1883 is included as Ch. 46, Art. III, Div. 2, §§ 46-73--46-77.

Financial assistance means any form of loan, grant, guarantee, insurance, payment, rebate, subsidy, disaster assistance loan or grant, or any other form of direct or indirect federal assistance, other than general or special revenue sharing or formula grants made to states.
Flood or *flooding* means a general and temporary condition of partial or complete inundation of normally dry land areas from:

(1) The overflow of floodwaters;
(2) The unusual and rapid accumulation or runoff of surface waters from any source, and/or;
(3) The collapse or subsidence of land along the shore of a lake or other body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels or suddenly caused by an unusually high water level in a natural body of water, accompanied by a severe storm, or by an unanticipated force of nature, such as flash flood, or by some similarly unusual and unforeseeable event which results in flooding as defined in this definition.

Flood boundary floodway map means the official map on which the Federal Insurance Administration has delineated both the areas of flood hazard and the floodway.
Flood hazard boundary map (FHBM) means an official map of a community issued by the Federal Emergency Management Agency where the boundaries of the flood, mudslide (i.e. mudflow) and related erosion areas having special hazards have been designated as zones A, M, and/or E.
Flood insurance rate map (FIRM) means the official map on which the Federal Insurance Administration has delineated both the areas of special flood hazards and the risk premium zones applicable to the community.
Flood hazard zones A, AE, AO, AH, A1-30 and, A99 are the areas shown on a FIRM which the Federal Emergency Management Agency has determined will be inundated during a one-hundred-year flood. These areas are called, collectively, "special flood hazard areas."
Flood hazard zone B or X is an area shown on a FIRM which is an area of moderate flood hazards.
Flood hazard zone C or X is an area shown on a FIRM which is an area of minimal hazards.
Flood hazard zone D is an area shown on a FIRM which has undetermined but possible flooding hazards.

Flood hazard zone E is an area of special flood-related erosion hazards.
Floodplain administrator means the city manager or designee who is authorized by this article to administer its provisions.
Floodplain or *Flood-prone area* means any land area susceptible to being inundated by water from any source (see definition of "flooding").
Floodplain board means the city council of the city at such times as they are engaged in the enforcement of this article.
Floodproofing or *floodprotection* means any combination of structural and nonstructural additions, changes, or adjustments to structures, including utility and sanitary facilities, which would preclude the entry of water. The structure must be watertight, with walls which are substantially impermeable to the passage of water. Structural components shall have the capability of resisting hydrostatic and hydrodynamic loads and the effect of buoyancy.
Floodway is the channel of a river or other watercourse and the adjacent land areas necessary in order to discharge the one-hundred-year flood without cumulatively increasing the water surface elevation.
Grading is any excavation or filling of land or combination thereof.
Lowest floor means the lowest floor of the lowest enclosed area (including basement). An unfinished or flood-resistant enclosure, usable solely for parking of vehicles, building access or storage in an area other than a basement area is not considered a building's lowest floor; provided, that such enclosure is not built so as to render the structure in violation of the applicable non-elevation design requirements of this article.
Manufactured home means a structure, transportable in one (1) or more sections, which is built on a permanent chassis and designed to be used with or without a permanent foundation when connected to the required utilities. For floodplain management purposes the term "manufactured home" also includes park trailers, travel trailers and other similar vehicles placed on a site for more than one hundred eighty (180) consecutive days.
Manufactured home park (subdivision) means a parcel or contiguous parcels of land which have been divided into two (2) or more lots for rent or sale and the placement of mobile homes.
Natural areas shall mean those areas within environmentally sensitive areas which are required to be retained in a natural state, including areas stipulated as such through the zoning process. Special conditions relating to environmentally sensitive lands will apply to such "natural areas."
Regulatory base flood elevation means an elevation one (1) foot above the "base flood water surface elevation."
Regulatory floodway means the channel of a wash or other watercourse and the adjacent land areas that must be reserved in order to discharge the base flood without raising the water surface elevation.
Residential structure means a place of residence and may be a single-family or multifamily dwelling.
Retention basin means an hydraulic structure similar to a reservoir that intercepts and stores stormwater and is specifically designed to be drained to the underground or to be emptied by evaporation to the atmosphere.
Special flood hazard area means an area having flood and/or flood related erosion hazards as shown on a FHBM or FIRM as zone A, AO, A1-30, AE, A99, AH, or E, and those areas identified as such by the floodplain administrator, delineated in accordance with paragraph 37-18 (b) and adopted by the floodplain board.
Start of construction, for purposes of this article only, includes substantial improvement, and means the date the building permit was issued, provided the actual start of construction, repair, reconstruction, placement, or other improvement was within one hundred eighty (180) days of the permit date. The actual start means either the first placement of permanent construction of a structure on a site, such as the pouring of slab or footings, the installation of piles, the construction of columns, or any work beyond the stage of excavation; or the placement of a manufactured home on a foundation. Permanent construction does not include land preparation,

such as clearing, grading and filling; nor does it include the installation of streets and/or walkways; nor does it include excavation for a basement, footings, piers, or foundations or the erection of temporary forms; nor does it include the installation on the property of accessory buildings, such as garages or sheds not occupied as dwelling units or not part of the main structure.

Structure means a walled and roofed building or a gas or liquid storage tank that is principally above the ground. This term includes, but is not limited to, houses, commercial buildings, factories, storage buildings, mobile homes, and similar structures.

Substantial improvement means any repair, reconstruction or improvement of a structure, the cost of which equals or exceeds fifty percent of the market value of the structure either before the improvement is started or before the damage occurred, if the structure has been damaged and is being restored. For the purposes of this definition, "substantial improvement" is considered to occur when the first alteration of any wall, ceiling, floor or other structural part of the building commences, whether or not that alteration affects the external dimensions of the structure. The term "substantial improvement" does not, however, include any alteration to comply with existing state or local health, sanitary, building, or safety codes or regulations which are solely necessary to assure safe living conditions.

Variance means a grant of relief from some of the requirements of this article which permits construction in a manner that would otherwise be prohibited by this article.

Waste disposal system means any system of disposing of worthless materials and useless by-products, either sanitary or commercial or industrial, except existing single-family septic systems and sanitary sewer pipe lines.

Watercourse means a lake, river, creek, stream, wash, arroyo, channel or other topographic feature on or over which waters flow at least periodically. Watercourses includes specifically designated areas in which substantial flood damage may occur.

(Code 1972, § 5-612; Ord. No. 1993, 2-29-88)

Sec. 37-18. Basis for establishment of special flood hazard areas and regulatory floodways.

(a) The city is a participant in the National Flood Insurance Program (NFIP). The special flood hazard areas and the parts of those areas which are designated as regulatory floodways are identified and delineated by the federal emergency management agency (FEMA) in an engineering report titled "Flood Insurance Study, Scottsdale, Arizona" with accompanying flood insurance rate maps (FIRM's) and flood hazard boundary maps (FHBM's). Such studies and maps are prepared for communities participating in the NFIP. The first study and maps for Scottsdale were dated June 1972, and there have been several revisions. The current flood insurance study and flood insurance rate maps for Scottsdale are on file at the city clerk's office, and they are hereby adopted by reference and declared to be a part of this article.

(b) A special flood hazard area shall be those areas of the city identified on the FIRM's including, but not limited to, zone A, zone A1-30, zone AE, zone AH, zone A99, and zone E; and those areas which have been identified by the floodplain administrator, adopted by the floodplain board, and have been delineated in accordance with Arizona Revised Statutes, sections 48-3609 and 48-3610; and which are compatible with criteria developed by the state director of water resources for defining the extent of flooding and the base flood water surface elevations.

(c) The regulatory floodways shall be:

(1) Those areas of the city identified on the FIRM's as flood hazard zones, including, but not limited to, zone AE, and zone AO.

(2) Those other areas shown on the FIRM and those areas not shown on the FIRM which have been adopted by the floodplain board as special flood hazard areas and require the definition of regulatory floodways.

(d) If a development is proposed on land designated as a special flood hazard area, the development shall:

(1) Be designed and constructed in a manner which complies with the requirements in section 37-41, and in a manner which raises the developed land to an elevation which is at or above the regulatory base floodwater surface elevation;

(2) Upon completion of the grading and flood protection features of the development, the developer shall provide the floodplain administrator as built grading plans and other engineering data prepared and signed by a professional engineer or registered land surveyor, which demonstrates compliance with this ordinance; and

(3) If the development lies within a special flood hazard zone shown on the FIRM, the developer shall provide the floodplain administrator the appropriate engineering data and certification showing that the development no longer lies within a special flood hazard zone. The developer shall also provide to the administrator an application to the Federal Emergency Management Agency requesting a letter of map amendment or letter of map revision. The administrator will forward the application with appropriate recommendations to the federal emergency management agency for action.

(e) The requirements described in paragraph (d)(3) above, of this section do not apply to the construction of:

(1) An individual, single-family residential structure, or

(2) An individual, multifamily residential or nonresidential structure on a parcel of land under one-half acre in size, however, the community development general manager or designee will notify the property owner that appropriate insurance will be required by federally insured lending agencies.

(f) If the requirements in subsection (d), do not apply to a development, the lowest floor elevation requirements described in section 37-42 paragraphs (6) and (7) are applicable.

(Code 1972, § 5-614; Ord. No. 1993, 2-29-88)

Sec. 37-19. Floodplain administrator.

(a) *Designated.* The city manager or designee shall be the floodplain administrator.

(b) *Responsibilities.* It is the responsibility of the floodplain administrator or his authorized representative to do the following:

(1) Review all applications for development permits and insure that the requirements of this article are enforced.

(2) Provide the Federal Emergency Management Agency (FEMA) information needed to update the FIRM's and serve as the city's agent for handling revisions of the FIRM's.

(3) Coordinate the provisions of this article with all other interested and affected political subdivisions, federal and state agencies as required by Arizona Revised Statutes sections 48-3609 and 48-3610, and 44 CFR parts 60.2 (e) and 60.3 (b)(6).

(4) Make interpretations where needed as to the exact location of the flood hazard zone boundaries and, when requested, provide the public with information concerning these interpretations and the content of the FIRM's.

(5) Take action on violations of the regulations in this article.

(6) Submit an annual reports to FEMA as required by 44 CFR parts 59-77 and 60.2 (f), and the coordinating agency for the state concerning the city's management of development in special flood hazard areas.

(7) Review proposed development documents to assure that necessary permits required by section 404 of the Clean Water Act (33 USC 1344) have ben obtained

for such development prior to issuance of any development permits required by the city or state statute.

(8) Notify FEMA of any annexations to the incorporated areas of the city and of any de-annexations.

(9) Maintain the following records and, upon request, provide the public with information concerning the content of these records:

a. A current copy of the FIRM's and of any letters of map amendment or any letters of map revision issued by FEMA for development in the city.

b. Certificates provided by builders pertaining to lowest floor elevations and floodproofing in the special flood hazard areas.

c. Floodplain and drainage management permits.

(10) Administer the processing of requests for a variance from the requirements of this article, maintain records of all actions taken, and report the variances that have been issued in the annual report to FEMA.

(Code 1972, § 5-616; Ord. No. 1993, 2-29-88)

Sec. 37-20. Appeals and variances.

(a) A person may appeal to the floodplain board for a variance or for a judgment on the interpretation of this article. The floodplain board may grant a variance if conditions would not be created by the variance which would result in danger or damage to persons or property and if strict application of the regulations would deprive the property owner of privileges enjoyed by similar property in the floodplain. The following subsections describe the conditions applicable to the granting of a variance.

(b) A variance shall not be granted for property within a regulatory floodway if any increase in the water surface elevation during a base flood discharge would result.

(c) A variance may be granted in conformance with subsections (d), (e) and (f) of this section for new construction and substantial improvements to be erected on a lot of one-half acre or less in size contiguous to and surrounded by lots with existing structures with lowest floors constructed below the base flood level.

(d) A variance shall only be granted upon the determination of the following:

(1) A good and sufficient cause exists.

(2) Failure to grant the variance would result in exceptional hardship to the applicant.

(3) Granting the variance will not allow conditions to be created which result in increased floodwater heights, additional threats to public safety, extraordinary public expense, the creation of nuisances, the causing of fraud or victimization of the public, or conflict with other laws or ordinances.

(e) A variance shall only be granted upon a determination that the variance is the minimum necessary, considering the flood hazard, to afford relief for the applicant.

(f) The floodplain administrator shall notify the applicant in writing that the following conditions will exist as a result of the variance:

(1) Construction of a lowest floor below the base flood level will result in increased premium rates for flood insurance.

(2) Construction below the base flood level increases risks to life and property.

(g) While the granting of variances generally is limited to a lot size less than one-half acre, deviations from this limit may be considered by the floodplain board; however, as the lot size is increased beyond one-half acre, the technical justifications required for a variance must be more detailed and comprehensive.

(Code 1972, § 5-617; Ord. No. 1993, 2-29-88)

Sec. 37-21. Interpretation.

In the interpretation and application of this article, all provisions shall be:

(1) Considered as minimum requirements;

(2) Liberally construed in favor of the council; and

(3) Deemed neither to limit nor repeal any other powers granted under law.

(Code 1972, § 5-619; Ord. No. 1993, 2-29-88)

Sec. 37-22. Warning and disclaimer of liability.

The degree of flood protection provided by the requirements in this article is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by manmade or natural causes. This article shall not create liability on the part of the city, any officer or employee thereof, or the federal government for any flood damages that result from reliance on this article or any administrative decision lawfully made thereunder.

(Code 1972, § 5-620; Ord. No. 1993, 2-29-88)

Secs. 37-23--37-40. Reserved.

DIVISION 2. REGULATIONS

Sec. 37-41. Prohibited development.

(a) A development is prohibited if it would create hazards to life or property by increasing the potential for flooding either on the property to be developed or on adjacent property or to any other property. Further: A watercourse may not be altered. Alteration within the meaning of this section includes, but is not limited to, encroachments, fill, new construction, substantial improvements to existing developments, and other construction, within a watercourse, unless professional engineer certifies that the alterations do not increase the flood levels, and will not increase flooding hazards within, upstream or downstream of the altered portion of the watercourse.

(b) Waste disposal systems shall not be installed wholly or partially in a floodway and or a regulatory floodway. Replacement of existing systems will be reviewed on an individual basis and may be granted a variance if approved by the Arizona Department of Water Resources.

(Code 1972, § 5-615(A); Ord. No. 1993, 2-29-88)

Sec. 37-42. Development requirements to be met for permit issuance.

Prior to the issuance of a permit by the city for development on private property or for work in the public rights-of-way, the applicant for the permit shall furnish the floodplain administrator and the project review manager information as required to determine that all proposed building sites will be reasonably safe from flooding and sufficient data to enable the city staff to determine that the proposed work is not of such a scope that it would be prohibited in accordance with subparagraphs (1) and (2) of this section. Reports, construction plans, and other data submitted in support of an application for a permit shall comply with the following criteria:

(1) *Drainage reports.* When a drainage report is required, it must be prepared and sealed by a civil engineer registered as a professional engineer in the state and it must be prepared in accordance with the criteria established by the city. The purpose of the report is to analyze the effect that a proposed development would have upon the rainfall runoff in the vicinity of the development, to provide data to insure that the development is designed to be protected from flooding, to provide data to insure that the development is to be designed to minimize flooding and to provide data supporting the design of facilities to be constructed for the management of rainfall runoff. Each drainage report must consider rainfall runoff from storms with a return frequency up to and including a one-hundred-year storm. The complexity of the report depends upon the nature of the development and the site on which the development will occur. A drainage report shall be submitted by an applicant requesting one of the following:

a. Approval of a subdivision plat, condominium, townhouse, or a lot split.

b. A permit for grading, unless the requirement is waived by the floodplain administrator.

c. A permit to construct right-of-way improvements.

d. A permit to construct any structure, except that a report will not be required if the structure is to be a single-family residential structure to be built without a basement outside of a special flood hazard area and to be located at a site which the floodplain administrator has determined will not be in the vicinity of a watercourse in which the flow of rainfall runoff might be hazardous to the structure or its occupants.

(2) *Drainage characteristics.* Rainfall runoff from storms of all return frequencies should enter and depart from property after its development in substantially the same manner as under pre-development conditions. Any proposals to modify drainage characteristics must be fully justified by engineering data which shall demonstrate to the floodplain administrator that hazards to life and property will not be increased by the proposed modifications. As a minimum, drainage and flood control easements will be dedicated to the city to the extent of the estimated one-hundred-year flood for all watercourses having a capacity of twenty-five (25) cubic feet per second or greater, and the development shall be responsible for the maintenance of the watercourse. Exceptions to this regulation will be for environmentally sensitive lands covered under section 37-42 (14) and other areas covered by master drainage plans, council stipulations or other provisions of this article which insure that the standards established by this section are met. Any proposed modification must be compatible with environmentally sensitive lands criteria.

(3) *Street crossings at natural or man-made drainage channels.*

a. The crossing structure requirements listed herein will normally apply; however, the engineer may depart from these requirements if he can demonstrate to the Floodplain Administrator's satisfaction that they are inappropriate because of the type of development or the nature of the terrain or because the requirements violate environmentally sensitive land ordinances. In extreme cases it may be necessary to allow for the entire channel flow to pass over the road.

1. Local and minor collector streets shall have a culvert or bridge which is capable of carrying all of the peak flow of runoff from a ten-year-frequency storm beneath the roadway and which is also capable of carrying enough of the peak flow of runoff from a twenty-five-year-frequency storm beneath the road so that the portion of the flow over the road is no more than six (6) inches deep.

2. Major collector and major or minor arterial streets shall have a culvert or bridge which is capable of carrying all of the peak flow of runoff from a fifty-year-frequency storm beneath the roadway and which is also capable of carrying enough of the peak flow of runoff from a one-hundred-year-frequency storm so that the portion of the flow over the road is no more than six (6) inches deep.

3. Watercourse crossings for roads shall be designed so that all lots and structures within a development will be accessible from the boundary of that development by at least one (1) route during the period of peak flow of runoff from a one-hundred-year-frequency storm. The boundary shall include any adjacent street or streets. Accessibility will be considered to exist if it can be demonstrated by the engineer that at the time of the peak flow the depth of flow over the road will be no greater than one (1) foot.

b. Regardless of the size of the culvert or bridge, the street crossing should be designed to convey the one-year storm runoff flow under and/or over

the road to the area downstream of the crossing to which the flow would have gone in the absence of the street crossing. The construction of a channel crossing must not cause the diversion of drainage flows except when that diversion is part of an approved plan for modification of drainage patterns.

(4) *Streets as water carriers.* It is expected that streets will carry water from adjacent property and from local areas, but they are not to be used as major water carriers in lieu of natural washes or man-made channels. The maximum depth for water flowing in any street shall be eight (8) inches during the peak runoff from a one-hundred-year-frequency storm. The above requirements imply that in some cases water may flow deeper than a normal vertical curb height and may flow for a short distance over sidewalk or other back-of-curb areas, but the flow of the water shall always be confined to the road right-of-way or to drainage easements. Particular care must be taken in street sag locations to insure that these requirements are met. Catch basins, scuppers, or similar facilities, together with the necessary channels, must be provided at appropriate locations to remove water flowing in the streets so as not to exceed the above described depth limit.

(5) *Design procedures and criteria.* The design procedures and criteria to be used shall be in accordance with those prepared and published by the city.

(6) *Lowest floor elevations in residential structures.*

a. In regulatory floodways, a new residential structure or the substantial improvement of an existing residential structure shall have its lowest floor constructed above the regulatory base flood elevation in the vicinity of the proposed construction site. In the regulatory floodway known as the Indian Bend Wash, a lowest floor elevation must also be above the water surface elevation calculated for floodwater flowing at the rate established by the U.S. Army Corps of Engineers' Indian Bend Wash Project design criteria.

b. In special flood hazard areas, a new residential structure or the substantial improvement of an existing residential structure shall have its lowest floor constructed at least one (1) foot above the base flood elevation.

c. In flood hazard zone AO, a new residential structure or the substantial improvement of an existing residential structure shall have its lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number specified on the FIRM (at least two (2) feet if no depth number is specified).

d. In areas outside of special flood hazard areas which are not in a regulatory floodway, a new residential structure (single- or multi-family) shall be constructed according to one (1) of the two (2) following requirements, except when the conditions in subparagraph f. apply:

1. The lowest floor shall be constructed at an elevation which is above the base flood water surface elevation.

2. The lowest floor may be constructed below the base flood water surface elevation, but flood proofing shall be provided for the structure to an elevation which is at least one (1) foot above the base flood water surface elevation.

e. In areas outside of special flood hazard areas those single-family residential structures which are to be built without a basement and located at a site which the floodplain administrator has determined will not be in the vicinity of a watercourse in which the flow of rainfall runoff might be hazardous to the structure or its occupants, the elevation of the lowest

floor may be established by one (1) of the methods described in the following subparagraphs:

1. If the structure is to be located in flood hazard zone B, C, D or X, the lowest floor may be set at an elevation which is fourteen (14) inches above the highest adjacent grade.

2. The floor elevation(s) chosen for the residence may be indicated on a topographic plan of the building site parcel which shows the construction pad site and any grading proposed on the parcel. This plan must be prepared and sealed by a civil engineer or architect registered as a professional engineer or architect in the state. The floor elevation(s) indicated on the plan are to be elevations certified by the engineer or architect sufficiently high to provide protection during the base flood in the event of flooding caused by a one-hundred-year storm. This method may be appropriate for residences to be built in environmentally sensitive areas and where the floor levels are stepped to conform with natural grade conditions.

f. A residential structure to be built adjacent to but not within a regulatory floodway that will have its lowest floor at an elevation lower than the regulatory base flood elevation must be floodproofed to an elevation at least one and five tenths (1.5) feet above the regulatory base flood elevation.

g. In regulatory floodways and in special flood hazard areas a depressed floor area shall be considered the lowest floor unless there is a basement.

h. In areas outside special flood hazard areas which are not in a regulatory floodway, a depressed floor area does not have to be considered as the lowest floor if there is no door opening directly to the outside which could admit flood water into the depressed floor area and if the depressed area walls and floor are sealed to prevent the infiltration of water into the depressed area.

(7) *Lowest floor elevations in nonresidential structures.*

a. In regulatory floodways and in special flood hazard areas a new nonresidential structure or the substantial improvement of an existing nonresidential structure shall be constructed according to one (1) of the two (2) following requirements:

1. The lowest floor shall be constructed at an elevation which is above the regulatory base flood elevation in the vicinity of the proposed construction site. In the regulatory floodway known as the Indian Bend Wash, a lowest floor elevation must also be above the water surface elevation calculated for floodwater flowing at the rate established by the U.S. Army Corps of Engineers' Indian Bend Wash Project design criteria, or

2. The lowest floor may be constructed below the regulatory base flood elevation, or floodproofing shall be provided for the structure to an elevation which is at least one (1) foot above the regulatory base flood elevation, or two (2) feet above the base flood water surface elevation. In the regulatory floodway known as the Indian Bend Wash, floodproofing shall be provided for the structure to an elevation which is one (1) foot above the water surface elevation calculated for floodwater flowing at the rate established by the U.S. Army Corps of Engineers' Indian Bend Wash Project design criteria.

b. In flood hazard zone AO, a new nonresidential structure or the substantial improvement of an existing nonresidential structure shall be constructed according to one (1) of the two (2) following requirements:

1. The lowest floor (including basement) elevated above the highest adjacent grade at least as high as the depth number shown on the FIRM (at least two (2) feet if no depth number is specified.

2. The lowest floor may be constructed below the minimum lowest floor elevation specified in subparagraph (1), above, but floodproofing shall be provided for the structure to an elevation which is at least as high as the minimum lowest floor elevation determined by the method in subparagraph (1), above.

c. In areas outside of special flood hazard areas, new nonresidential structure or the substantial improvement of an existing nonresidential structure shall be constructed according to one (1) of the two (2) following requirements:

1. The lowest floor shall be constructed at an elevation which is at or above the base flood water surface elevation.

2. The lowest floor may be constructed below the elevation of the base flood water surface elevation but floodproofing shall be provided for the structure to an elevation which is at least as high as the base flood water surface elevation.

d. In flood hazard zones AH, and AO, adequate drainage paths must be constructed to guide floodwaters around and away from the structures.

(8) *Manufactured homes and manufactured home parks.*

a. The new installation of a manufactured home in an area other than a manufactured home park, the construction of a new manufactured home park, or the enlargement of an existing manufactured home park within a regulatory floodway is prohibited.

b. The new installation of a manufactured home or the replacement of an existing manufactured home outside the special flood hazard areas must be done in a manner that assures that the manufactured home is anchored to the earth so as to prevent flotation, collapse or lateral movement in the event of flooding.

c. A manufactured home to be installed in a new location or as a replacement for an existing manufactured home in a special flood hazard area and a manufactured home to be installed as a replacement for an existing manufactured home located within a regulatory floodway shall be anchored to resist flotation, collapse or lateral movement by providing over-the-top and frame ties to ground anchors. The following specific requirements must be met:

1. Over-the-top ties must be provided at each of the four (4) corners of the manufactured home. Manufactured homes fifty (50) feet or more in length must have two (2) additional over-the-top ties per side at intermediate locations, and mobile manufactured homes less than fifty (50) feet in length must have one (1) additional over-the-top tie per side.

2. Frame ties must be provided at each of the four corners of the manufactured home. Manufactured homes fifty (50) feet or more in length must have five (5) additional frame ties per side, and manufactured homes less than fifty (50) feet in length must have four (4) additional frame ties per side.

3. All components of the anchoring system must be capable of resisting forces of at least four thousand eight hundred (4,800) pounds.

4. Any additions to a manufactured home must be similarly anchored.

d. The owners of manufactured home parks that are located within special flood hazard areas shall have evacuation plans prepared indicating alternate vehicular access and escape routes. These plans shall be filed with the Maricopa County Department of Civil Defense and Emergency Services and with the city's field services director.

e. If an existing manufactured home park within a regulatory floodway must undergo repair, reconstruction or improvement of the streets, utility systems and pads at a cost which equals or exceeds fifty (50) percent of the value of the streets, utility systems and pads before the repair, reconstruction, or improvement has commenced, the following requirements must be met:

1. All manufactured homes are placed on pads or lots elevated on compacted fill or on pilings so that the bottom of the structural frame or the lowest point of any attached appliances, whichever is lower, is at or above the regulatory flood elevation.

2. Adequate surface drainage and access for a hauler must be provided.

3. If the stands are elevated on pilings, the lots must be large enough to permit steps, the pilings must have foundations on stable soil and be no more than ten (10) feet apart, and reinforcement must be provided for pilings more than six (6) feet above the ground.

f. A manufactured home which is located in a regulatory floodway or in a special flood hazard area may be replaced by another manufactured home only if:

1. The manufactured home which is to be replaced was not damaged by a flood to more than fifty (50) percent of its value before the flood.

2. The replacement manufactured home is elevated so that the bottom of the structural frame or the lowest point of any attached appliances, whichever is lower, is above the regulatory base flood elevation.

(9) *Reference to regulatory base flood water surface elevations on development plans.* The grading and drainage plans for any development adjacent to a regulatory floodway and the grading and drainage plans for any development which proposes to modify an existing regulatory floodway as a part of the development must indicate the base flood water surface elevations.

(10) *Information pertaining to flood protection to be placed on building plans.* The following subparagraphs describe requirements for information which shall be placed on building plans for both residential and nonresidential structures. Depending upon the type of structure and its location, one (1) or more of the subparagraphs will apply:

a. The proposed elevation of the lowest floor must be shown, regardless of the type of structure or its location.

b. If the structure is to be built in a regulatory floodway or in a special flood hazard area, the base flood water surface elevation must be shown.

c. If the structure is to be built in flood hazard zone AO, the elevation of the highest ground adjacent to the structure and the depth number for the AO zone must be shown.

d. If the structure is to be floodproofed, the elevation to which the floodproofing will be provided must be shown.

(11) *Minimizing potential for flood damage.* Within any area of the city where the floodplain administrator determines that the land is subject to flooding, including, but not limited to, the special flood hazard areas, all development, including substantial improvements to structures, must meet the following requirements:

a. All structures shall be anchored to their foundations to prevent flotation, collapse, or lateral movement.

b. Building construction materials and utility system equipment shall be resistant to flood damage.

c. The construction methods and practices shall be those which minimize flood damage.

d. Multiple occupancy developments such as subdivisions, shopping centers, etc. shall have their public utility systems such as sewer, water, gas and electrical lines and their associated facilities located and constructed in a manner to minimize or eliminate the potential for flood damage. The developments must be constructed with drainage systems which will minimize the exposure to flood damage.

e. New and replacement water supply systems shall be designed and constructed to minimize or eliminate infiltration of floodwater into the systems.

f. New and replacement sanitary sewage systems shall be designed and constructed to minimize or eliminate infiltration of floodwaters into the systems and the discharge of sewage into the floodwaters.

(12) *Storm water storage facilities.*

a. Except as noted below, development of all land within the city must include provisions for the management of stormwater runoff from the property which is to be developed. This management shall consist of constructing storm water storage facilities, which includes detention basins. Stormwater storage facilities will provide reduced peak rates of outlet flow from the developed property onto downstream property in comparison to the peak rates of runoff flow from the same property under natural conditions with no development. As a minimum, all development will make provisions to store runoff from rainfall events up to and including the one-hundred-year two-hour duration event. If a suitable outlet for a detention basin is not available, or if engineering analysis indicates that available outlet systems would be overtaxed by a detention basin outflow, or groundwater recharge is indicated by an approved master groundwater recharge plan a retention basin shall be constructed in lieu of a detention basin.

The requirement for construction of a detention system or a retention basin all types of stormwater storage facilities may be is waived in the following cases:

1. The runoff has been included in a storage facility at another location.

2. An application for a building permit to construct a single-family residential structure.

3. Development adjacent to a floodway or a watercourse drainage channel which has been determined by the project review manager using engineering analyses provided by the development to have

been designed and constructed to handle the additional runoff flow without increasing the potential for flood damage on any other downstream property.

4. Development of a parcel under one-half acre in an area where it can be demonstrated by engineering analyses that no significant increase in the potential for flood damage will be created by the development.

If storage is waived, the development shall be required to contribute to the cost of drainage works on the basis of runoff contribution.

b. Stormwater storage facilities shall be designed and constructed according to the procedures and criteria established by the city including the following:

1. The extent of the area to be used to estimate development storage requirements is the entire proposed development including: streets, alleys, easements and rights-of-way, and one-half or other fractional parts of streets, alleys, easements and rights-of-way.

2. If possible, storage facilities are to be located so they can intercept the flow from the entire development;

3. If portions of the area cannot drain to a primary storage facility then additional facilities are to be added for these areas as approved by the director of project review;

4. Individual lot facilities are prohibited except when a clear unobstructed access from a public rights-of-way, for maintenance purposes, is conveyed by dedication or easement to the city;

5. No stormwater storage facility shall detain or retain standing water longer than thirty-six (36) hours if the basin has not been designed and constructed to be a permanent body of water with appropriate health, safety, and water quality measures for such a body of water.

c. Stormwater storage facilities are to be drained by either controlled bleed-off, discharge pump and, in limited cases, by infiltration or dry well or injection wells. Controlled bleed-off or pumping to a recognized water course is the preferred method. Methods which discharge stored stormwater to the underground must be in accordance with the approved groundwater master plan and approved by the floodplain administrator, the director of project review and the water resources director. In addition, the development must provide the director of project review the state and federal permits required to discharge stormwaters to the underground prior to the issuance of any other development permit.

(13) *Parking in flood hazard areas.* Parking areas shall be permitted within regulatory floodways and special flood hazard areas provided that there will be no overnight parking, that there will be no unattended vehicle(s), and that there will be no obstruction to the natural flow of water.

a. Overnight parking shall be considered to exist when a vehicle is left unattended during the hours from sunset to sunrise.

b. "Unattended" shall mean that the owner or authorized driver cannot reasonably be expected to be available to remove the vehicle before flooding occurs.

Whenever parking is permitted within regulatory floodways and special flood hazard areas, warning signs shall be posted by the parking area owner to indicate that the parking area is subject to flooding.

(14) *Special considerations in environmentally sensitive land areas.*

a. Existing watercourses with a capacity of fifty (50) cubic feet per second or greater, disregarding any estimated peak discharge values, shall be maintained in their natural state unless it is determined that alterations are required to meet other provisions of this ordinance.
b. A drainage and flood control easement will be dedicated to the city which encompasses the area required to convey the base flood in the watercourse described in section 37-42(14)a.
c. Road-wash crossings may disrupt the natural channel beyond the right-of-way limits if engineering investigations determine the need, and are approved by the director of project review.
d. Stormwater storage facilities may not be required in areas zoned for environmentally sensitive development if the city staff determines that such facilities cannot be built without conflicting with the city's environmentally sensitive lands ordinance requirements. If on-site stormwater storage facilities requirements are waived, the development may be required to contribute to the cost of drainage works at another location on the basis of runoff contribution.
e. All drainage structures and detention facilities shall be constructed in such a manner as to minimize the impact on the natural environment, promote recharge when in conformance with the approved groundwater, recharge master plan and, when finished, shall be revegetated to be compatible with nearby natural areas.

(15) *Conformance with state law.* No construction within the limits outlined in this article shall be permitted which would violate prevailing water law of the state, whether statutory or by the courts of this state.

(Code 1972, § 5-615(B); Ord. No. 1993, 2-29-88)

Sec. 37-43. Requirement for certifications and required permits.

(a) Before the city will make a final inspection and grant a utility clearance for a single-family residential structure built in a regulatory floodway, a special flood hazard area or in flood hazard zones A or AO, or before the city will grant a certificate of occupancy for a structure other than a single-family residential structure built in a regulatory floodway, a special flood hazard zone or in flood hazard zones A or AO, the builder must submit certain certificates to the floodplain administrator. The certificates which are required pertain to lowest floor elevations, adjacent ground elevations and floodproofing. The following subparagraphs describe the required certificates.

(b) Certificates pertaining to elevations shall be made by either a civil engineer or land surveyor who is registered to practice in the state.

(c) Certificates pertaining to the adequacy of floodproofing shall be made by a civil engineer or architect who is registered to practice in the state.

(d) A certificate shall be submitted stating the "as-built" elevation (in relation to mean sea level) of the lowest floor of each new structure or substantial improvement to a structure built in a regulatory floodway or in a special flood hazard area. If the lowest floor is below grade on one (1) or more sides, the certificate must also state the elevation of the floor immediately above the lowest floor. This certificate must indicate whether the structure does or does not have a basement. If a structure has been floodproofed, a statement of the elevation to which the structure was floodproofed must be included with this certificate.

(e) For those structures which have been built in a regulatory floodway or in a special flood hazard area and have been floodproofed, a certificate shall be submitted which certifies that the floodproofing methods are adequate to withstand the flood depths, pressures, velocities, impact and uplift forces and other factors associated with the base flood conditions expected at the building site.

(f) Other permits. The city, being a participant in the National Flood Insurance Program and subject to certain federal rules associated with that program; other federal rules and directives, and; subject to the statutes of the state, establishes the following methods to manage those laws and rules when applicable:

(1) *Floodplain and drainage management permit.* Prior to issuance of a building permit, a floodplain and drainage management permit shall be obtained. The application for a permit will be on forms provided by the floodplain administrator and must include, but not be limited to, plans drawn to scale showing the nature, location, dimensions, and elevation of the area in question; existing or proposed structures, fills and excavations, drainage facilities, and; locations of the foregoing. The following information is required to be included in the application specifically:

a. In relation to mean sea level, existing ground elevations and proposed elevation of the lowest habitable floor for all structures including basements;

b. Proposed elevation in relation to mean sea level, to which any structure will be floodproofed;

c. Description of the extent to which any watercourse will be altered or relocated as a result of proposed development; and

d. Any certifications required by this ordinance, state law and federal rules.

(2) *Evidence of state and federal permits.* Prior to start of construction the developer must submit evidence to the director of project review that necessary state and federal permits have been obtained.

(Code 1972, § 5-615(C); Ord. No. 1993, 2-29-88)

Sec. 37-44. Obstruction of waterway--Prohibited.

No person in the city shall either obstruct or reduce the capacity of a watercourse by any use or by filling, dumping, or constructing or by any other means, except as provided in this article.

(Code 1972, § 5-618(A); Ord. No. 1993, 2-29-88)

Sec. 37-45. Same--Removal of obstructions.

(a) Any person who owns, occupies, or leases real property within the city and who obstructs or reduces the capacity of a watercourse other than as provided for in this article, shall be deemed to have created a public nuisance. Such persons shall be notified in writing, either personally delivered or by certified or registered mail, return receipt requested, by the floodplain administrator or his authorized representative, to remove the obstructions or the materials creating the reduction of the capacity of a watercourse within ten (10) days after receipt of said written notice. If the owner does not reside on such property, a duplicate shall also be sent to him at his last known address.

(b) If the owner, lessee, or occupant of such real property, after having been given notice as required above, does not comply and abate such conditions which constitute a public nuisance, the floodplain administrator shall be authorized to abate such condition at the expense of such owner, lessee or occupant.

(c) The floodplain administrator, or his authorized representative, shall prepare a verified statement and account of actual cost of such abatement, including inspection and other incidental costs in connection with such abatement. Said verified statement and account is hereby declared as a debt of such owner, lessee, or occupant. A copy of said statement and account shall be personally delivered or delivered by certified mail, return receipt requested, to the party served with the original notice. The city attorney may institute an action to collect the debts so created in the superior court of the county at any time after delivery of the statement and account.

(d) Within ten (10) days after receipt of the notice described in subsection (a), any person may appeal the city's request by serving written notice of appeal upon the city clerk and shall be entitled to a hearing before the floodplain board on the appeal. In the event such an appeal is filed, all proceedings shall be stayed pending disposition of the appeal. Any

person may also appeal to the floodplain board within ten (10) days after the receipt of the statement and account prepared and served pursuant to subsection (c) the amount of said debt by serving written notice of appeal upon the city clerk which also shall stay all further proceedings pending disposition of the appeal.

(e) When, in the opinion of the floodplain administrator, there is immediate danger to life or property, constituting an emergency, as the result of any obstruction or reduction of the capacity of a watercourse not authorized under this article, he may order the immediate abatement of said condition notwithstanding the notice provisions provided in subsection (a) of this section. The cost of said abatement shall be collected in the same manner as other debts, as provided for in subsection (c) of this section.

(Code 1972, § 5-618(B); Ord. No. 1993, 2-29-88)

Sec. 37-46. Penalties.

Any person, corporation, partnership or association violating or failing to comply with the provisions of this article shall, upon conviction thereof, be guilty of a class 1 misdemeanor, or appropriate actions or proceedings to prevent such acts as may be filed in a court of competent jurisdiction.

(Ord. No. 1993, 2-29-88)

Sec. 37-47. Severability.

This article and the various parts thereof are hereby declared to be severable. Should any provision of this article be declared by the courts to be unconstitutional or invalid, such decision shall not affect the validity of the article as a whole, or any portion thereof, other than the provision so declared, to be unconstitutional or invalid.

(Ord. No. 1993, 2-29-88)

Sec. 37-48. Conflict.

This article shall take precedence over any conflicting ordinance of the city.

(Ord. No. 1993, 2-29-88)

DIVISION 3. DRAINAGE FACILITY DEVELOPMENT FEES

Sec. 37-49. Purpose.

The purpose of this section is to impose development fees to reimburse the city for financing and constructing necessary public drainage and related improvements on lands owned by the State of Arizona within the Reata Pass Wash Desert Greenbelt Improvement District No. 18902, and thus make possible the beneficial use of the property to be developed.

(Ord. No. 3131, § 1, 5-4-98)

Sec. 37-50. Definitions.

Developer means the person that is responsible for creating a demand for drainage facilities.

Development means any proposed improvement to property that creates a demand for the drainage facilities in the area of the Reata Pass Wash Drainage Improvement Program.

Drainage improvement program means those drainage facility improvements set forth in the report.

Person means an individual, corporation, a partnership, an incorporated association, or any other similar entity.

Report means the document entitled Project Cost Estimate and Assessment Methodology dated February 2, 1998, prepared by Simons, Li and Associates.

(Ord. No. 3131, § 1, 5-4-98)

Sec. 37-51. Drainage development fee imposed.

(a) There is hereby imposed within the Reata Pass Wash Desert Greenbelt Improvement DistrIct No. 18902, as depicted on the following map, a drainage development fee on all new development on property that has been owned by the Arizona State Land Department and thus has not paid improvement district assessments in the Reata Pass Wash Desert Greenbelt Improvement District No. 18902.

(b) The developer shall pay to the city the drainage development fee at the time and as a condition of the issuance of building permits for new residential dwelling units or non residential structures.

(Ord. No. 3131, § 1, 5-4-98)

INSET:

Sec. 37-52. Fee amount.

(a) The amount of the development fee shall be three thousand six hundred twenty-five ($3,625.00) per acre, plus the cost of interest on that amount equal to that paid by the city for the general obligation bonds sold to finance the Reata Pass Wash drainage improvements.

(b) The interest cost will be calculated by the city financial services general manager, or his designee, for each development at the time that the development fee is paid, based on the time between the date of the sale of the bonds and the time the fee is to be paid. The city financial services general manager, or his designee, shall provide to the city development services director a schedule for the payment of interest to be used for the purposes of this section.

(c) For development of less than an acre, the amount of the fee shall be proportionate to the acreage involved. In the case of platted properties, the acreage attributable to common areas of the plat shall be allocated proportionally to individual lots within the plat at the time the plat is approved.

(Ord. No. 3131, § 1, 5-4-98)

Sec. 37-53. Payment of the fee.

(1) The fee shall be paid in cash by the developer or the person authorized on his behalf to apply for the issuance of a construction permit, to the city development services director or his designee. No construction permit may be issued by the city until such fee has been paid.

(2) The city may accept the offer by the developer to construct or otherwise provide all or part of the improvements (including the dedication of land) that are contained in the drainage improvements program for the Reata Pass Wash. The construction of the drainage improvements must be in accordance with the engineering and design standards of the drainage improvements program.

(a) The timing of completion, the necessary security for completion of construction, the standards for acceptance of the construction and other construction matters, the legal descriptions of and the allocation of dollar amounts of the value of the fee otherwise due in lieu of construction per development parcel within a larger development, and other such matters as are appropriate shall be the subject of an agreement between the developer and the city. Drainage improvements that are local to the site, and which therefore do not serve the regional purposes of the drainage improvement program are not eligible for such credits.

(b) Thereafter, drainage fees collected pursuant to this division for the property subject to the development agreement shall be refunded by the city to the developer within thirty (30) days of the end of the quarter in which the drainage fees have been paid. Credits shall be payable for a period of up to twenty (20) years from the date the city issues its final acceptance of the drainage improvements pursuant to the development agreement.

(Ord. No. 3131, § 1, 5-4-98)

Sec. 37-54. Drainage development fee fund.

There is hereby established a drainage development fee fund, into which all fees collected pursuant to this section shall be held. Monies withdrawn from this fund must be used for the purpose of providing drainage improvements in the Reata Pass Wash area consistent with the

drainage improvements program as set forth in the report. Interest earned on the monies in the fund shall be credited to the fund.
(Ord. No. 3131, § 1, 5-4-98)

Sec. 37-55. Use of fees.

Fees collected pursuant to this section shall be used solely for the purpose of acquiring, equipping, financing and/or installing improvements to the Reata Pass Wash Drainage Improvements Program and shall not be used for maintenance or operations. At least once each fiscal period, the city manager or designee shall present to the city council a report on the use of the fees collected in the fund for specific drainage improvements in the Reata Pass Wash Drainage Improvement Program.
(Ord. No. 3131, § 1, 5-4-98)

Sec. 37-56. Refund of drainage development fees.

Any funds not expended or encumbered within fifteen (15) years from the date the drainage development fee was paid are refundable upon application of the developer or its successor. Development fees shall be deemed expended or encumbered in the order received by the city on a first-in, first-out basis. Development fees are expended or encumbered when actually paid by the city or when a lease, purchase, construction option or other contract or agreement creating an absolute or continuing obligation to pay and relating to the purposes of this section has been approved by the city council. Written application for a refund shall be made within one (1) year after the date the development fee becomes refundable and shall include documentation sufficient to establish the date and amount of the development fee payment. Development fees for which no timely refund application is made may be expended by the city for the purposes stated in this section.
(Ord. No. 3131, § 1, 5-4-98)

Sec. 37-57. Review of fee.

The drainage development fee adopted by this section shall be reviewed at least once every three (3) years by the city council to determine if any changes to the fee or its administration may be appropriate.
(Ord. No. 3131, § 1, 5-4-98)

APPENDIX B

Application to Release Existing Drainage Easement

_____RE_____

CITY OF SCOTTSDALE
PROJECT REVIEW

Q/S_____

APPLICATION TO RELEASE EXISTING DRAINAGE EASEMENT (D.E.)

For information regarding release of this drainage easement, call (480) 312-7696.

APPLICANT: _____ DATE: _____

ADDRESS: _____

_____

PHONE: _____FAX: _____

In order to begin the easement release process, the following information must be submitted for review by city staff:

1. Evidence of property ownership. (i.e. deed or title report no more than 90 days old)

2. Written explanation of the reason(s) the easement should be released. One of the following conditions must exist and be clearly documented on the Grading and Drainage Plan (G&D) and in the Drainage Report before the release of a drainage easement will be considered:
   a.) Upstream flows have been physically cutoff or diminished.
   b.) More detailed topographic mapping and aerial photography has shown the original easement dedication to be incorrectly located.
   c.) The original hydrology was found to be out of date or in error.
   d.) Internal relocation of the watercourse or drainage facility, as long as it is not a natural wash within the ESL area, that has a capacity of 50 cfs or greater.

3. A statement by a registered civil engineer in the State of Arizona certifying that the abandonment or modification and rededication will not increase flood levels, and will not increase flooding hazards within, upstream or downstream of the altered portion of the watercourse.

4. A legal description of the easement(s) to be released prepared and sealed by a land surveyor registered in the state of Arizona. A graphic of the easement(s) to be released prepared and sealed by a land surveyor registered in the state of Arizona.

5. Copy of the original recorded easement document.

6. Two G&D plans, clearly depicting the existing D.E. and proposed conditions (location of the proposed new easement) and one Drainage Report. Both must be prepared and sealed by a civil engineer, registered in the state of Arizona.

7. If a modification or relocation is proposed the applicant shall provide a legal description and exhibit of the new easement(s), prepared and sealed by a land surveyor registered in the state of Arizona. All documents must meet the Maricopa County Recorders office requirements for recordation.

8. One copy of a combination, one-hundred scale, city LIS aerial photo, with easements, and parcel layers overlaid with subject parcel clearly identified, with as a minimum, all adjacent parcels included.

9. Non-refundable processing fee of $619.00.

_____
Signature of Applicant

NOTES: 1. This is only an application and in no way guarantees the release of any easement(s).
2. City staff reserves the right to request information not listed above in order to make a determination with regard to the release of any easement.

PAGE 2
APPLICATION TO RELEASE EXISTING DRAINAGE EASEMENT

Project Name: _____ _____RE____

This **APPLICATION TO RELEASE EXISTING DRAINAGE EASEMENT** has been submitted for review. If there are outstanding issues or the request is unacceptable, redline the plan and report, make the appropriate comments below and return the entire package to applicant for correction. If the application is in order and the release can be made sign below and pass the package on to the next reviewer.

Civil Plan Reviewer: _____ Date: _____ Phone: _____

Drainage Planning Reviewer: _____ Date: _____ Phone: _____

Review Item	Comments

Signatures for Final Approval:

_____ _____
Development Quality/Compliance Director **Date**

_____ _____
Floodplain Administrator **Date**

APPENDIX C

City of Scottsdale
Section 404 Certification Form

CITY OF SCOTTSDALE SECTION 404 CERTIFICATION FORM

Before the city issues development permits for a project, the developer's Engineer or the property owner must certify that it complies with, or is exempt from, Section 404 of the Clean Water Act of the United States. [Section 404 regulates the discharge of dredged or fill material into a wetland, lake, (including dry lakes), river, stream (including intermittent streams, ephemeral washes, and arroyos), or other waters of the United States.

Prior to submittal of improvement plans to Project Review the form below must be completed (and submitted with the improvement plans) as evidence of compliance.

Certification of Section 404 Permit Status

Owner's Name: _____Phone No. _____

Project Name/Description: _____Case No._____

Project Location/Address: _____

_____

A registered Engineer or the property Owner must check the applicable condition and certify by signing below that:

1. Section 404 does apply to the project because there will be a discharge of dredged or fill material to waters of the U.S., and:

☐ **a: A Section 404 Permit has already been obtained for this project.**

-or-

☐ **b: This project qualifies for a "Nationwide Permit," and this project will meet all terms and conditions of the applicable nationwide permit.**

2. Section 404 does not apply to the project because:

☐ **a: No watercourses or other waters of the U.S. exist on the property.**

-or-

☐ **b: Watercourses or other waters of the U.S. do exist on the property, but the project will not involve the discharge of dredged or fill material into any of these waters.**

I certify that the above statement is true.

_____

Engineer's Signature and Seal, or Owner's Signature Date

_____

Title Company

APPENDIX D

Request for Stormwater Storage Waiver Form

City of Scottsdale Case Numbers

_____PA_____ _____DR_____

_____ZN_____ _____PP_____

_____UP_____

Before the submittal of improvement plans
the developer must obtain approval of this waiver request. Denial may require a revised site plan be submitted to the DR Board.

REQUEST FOR STORMWATER STORAGE WAIVER FORM (Page 1 of 3)

(To be completed by the applicant and submitted to the city for processing)

Waiver Criteria

A waiver is an intentional relinquishment of a claim or right. Before the city can waive some or all of the required stormwater storage at least one of the following city ordinance criteria (**in bold**) must be met. Check the criteria below that applies to this project and provide the engineering analyses that demonstrate that the effect of this waiver will not increase the potential for flooding on any property.

☐ 1. **The runoff has been included in a storage facility at another location.** The developer must demonstrate that runoff from this site will be safely conveyed to the other location through an adequately designed conveyance facility.

☐ 2. **Application is for a building permit to construct a single-family residential structure.**

☐ 3. **Development is adjacent to a watercourse or channel that has been designed and constructed to handle the additional runoff flow without increasing the potential for flood damage to any other downstream property.** The developer must demonstrate that the watercourse has the extra capacity needed to convey the additional runoff.

☐ 4. **The development is for a parcel under one-half acre in an area where it can be demonstrated by engineering analysis that no significant increase in the potential for flood damage will be created by the development.**

☐ 5. **There is a possible conflict with the requirements of the city's Environmentally Sensitive Lands Ordinance** (city staff must make the final determination of this)**.**

I, _____ _____ certify that:
DEVELOPER OR ENGINEER **DATE**

The _____ meets one of the criteria checked above.
PROJECT or DEVELOPMENT NAME

Project Location _____

Applicant Phone ( ) _____

Applicant Mailing Address .

I, _____ _____ believe that the above is correct and the project (**does**) / (**does not**) meet one or more of the waiver criteria.
PROJECT COORDINATION STAFF **DATE**

REQUEST FOR STORMWATER STORAGE WAIVER FORM (PAGE 2 of 3)
(To be completed by applicant and submitted to the city for processing)

IN-LIEU FEE CALCULATIONS

If the city grants a waiver, the developer is required to contribute the following In-Lieu Fees for the cost of drainage facilities as determined in 1, 2, or 3 below. Please check the appropriate box for determining the In-Lieu fee.

Project Name _____

☐ **1. The fee is based on runoff contribution determined as follows:**

_____

_____

_____

The scope and cost of drainage facilities that fees are being contributed towards include the following components:

- _____ $_____
- _____ $_____
- _____ $_____

In-lieu Fees TOTAL **$**_____

☐ **2. The fee is based on what it would have cost to provide the volume of storage being waived. Payment in-lieu of stormwater storage shall include all applicable costs, including but not limited to:**

- Land costs $_____
  (documentation must be provided for verification of land costs)
- Construction costs
  - Excavation and disposal _____
  - Fill _____
  - Inlet and outlet structures _____
  - Overflow structures _____
- Plant salvage and/or revegetation costs _____
- Other costs _____ _____

In-lieu Fees TOTAL **$**_____

IN-LIEU FEES CALCULATED BY _____ _____
DATE

☐ **3. No In-Lieu Fee recommended by city staff.**

Reason _____

RECOMMENDED BY _____ _____
DRAINAGE PLANNER **DATE**

APPROVED BY _____ _____
FLOODPLAIN ADMINISTRATOR **DATE**

REQUEST FOR STORMWATER STORAGE WAIVER FORM (PAGE 3 of 3)

(This page to be completed by city staff)

Project Name _____

CHECK APPROPRIATE BOXES

☐ **Waiver criteria met (specify):** ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

☐ **Waiver approval recommended.**

☐ **Waiver recommended for denial:**

- ☐ None of the waiver criteria met.
- ☐ Downstream conditions prohibit the waiver of any storage.
- ☐ Other: _____

Explain:_____

_____

☐ **Waiver request returned:**

- ☐ Insufficient data provided.
- ☐ Other: _____

Explain:_____

_____

Recommended Conditions of Waiver:

- ☐ All storage requirements waived.
- ☐ Pre development conditions must be maintained.
- ☐ Other: _____

Explain:_____

_____

Above Recommended by: _____ _____

DRAINAGE PLANNER **DATE**

WAIVER: _____ **APPROVED; OR** _____**DENIED , per above conditions:**

By _____ _____

FLOODPLAIN ADMINISTRATOR **DATE**

By _____ _____

DEVELOPMENT QUALITY/COMPLIANCE DIRECTOR **DATE**

Section 2.2

HYDROLOGY AND DRAINAGE REPORT PREPARATION

DESIGN STANDARDS AND POLICIES

REVISED DECEMBER 1999

CHAPTER 2

DRAINAGE

SECTION 2.2
HYDROLOGY AND DRAINAGE REPORT PREPARATION

CONTENTS

SECTION	PARAGRAPH TITLE	PAGE
2-201	**INTRODUCTION**	**1**
	A. General Comments	**1**
	B. Goals and Objectives	**1**
	C. Application and Limitations	**2**
	D. Acknowledgments	**3**
2-202	**DRAINAGE REPORT PREPARATION**	**3**
	A. Requirements for a Drainage Report	**3**
	B. The Purpose of a Drainage Report	**4**
	C. Elements of a Drainage Report	**4**
	Figure 2-202 Outline for Drainage Reports	**5**
	D. On-Site Conditions	**6**
	E. Off-Site Watershed Conditions	**6**
	F. Proposed Drainage Plan	**6**
	G. Conclusions	**7**
2-203	**METHODS FOR ESTIMATING PEAK DISCHARGE**	**7**
	A. Introduction	**7**
	B. Watershed Conditions	**8**
	C. The Rational Method	**8**
	D. The Corps of Engineer's HEC-1 Computer Model	**9**
	E. Pre versus Post Development Discharge Analysis Procedures	**10**
2-204	**CALCULATION OF RUNOFF VOLUMES**	**11**
	A. Standard Formula	**11**
	B. HEC-1 Computer Modeling	**11**
2-205	**MASTER DRAINAGE PLAN CHECK LIST**	**12**
REFERENCES		**14**
APPENDIX A	Steps for Determination of Precipitation Values for Various Duration and Return Periods (Sheets 1 through 3)	**16**
APPENDIX B	Time of Concentration and Travel Time: SCS TR55 Procedure (Sheets 1 through 4)	**20**
APPENDIX C	Precipitation Frequency Maps (Figures 2.2-1 through 2.2-12)	**25**

FIGURES

FIGURE	DESCRIPTION	PAGE
2-202	Outline for Drainage Reports	**5**
2.2-1	2-Year - 6-Hour Precipitation Map	**26**
2.2-2	5-Year - 6-Hour Precipitation Map	**27**
2.2-3	10-Year - 6-Hour Precipitation Map	**28**
2.2-4	25-Year - 6-Hour Precipitation Map	**29**
2.2-5	50-Year - 6-Hour Precipitation Map	**30**
2.2-6	100-Year - 6-Hour Precipitation map	**31**
2.2-7	2-Year - 24-Hour Precipitation Map	**32**
2.2-8	5-Year - 24-Hour Precipitation Map	**33**
2.2-9	10-Year - 24-Hour Precipitation Map	**34**
2.2-10	25-Year - 24-Hour Precipitation Map	**35**
2.2-11	50-Year - 24-Hour Precipitation Map	**36**
2.2-12	100-Year - 24-Hour Precipitation Map	**37**
2.2-13	Rainfall Intensity (I) Values for Use in Rational Method	**39**
2.2-14	Overland Flow Velocities for Upland Method of Estimating Tc	**40**
2.2-15	Flow Velocities in Street Gutters	**41**
2.2-16	Percent of Impervious Area vs. Dwelling Density	**42**
2.2-17	Runoff Coefficients (C) for Use with the Rational Formula	**43**
2.2-18	Hydrologic Design Data Record for the Rational Method	**44**
2.2-19	Runoff Curve Numbers for Urban Areas	**45**
2.2-20	Runoff Curve Numbers for Arid and Semiarid Rangelands	**46**
2.2-21	Runoff Curve Numbers (CN) for Antecedent Moisture Conditions I, II, and III	**47**

SECTION 2.2
HYDROLOGY AND DRAINAGE REPORT PREPARATION

2-201 INTRODUCTION

A. General Comments

This manual section describes the city's policies concerning hydrologic analysis procedures to be used in the city of Scottsdale for the planning and design of drainage and flood control facilities and the preparation of accompanying drainage reports. This manual contains recommended procedures, equations, data and basic assumptions which the planner or designer is generally required to use. If a situation is encountered in which the use of other methods or data in addition to or instead of those presented here are believed to be more appropriate, then city Drainage Planning staff should be consulted and advance approval must be received before using them. When methods or data not described in this booklet are used, the drainage report must include enough information to enable the city Staff to fully evaluate the applicability of the methods and data. If a computer program is used that the city does not have in its software library, the consultant must provide the city with a fully usable copy of the appropriate software, or show adequate comparisons with known procedures.

For flood control projects that are cost-shared with the Flood Control District of Maricopa County, the hydrologic design procedure contained in Vol. 1, Hydrology of the Drainage Design Manual for Maricopa County must be used.

B. Goals and Objectives

The following are the basic goals and objectives used as a guide in preparing this manual:

1. Reflect current requirements of the city floodplain and drainage ordinance, as well as other city ordinances and applicable County, State or Federal regulations.

2. Use the best and most current data and methods available.

3. Provide guidance for hydrologic design methods that:

    a. Reflect commonly accepted state of the art procedures;

    b. Produce safe, reasonable, and reliable results (within an acceptable range of values);

    c. Give flexibility to the designer while at the same time maintains a reasonable level of design consistency;

    d. Are not unnecessarily complex or confusing;

    e. Do not require more detailed or complex input data than is commonly available;

    f. Are technically and legally defensible;

    g. Provide results that are consistent with adjacent jurisdictions, primarily the city of Phoenix, the Flood Control District of Maricopa County (FCDMC) and ADOT.

Because of efforts to meet the above goals and objectives, some options in this manual differ slightly from adjacent jurisdictions, such as the Flood Control District of Maricopa County. However, results do not differ significantly. The sensitivity analysis conducted by several independent sources has verified that results are consistent and are within acceptable ranges of seven other methods and six different envelope curves. In addition, results were found to be comparable to:

- An envelope curve of one hundred year frequency peak discharge values for Maricopa County, prepared by ADWR;

- A preliminary plot of flood frequency data for USGS streamflow data from 64 gages located in the Central Region of Arizona, obtained from ADOT; and

- The sample problem in the FCDMC's Hydrology Manual.

C. Application and Limitations

The purpose of this manual is to provide a means of assisting in the estimation of runoff that might result from a design storm of a given return interval.

Hydrology is a discipline, which requires not only technical competence but also experience and good judgment. The city does not warrant or guarantee the reliability of the hydrologic methods, techniques, and/or parameter values described herein. The user of this manual is expected to validate the reasonableness of the estimated values by applying alternative methods or other appropriate checks, which have been developed for this area.

It is not the intent nor purpose of this manual to inhibit sound innovative design or the use of new techniques. Therefore as mentioned previously, where special conditions or needs exist, other methods and procedures may be used with prior city approval and appropriate documentation to support the validity of the methods.

It is anticipated that, over time, as more data becomes available and/or more appropriate techniques are developed, this manual will be revised. Such revisions will probably take

place annually or as needed. If any inadequacies or inaccuracies are found with any of these procedures, they should be brought to the city's attention immediately.

D. Acknowledgments

The information and procedures that are presented in this manual are mainly the result of previously published efforts of many talented individuals. The author of this manual has made every effort to cite the original authors and researchers whose contributions to this manual, and to the science of hydrology, are gratefully appreciated.

The author of this manual is indebted to the many individuals and organizations, including the staff at city of Scottsdale that have supported this effort through recommendations, technical guidance, encouragement, and review of draft sections of this manual. In particular, the following people have provided immeasurable assistance without which this manual could not have been completed in this form. Those individuals, in alphabetical order, are:

Scott Buchanan, Stanley Consultants, Inc., Phoenix, AZ
Ginny Coltman, Drainage Planner, City of Scottsdale
Greg Crossman, former Drainage Planner, City of Scottsdale
Bill Erickson, Drainage Planner, City of Scottsdale
Richard Hawkins, University of Arizona, Tucson, AZ
Ray Jordan, ADOT, Phoenix, AZ
George Lopez-Cepero, ADOT, Phoenix, AZ
Collis Lovely, Drainage Planner, City of Scottsdale (Primary Author)
Jim Mayer, former City of Scottsdale Employee
James R. Morris, formerly with ADWR, Phoenix, AZ
Herbert B. Osborn, Ph.D., P.E., (retired), Arid Lands Watershed Management Research Unit, U.S. Department of Agriculture, Tucson, AZ
Kenneth G. Renard, Ph.D., P.E., Arid Lands Watershed Management Research Unit, U.S. Department of Agriculture, USDA, ARS, Tucson, AZ
Marilyn Suco, former City of Scottsdale Employee
Robert Ward, Consulting Engineer, Mesa, AZ

2-202 DRAINAGE REPORT PREPARATION

A. Requirements for a Drainage Report

A drainage report is required by the city's Floodplain and Drainage Ordinance to:

- document the effect that a proposed project would have upon stormwater runoff;
- provide data to insure that the project will be safe from flooding; and
- to provide data supporting the design of drainage and flood control facilities.

Each drainage report must consider runoff from storms with a return frequency up to and including a 100-year event. The complexity of the report depends upon the nature of the project and the site on which the project will occur.

A drainage report must be prepared by a qualified professional drainage designer and sealed by a professional Civil Engineer registered in the State of Arizona. The design and drainage report must be prepared in accordance with the city's current Floodplain and Drainage Ordinance; the criteria and direction contained within Sections 2.1 - 2.3 of the Design Standards and Policies Manual; and other applicable city policies and criteria.

An applicant is required to submit a drainage report when requesting one of the following:

- Approval of subdivision plat (preliminary and final).
- A permit for grading, unless the requirement is waived by the Floodplain Administrator.
- A permit to construct right-of-way improvements.
- A permit to construct any structure. (A drainage report is not needed if the structure is a single family residential structure without a basement in Flood Hazard Zones X, B, C, or D, and is located at a site which the Floodplain Administrator has determined is not in the vicinity of a watercourse where the flow of rainfall runoff might be hazardous to the structure or its occupants.)
- Zoning case approval.
- The modification or release of a dedicated drainage easement.
- Development review case approval.
- Lot split.

B. The Purpose of a Drainage Report

The purpose of a drainage report is to document that stormwater runoff has been considered in the planning of each project and that the public and its property will be protected from damage by runoff flows and flooding to the extent of the 100-year flood event. The requirement for this protection not only applies to those who will own and/or use a proposed project but also to those who own or occupy property adjacent to or near enough to be affected by the proposed project.

C. Elements of a Drainage Report

Refer to the following Figure 202-C. “Outline for Drainage Reports”, for specific items that must be included (as applicable) for any type of a drainage report including a master drainage plan. Following the outline is a more detailed description of the various sections of the report. See Section 2-205 for a checklist of Master Drainage Plan submittal requirements.

Each drainage report must have a section which includes a narrative, topographic maps and aerial photographs that describes the location and condition of the property where the project is located (on-site conditions) and the upstream (off-site) watersheds as well as any downstream constraints which affect the property.

An essential part of each report is a topographic map, which shows the location of the project area. As a minimum, the city GIS quarter-section topographic maps with either a 1-foot or 2-foot contour interval must be used as the base map. The map need not be elaborate, but it must show the location of the property with respect to the street system and other features such as the Arizona Canal or the CAP Aqueduct. For the area of the city north of the CAP, a city of Scottsdale 400 scale Existing Drainage Network aerial photograph (the most current available) must accompany each drainage report, which shows existing on-site drainage conditions on the property. South of the CAP, the city’s Stormwater Master Plan and any applicable as-built drawings should be used.

Figure 2-202 OUTLINE FOR DRAINAGE REPORTS

Title Page: Project Name, Type of Drainage Report, or Plan; and Author's Seal and Date

Table of Contents: Author's Seal and Date

1. **Introduction**
   - Project Name and Site Location
   - Project Size and Type of Report
   - Purpose and Objectives

2. **Description of Existing Drainage Conditions and Characteristics**
   - On-site drainage:
     - Existing drainage network, patterns, and watershed and floodplain boundaries.
   - Off-site watershed:
     - Existing and future conditions and the drainage network entering the project site.
   - Relation to adjacent drainage plans and projects.
   - Flood Hazard Zones on the property, FIRM maps.

3. **Proposed Drainage Plan**
   - General description of proposed drainage system and components
   - Stormwater storage requirements:
     Volume required, volume provided, and basin locations.
   - Pre- and post-runoff characteristics at concentration points exiting the property.
   - Proposed drainage structures or special drainage facilities:
     Include design criteria and probable effect on the existing upstream and downstream drainage system.

4. **Special Conditions**- Stipulations, 404 Permit, NPDES

5. **Data Analysis Methods**
   - Hydrologic procedures and assumptions.
   - Hydraulic procedures, methods, and assumptions.
   - Stormwater storage calculation methods and assumptions.

6. **Conclusions**
   - Overall Project
   - Project Phasing

7. **References**

Appendices - Hydrologic and Hydraulic Data and Calculations
Floppy Disks - HEC-1; and HEC-2 or HEC-RAS Input Files
Exhibits
- *Vicinity Map*
- *Existing Conditions*
  - *Off-Site Watershed Topographic Map*
  - *Existing On-site Drainage Topographic Maps*
    - *Minimum of city GIS 2-foot contour topographic mapping and city 800 scale aerial photo.*
- *Proposed On-site Drainage Plan*
  - *Scale appropriate to type of drainage report and size of the project.*

D. On-Site Conditions

This section of the report should include the following basic information about the property, as applicable:

- Narrative description of: existing drainage patterns, natural and constructed watercourses, open channels, storm drains, dams, or storage basins; and an existing conditions map showing all the above plus the 100-year floodplain for all washes with a capacity of 50 cfs or greater in ESL areas of the city and 25 cfs in the remainder of the city.

- Description of the existing ground cover conditions and how the identification of the SCS hydrologic soil group(s) or appropriate Green-Ampt soil characteristics were identified for the property.

- Description of any existing development located on the property and how it affects drainage.

E. Off-Site Watershed Conditions

Watersheds above the project area from which stormwater runoff enters or affects the project's property must be delineated on topographic maps. These maps should be prepared at a scale that will clearly show the drainage areas so watershed boundaries can be drawn with accuracy. Contour lines should be shown on the maps at an interval appropriate to the ground slope and complexity of the terrain. Recent photographs of every part of the city are available at scales 1 inch = 100; 400; and 800 feet. The most current aerial photograph(s) must be included in each drainage report that shows the off-site watershed areas and adjacent properties in relation to the project site.

- The section should include:

- Existing upstream and downstream drainage patterns and a description of how existing developments on adjacent properties affect drainage on the project area.

- A description of the ground cover conditions assumed and how the SCS hydrologic soil group(s) or Green Ampt soil classes were determined for the offsite watersheds.

- A description of fully developed offsite conditions in accordance with the approved Land Use Plan for Scottsdale as approved by the City Council, and a discussion of any potential adverse affects on this project.

- A description of any proposed projects or developments, that have approved designs, that will affect property. Review approved drainage plans and reports for development or CIP projects that may impact drainage on the property.

- Describe any other unusual conditions, which would significantly affect drainage on the property.

F. Proposed Drainage Plan

The section must describe how the proposed project will manage stormwater runoff and the sequence of infrastructure installation and any planned phasing of the project.

- <u>Depicting pre- and post-project topography:</u> Prior to the project or development of a piece of property, topographic conditions exist on the property which will influence flow of drainage water which enters the property from watersheds above it or which

originates on the property. When the project has been completed, certain topographic changes will have occurred which influence the drainage and the resulting time of concentration. The drainage report must include sufficient pre- and post-project topographic information to demonstrate the effects of the project. This information should be depicted on contour maps. In addition to showing the developer's property, these maps should also show enough of the adjacent property to give a clear picture of what exists there that will affect drainage. Information about adjacent property, such as significant differences in elevation, walls, drainage structures, buildings with their floor elevations, etc. must be included.

- Pre- and Post-Project Stormwater Runoff: The amount and type of stormwater runoff that would exit the property prior to the project and after the project must be depicted for a 2-year, 10-year and a 100-year storm. If, as a result of the project, drainage flows will be reduced by facilities such as stormwater storage basins, the effect of these facilities on flows exiting the property should be described and depicted on appropriate maps. Construction of roads, parking areas, roofs, channels, and other project features generally increases the runoff volume and peak discharge and reduces the time of concentration.

- The Basis of Design for Drainage and Flood Control Facilities: Summarize the design criteria used and provide a brief description of the type of facility, its purpose, and the design approach used. Any sketches, data, and calculations that support the design and the criteria for the selection of materials and the location should be included in an appendix. (See Section 2.1 *Policies* and Section 2.3, *Hydraulics* for policy guidance and design criteria.)

- The Basis for Selecting Elevations for the Lowest Floor: Elevations must be selected to provide protection from flooding. The basis for the selection of a floor elevation or the design of protection for the interior of the building must be clearly presented (see Sections 2.1 and 2.3). Supporting documentation should be included in an appendix.

G. Conclusions
- Overall Project
- Description of the Provisions for Project Phasing:
  The phasing of parcels and the timing of the installation of drainage facilities should be described. Any project, particularly a large one, may have interim stormwater runoff, flooding, and erosion problems that would not exist after the project has been completed. The report must indicate how the phasing will occur, what interim drainage problems are anticipated, and what interim measures will be taken to protect against them.

2-203 METHODS FOR ESTIMATING PEAK DISCHARGE

A. Introduction
Two methods are defined for the determination of peak discharges: the Rational Method, and rainfall-runoff modeling using the U.S. Army Corps of Engineers' HEC-1 Flood Hydrograph Package. For small watersheds less than 160 acres, the Rational Method is acceptable. For smaller watersheds that are non-uniform, irregular in shape, or when routing of flows is necessary, or for areas larger than 160 acres, HEC-1 modeling is required. Staff must approve of optional computer programs prior to preparation of the report.

The city's procedures are similar to those contained in the FCDMC's Hydrology Manual for Maricopa County. Scottsdale uses a six-hour duration storm event. However, Scottsdale uses the original source data, NOAA Atlas II for precipitation data, and the storm distribution pattern built in HEC-1. A detailed analysis of various methodologies conducted by Robert L. Ward tested and verified that the results using the following HEC-1 methods are comparable to those of the FCDMC and others.

B. Watershed Conditions

When a peak runoff flow rate is determined to size a drainage facility, or to determine the lowest floor elevation to protect a structure from flooding, the flow rate must be estimated by considering the watershed conditions that would produce the greatest peak flow rate. Usually a watershed which is fully developed in accordance with the city's General Plan Land Use Element will produce such conditions but other interim conditions such as the watershed's current state or its development in accordance with existing zoning may produce a greater peak flow rate and must be considered.

SPLIT-FLOW CONDITIONS:

Other considerations in north Scottsdale are upstream split flow channel conditions. These splits in the alluvial channels and highly erodible soils typical of north Scottsdale are generally unstable and very unpredictable. In setting finished floor elevations regarding upstream splits, it should be assumed that 100% of the flow could go either direction in any given flood event. For infrastructure design, the estimate of the actual split based on a hydraulic analysis of the current channel cross sections must include a minimum safety factor of 30 percent. If the designer feels that there are extenuating factors affecting the stability of the split in question the safety factor should be increased accordingly. The report should also include a brief description of all the assumptions made regarding watershed conditions used in the model or equations to calculate the peak flow rates.

C. The Rational Method

The Rational Method is limited to use on small, uniform, regularly shaped watersheds less than or equal to 160 acres in size.

$$Q = C\,I\,A\,f$$

Q = the instantaneous peak flow or discharge rate in cubic feet per second
C = a dimension-less runoff coefficient (Figure 2.2-17)
I = rainfall intensity in inches per hour

Caution

Rainfall Intensity is a rate, not the total depth of rainfall for a given duration storm

A = contributing drainage or watershed area in acres
f = frequency adjustment factor (per FCDMC, Hydrology Manual, 6-92)

The Rational Method only generates a peak discharge flow rate. It cannot be used to determine runoff volumes. HEC-1 is recommended if runoff volume is needed. Calculations must be submitted using Figure 2.2-18, or a similar form containing the same data and information. Frequency adjustment factors are included in Figure 2.2-18.

PRECIPITATION

Precipitation input is "*rainfall intensity,*" **I**. It is obtained directly from Figure 2.2-13, which applies citywide. The time of concentration, **Tc**, is all that is required to determine **I** from Figure 2.2-13.

TIME OF CONCENTRATION

Time of concentration, **Tc**, is the total time of travel from the most hydraulically remote part of the watershed to the concentration point of interest. Figures 2.2-14 and 2.2-15 can be used to estimate flow velocity for calculating the time of travel. Procedures from Chapter 3 of SCS's TR-55, contained in Appendix B, are recommended for determining **Tc**. The minimum time of concentration that should be used is five minutes.

Do not add a standard set amount of time to the estimated Tc for lot runoff delay (such as 5 or 10 minutes). Natural land slopes are too variable in Scottsdale to add a set amount of time for lot runoff. Analyze delays from lot runoff as overland flow or sheet flow. Use the size and slope of the lot to determine the actual time of travel across the lot.

RUNOFF COEFFICIENTS

Figure 2.2-17 must be used to obtain the runoff coefficients, or **C** values. Composite **C** values for the appropriate zoning category or weighted average values calculated for the specific site, are both acceptable approaches.

CAUTION

HEC-1 computer program or equivalent computer programs should be used instead of the Rational Method on areas greater than 40 acres in size if the watershed is non-uniform or irregular in shape. HEC-1 or its equivalent must be used if the routing of flows is necessary.

D. The Corps of Engineer's HEC-1 Computer Model

HEC-1 procedures are applicable for any watershed area over 40 acres and up to 100 square miles in size. HEC-1 is required for analyzing drainage areas over 160 acres in size. **HEC-HMS is not an acceptable substitute for HEC-1**. Minimum required submittals when using HEC-1 are:

1. A printout of the input data,
2. A schematic (routing) diagram of the stream network,
3. The runoff summary output table, and
4. A diskette with the input file(s).

PRECIPITATION The required precipitation input is the six hour duration storm using the model's built in hypothetical storm distribution pattern and is input using the PH record. Precipitation values are to be obtained from the Isopluvial maps (Figures 2.2-1 through 2.2-2) for the specific frequency desired. The 5, 15, 60, 120, 180, and 360 (6-hour) minute duration rainfall amounts should be calculated per the formula and procedures in Appendix A.

INFILTRATION: Infiltration or soil losses can be determined using SCS Runoff Curve Numbers (use Figures 2.2-19 and 2.2-20) or Green and Ampt (G&A) procedures per FCDMC Hydrology Manual. Use the most recent published SCS soil survey maps of the area to determine the hydrologic soil group or surface soil texture for the G&A procedures. Use USDA Soil Conservation Services maps, Soil Survey of Aguila-Carefree Area, Parts of Maricopa and Pinal Counties, or the Soil Survey of Eastern Maricopa and Northern Pinal Counties, Arizona, depending on what part of the city you are located. The simplified map in Figure 2-14 of the previous Design Standards and Policies Manual is not sufficiently detailed and is superseded by the above soil maps.

RUNOFF CURVE NUMBERS: When using runoff curve numbers (ROCN) within the city of Scottsdale one must:

- Assume poor hydrologic condition and desert shrub cover type for natural undisturbed desert conditions in Figure 2.2-20.

- For lawns, golf courses, and other grassed open space areas, assume good condition in Figure 2.2-19 to determine the ROCN, then adjust the ROCN to antecedent moisture condition III (use Figure 2.2-21).

- For developed conditions, increase the percent impervious on the LS card without changing the ROCN (except in the case of grassed areas, in which the curve number should be adjusted up according to the above). Obtain the percent impervious from Figure 2.2-16 for residential districts or use actual amount. For commercial or industrial districts use the actual or estimated percent impervious. A minimum of 85 percent for commercial and 72 percent industrial must be used.

HYDROGRAPH GENERATION Small basin or sub-watershed hydrographs can be generated using the SCS dimensionless unit hydrograph procedure or kinematic wave method as described in the HEC-1 Users Manual. Computation time interval should generally range from 5 to 1 minute.

TIME OF CONCENTRATION (**Tc**) Use the estimated time of travel, from the most hydraulically remote part of the watershed to the concentration point. The procedures from Chapter 3 of SCS's TR-55 (contained in Appendix B) are recommended for obtaining **Tc**.
CAUTION: For the SCS method, remember TLAG on the UD input card is equal to 0.6(**Tc**), not **Tc**.

CHANNEL ROUTING Channel routing should use the Normal Depth (Modified Puls), eight point routing procedure as described in the HEC-1 Users Manual.
CAUTION: For the 1990 version of the HEC-1 program, do not use the kinematic wave method with the multi-ratio JR cards because the hydrographs do not combine properly. For the 1988 version, do not use JD cards with the Green-Ampt method, as errors will result. HEC-1 versions prior to the 1988 version will not be accepted.

E. Pre- versus Post-Development Discharge Analysis Procedures
The following HEC-1 analysis procedures must be used when it is necessary to establish a comparison of pre-development to post-development discharge (runoff) conditions.

1. The HEC-1 modeling procedures described in Section 2-203 must be followed.

2. Reflect fully developed conditions per section 2-203C.3, by:

   a. Increasing the percent impervious on the LS card to reflect the amount of impervious surfaces that will exist under fully developed conditions.

   b. Recalculate the time of concentration (**Tc**) based on the proposed drainage system, after full development. Normally there should be a reduction in **Tc** after development.

3. The existing condition model must be sub-divided, as necessary, to create concentration points which will match the subwatershed areas above each proposed storage facility under fully developed conditions.

4. Each separate storage facility proposed must be modeled as it will physically exist under fully developed conditions with appropriate routing and combining operations through each basin and through the entire watershed. The modeling of storage capacity provided, as one hypothetical reservoir at the outlet with all the upstream storage arbitrarily combined at this one location, is not acceptable.

5. As a minimum the 2, 10 and 100-year frequency events must be analyzed.

6. Comparison of discharge values for existing and post development conditions must be made at concentration points just downstream from each proposed storage facility; other critical locations such as road crossings; and at points where flows exit the proposed development.

2-204 CALCULATION OF RUNOFF VOLUMES

The only method for the determination of the required volume of stormwater storage is the standard formula described in Section 2-204 A. HEC-1 modeling can be used for storage basin design and analysis (see Section 2-204 B) or if a pre-versus post volume difference is needed. The current citywide ordinance requirement is to provide on-site storage for runoff from the 2-hour 100-year frequency event, as described below, and in Section 2.1 of the Design Standards and Policies Manual.

A. Standard Formula

Vr = (P/12) AC

Vr = Required storage volume in acre-feet.
P = Precipitation amount = 2.82 inches. The average depth of the 100 year 2 hour duration rainfall.(applies citywide).
A = Area in acres; the developed portion of the entire site in acres, to the centerline of adjacent streets, on which any man-made change is planned, including, but not limited to: construction, excavation, filling, grading, paving, or mining. See the Stormwater Storage Policy Statement in Section 2.1.
C = Runoff coefficient; Rational Method values from Figure 2.2-17, either composite or weighted can be used.

B. HEC-1 Computer Modeling

The HEC-1 model, or similar computer program, is not to be used to determine the ordinance required 2-hour 100-year stormwater storage runoff volumes. The HEC-1 program is, however, recommended for use in storage routing for storage basin design and analysis purposes; or for a pre versus post analysis (which must use a six hour storm and procedures described under Section 203). Use modified Puls level pool routing option in HEC-1 for hydrograph routing through storage basins and lakes. For permanent lakes, assume no available storage below the normal water surface elevation.

CAUTION: Do not use the built-in orifice equation in the HEC-1 model because errors can result. It is necessary to build a stage discharge table and input to the model.

2-205 MASTER DRAINAGE PLAN CHECK LIST

This checklist is to assist in submitting a complete and successful Master Drainage Plan to the city of Scottsdale. The following items on this list are required with the submittal.

Master Plan #_____ --MP-- _____ Title:_____

PART I - GENERAL REQUIREMENTS

1. Master Drainage Plan Check List (this list).
2. Master Plan Review Fee: $_____.
3. Six (6) copies of the approved Master Drainage Plan Report, two (2) copies to initiate the review process.

PART II - REQUIRED PLANS AND RELATED DATA

Each Master Drainage Plan Report submittal shall include the following items:

DESCRIPTION OF PROJECT

1. Project Name.
2. Location.
3. Description of the type and scope of project.
4. Size.
5. Vicinity Map.

DESCRIPTION OF ON-SITE DRAINAGE CHARACTERISTICS

1. COS Drainage Aerial Photograph 400 scale, (clearly identifying project location) - 30" x 30".
2. Topographic Map, 100 scale, one foot contour interval, 24" x 36".
3. Show key concentration points with Q100 year peak discharges.
4. Show watershed boundaries.
5. Show floodplain boundaries for all washes were Q100 year is 250 cfs or greater.
6. Describe existing onsite drainage characteristics.

DESCRIPTION OF OFF-SITE WATERSHED CONDITIONS

1. Aerial photos, city 800 scale.
2. City GIS 2 ft. contour interval topographic maps.
3. Show drainage concentration points entering and leaving the project site.
4. Describe existing drainage conditions and characteristics and any future planned projects.
5. Describe relation to existing Master Plans and adjacent drainage plans.

PROPOSED MASTER DRAINAGE PLAN

1. Proposed on-site drainage plan: Scale one inch equals 100 feet, one foot contour intervals, 24" x 36".
2. Site development plan 24" x 36".
3. Show peak discharge values Q100 year at key concentration points.
4. Show and describe major drainage structures or special drainage facilities needed.
5. Describe proposed drainage system and components, including design criteria and probable effect on the existing upstream and downstream drainage system.

6. Describe ordinance stormwater requirements, volume required, volume provided, and location.

DATA ANALYSIS METHODS

1. Describe hydrologic procedures and assumptions.
2. Describe hydraulic procedures, and assumptions.
3. Describe stormwater storage calculation methods and assumptions.

DATA AND CALCULATIONS

1. Peak flow calculations (Figure 2.2-18 data records; or HEC- I printouts).
2. Channel design calculations.
3. Culvert design calculations.
4. Floodplain calculations (Manning's or HEC-2 printouts).
5. Storage volume calculations.
6. Retention/detention basin inflow-outflow analysis and design calculations.

PART III - MASTER DRAINAGE PLAN REPORT FORMAT

The following chapters should include the data and exhibits listed above in Part II. See 2-202 and 2-205 in section 2.2 of the city's Design Standards and Policies Manual for additional guidance for Report Preparation.

1. Project Description.
2. On-site Drainage Characteristics.
3. Off-site Watershed Conditions.
4. Proposed Master Drainage Plan.
5. Project Phasing Plan.
6. Data and Calculations (Appendixes).

APPENDIX

Data and Calculations (as applicable):

- Peak Flow Calculations (Figure 2.2-18, Data Records; or HEC-1 printouts)
- Channel Design Calculations
- Culvert Design Calculations
- Floodplain Calculations (Manning's, HEC-2, or HECRAS printouts)
- Storage Volume Calculations
- Retention/ Detention Basin Inflow-Outflow Analysis and Basin Design Calculations.
- Street Capacity Calculations
- Curb Opening, Catch Basin Calculations
- Storm Drain Calculations
- Sediment and Scour Calculations
- Rip-Rap Sizing
- Finished Floor Elevations:
  Basis for setting finished floor elevations:
  - In relation to designated floodplains or adjacent washes;
  - In relation to natural or adjacent ground elevation if in an AO Zone or not in floodplain.
- Erosion/ Sediment Control Plan
- Soils and or Geologic Analyses
- Special Problem Calculations

REFERENCES

Arizona Department of Water Resources, Engineering Division, Floodplain Management Section, "FLOOD HAZARD IDENTIFICATION FOR RIVERINE TYPE FLOODING IN ARIZONA," SSA-2-91 (Draft), Phoenix, 1990.

Arkell, E.E., and Richards, F., "SHORT DURATION RAINFALL RELATIONS FOR THE WESTERN UNITED STATES," Conference on climate and Water Management - A Critical Era and Conference on the Human Consequences of 1985's Climate, August 4-7, American Meteorological Society, pp. 136-141, 1986.

Boughton, Walter C., Kenneth G. Renard, and Jeffrey J. Stone, "FLOOD FREQUENCY ESTIMATES IN SOUTHEASTERN ARIZONA," Journal of Irrigation and Drainage Engineering, Vol. 113, No. 4, Nov. 1987, pp. 469-478.

City of Scottsdale, "THE FLOODPLAIN AND DRAINAGE ORDINANCE, SCOTTSDALE, AZ," City of Scottsdale, Chapter 37, Sup. No. 3, Code 1972§ 5-611; Ord. No. 1993, 2-29-88.

Dawdy, David R., "THE SORRY STATE OF FLOOD HYDROLOGY IN THE ARID SOUTHWEST," Hydraulics/Hydrology of Arid Lands, New York, N.Y., American Society of Civil Engineers, 1990, pp. 743-748.

DeVries, J.J., T.V. Hromadka II, "COMPARISON OF STREAMFLOW ROUTING PROCEDURES FOR HYDROLOGIC MODELS," Computational Hydrology 87, Mission Viejo, CA, Lighthouse Publications, 1987, pp. C-26 - C-33.

Flood Control District of Maricopa County, "EVALUATION OF HYDROLOGIC AND HYDRAULIC METHODS - PRELIMINARY DRAFT," Maricopa Co., AZ, Sept. 31, 1985.

Flood Control District of Maricopa County, "DRAINAGE REGULATION FOR THE UNINCORPORATED AREA OF MARICOPA COUNTY, ARIZONA, PHOENIX, AZ," Adopted 9-26-88, effective 10-5-88.

Flood Control District of Maricopa County, "FLOODPLAIN REGULATIONS FOR MARICOPA COUNTY, Adopted 8-4-86, Amended through 9-3-91.

Flood Control District of Maricopa County, "UNIFORM DRAINAGE POLICIES AND STANDARDS FOR MARICOPA COUNTY, AZ, PHOENIX, AZ," The FCDMD, Approved 4-20-87, Resolution FCD 87-7.

Hawkins, Richard H., "ASYMPTOTIC DETERMINATION OF CURVE NUMBERS FROM RAINFALL RUNOFF DATA," Watershed Planning and Analysis in Action, Durango, Colo., 1990, pp. 67-76.

Hogan, Daniel H., "COMPUTER-ASSISTED FLOODPLAIN HYDROLOGY AND HYDRAULICS, New York, McGraw-Hill, Inc. 1989.

Hromadka II, T. V., "COMPLEX WATERSHED MODELS IN FLOOD CONTROL: QUESTIONS OF CREDIBILITY," Computational Hydrology 87, Mission Viejo, CA, Lighthouse Publications, 1987, pp A-34 - A-37.

Kirpich, Z.P., "TIME OF CONCENTRATION OF SMALL AGRICULTURAL WATERSHEDS," Engineer's notebook, ASCE.

Miller, J.F., R. H. Frederick, and R.J. Tracey, "PRECIPITATION FREQUENCY ATLAS OF THE WESTERN UNITED STATES, VIII: ARIZONA: NOAA ATLAS 2," Silver Spring, Maryland, National Oceanic and Atmospheric Administration, 1973.

Osborn, Herbert B., and Kenneth G. Renard, "RAINFALL INTENSITIES FOR SOUTHEASTERN ARIZONA," journal of Irrigation and Drainage Engineering, ASCE, Vol. 114, No. 1, Feb. 1988.

Reich, B.M., D.G. Renard and F.A. Lopez, "ALIGNMENT OF LARGE FLOOD PEAKS ON ARID WATERSHEDS," Hydraulics /Hydrology of Arid Lands, New York, N.Y. ASCE, 1990, pp. 477 - 482.

Sabol, George V., J.M. Rumann, Davar Khalili, and Stephen D. Waters, "DRAINAGE DESIGN MANUAL FOR MARICOPA COUNTY, ARIZONA, VOLUME I - HYDROLOGY," Special Projects Branch, Hydrology Division, Flood Control District of Maricopa County, Arizona, June 1, 1992.

U.S. Army Corps of Engineers, "HEC-1 FLOOD HYDROGRAPH PACKAGE USERS MANUAL," Davis, California, Hydrologic Engineering Center, September 1990.

U.S. Department of Agriculture, Soil Conservation Service, "URBAN HYDROLOGY FOR SMALL WATERSHEDS, TECHNICAL RELEASE 55, 2ND ED., 21 O-VI," Washington, D.C., Engineering Division, June 1986.

Ward, Robert L., "SENSITIVITY ANALYSIS OF REATA PASS HYDROLOGY SCOTTSDALE, ARIZONA, PHOENIX, AZ," Water Resources Associates, Inc., for the City of Scottsdale, Feb. 3, 1992.

Wisler, C.O., E.F. Brater, "HYDROLOGY," New York, John Wiley and Sons, Inc., 1967.

Wu, Jy S., Fred C.J. Wu, "APPLICATION OF MICROCOMPUTER PROGRAMS FOR PEAK DISCHARGE CALCULATION," Computational Hydrology 87, Mission Viejo, CA, Lighthouse Publications, 1987, pp. A-21 - A-24.

APPENDIX A

Steps for Determination of Precipitation Values for Various Durations and Return Periods

APPENDIX A

Steps for Determination of Precipitation Values for Various Durations and Return Periods.

Step 1: From the precipitation maps, Figures 2.2-1 through 2.2-12, determine the precipitation values for the six and twenty four hour duration storms for return periods of 2, 5, 10, 25, 50, and 100 years. Tabulate these values in Table 1 in the column headed "Map Values."

Table 1

Return Period (Years)	Precipitaton Values (Inches)			
	6 hour duration		24 hour duration	
	Map Value	Corrected Value	Map Value	Corrected Value
2				
5				
10				
25				
50				
100				

NOTE: There is a possibility of making an error while reading the maps because: (1) a site is not easy to locate precisely on a series of 12 maps, (2) there may be some slight registration differences in printing, and (3) precise interpolation between isolines is difficult. In order to minimize any errors in reading the maps, these values should be plotted on the diagram "Precipitation Depth versus Return Period," Appendix A, Figure 1.

Step 2: Plot these values on the diagram "Precipitation Depth versus Return Period," Appendix A, Figure 1.

Step 3: Draw a line of best fit through the 6 hour precipitation values and another line through the 24-hour precipitation values.

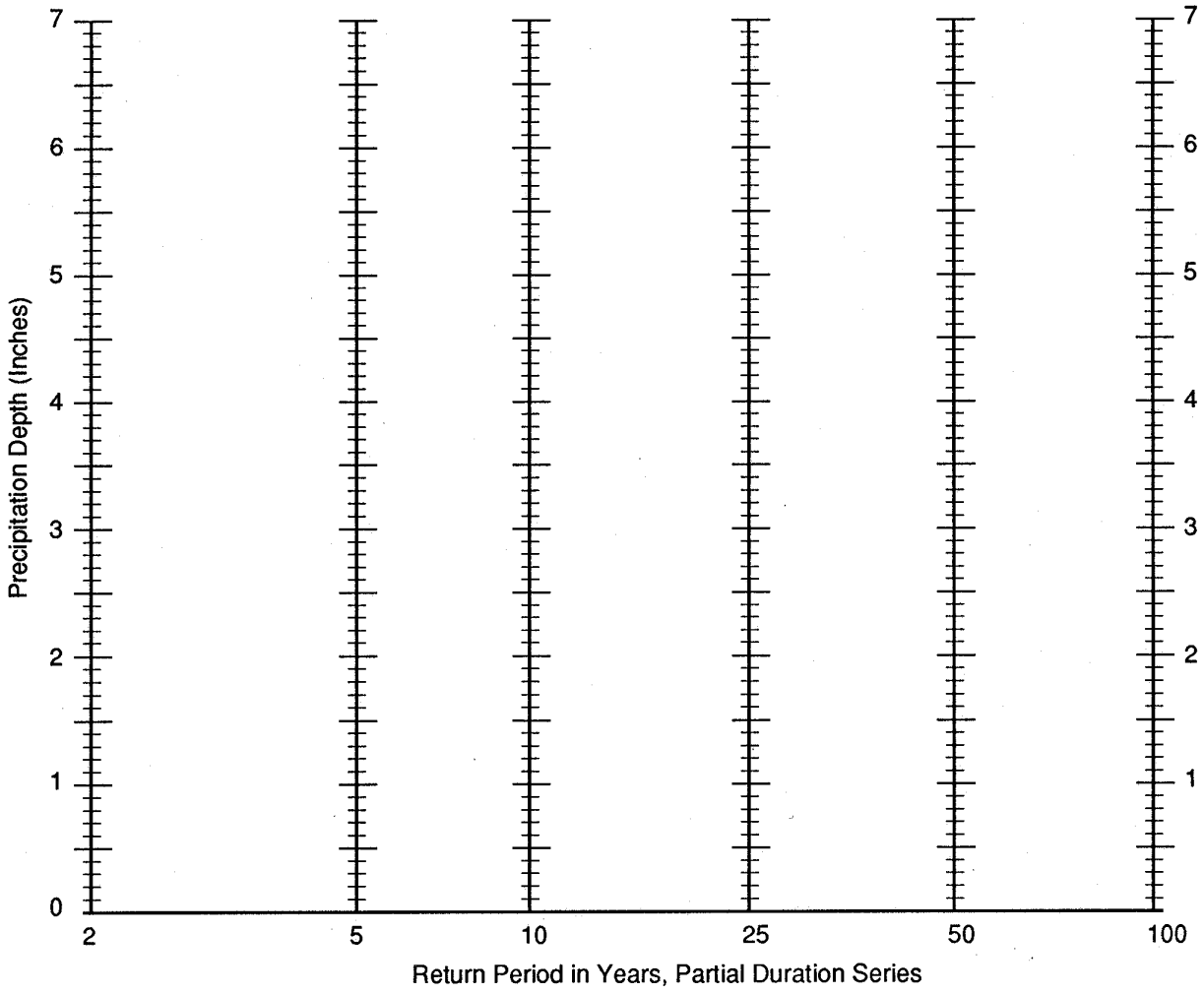
Step 4: Tabulate the values represented by the lines of best fit, obtained in Step 3, in the column of Table I entitled "Corrected Value."

NOTE: The 1 hour precipitation value is needed to determine the 2 and 3 hour values as well as the 5, 10, 15, and 30 minute values.

Sheet 1 of 3
(Source: Addendum to "Hydrologic Design for Highway Drainage in Arizona," April 1975, and ADOT, April 17,1987)

APPENDIX A (con't)

Figure 1. Precipitation Depth versus Return Period for Partial Duration Series



Project: _____ Station: _____

Sheet 2 of 3

(Source: Addendum to "Hydrologic Design for Highway Drainage in Arizona," April 1975)

APPENDIX A (con't)

Steps for Determination of Precipitation Values for Various Durations and Return Periods.

Step 5: Using the 6 and 24 hour values for the 2 year and 100 year return periods, from Table 1 (corrected values), solve the following equations to determine the 1 hour values:

$$Y_2 = -0.011 + 0.942(X_1^2 / X_2)$$

$$Y_{100} = 0.494 + 0.755(X_3^2 / X_4)$$

Where: Y_2 = 2 year 1 hour value
Y_{100} = 100 year 1 hour value
X_1 = 2 year 6 hour value from Table 1
X_2 = 2 year 24 hour value from Table 1
X_3 = 100 year 6 hour value from Table 1
X_4 = 100 year 24 hour value from Table 1

Step 6: To determine 1 hour precipitation values for the other return periods, first plot the 2 year 1 hour value and the 100 year 1 hour value on Figure 1. Connect the two points by a straight line. The values on this line will give the 1 hour precipitation values for the various return periods.

Step 7: To determine the 2 and 3 hour precipitation values, use the following formula with data far the appropriate return period from Table 1 (corrected values):

$$P_{2\ hour} = 0.341\ (P_{6\ hour}) + 0.659\ (P_{1\ hour})$$
$$P_{3\ hour} = 0.569\ (P_{6\ hour}) + 0.431\ (P_{1\ hour})$$

Step 8: The 12 hour precipitation value for any return period is determined by the following equation:

$$P_{12hr} = 0.49\ P_{24\ hour} + 0.51\ P_{6\ hour}$$

Step 9: To determine precipitation values for durations less than 1 hour for any return period, multiply the 1 hour depth by the following ration:

Duration (minutes) :	5	10	15	30
Ratio to one hour*:	.34	.51	.62	.82

*From Arkell and Richards (1986) per FCDMC's Hydrology Manual (9-90)

Sheet 3 of 3
(Source: Addendum to "Hydrologic Design for Highway Drainage in Arizona," April 1975, and ADOT April 17,1987)

APPENDIX B

Time of Concentration and Travel Time: SCS TR55 Procedure

APPENDIX B

Time of Concentration and Travel Time: SCS TR55 Procedure

Introduction

Travel time (Tt) is the time it takes water to travel from one location to another in a watershed. Tt is a component of time of concentration (Tc), which is the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. TC is computed by summing all the travel times for consecutive components of the drainage conveyance system. Tc influences the shape and peak of the runoff hydrograph. Urbanization usually decreases Tc, thereby increasing the peak discharge. But Tc can be increased as a result of (a) ponding behind small or inadequate drainage systems, including storm drain inlets and road culverts, or (b) reduction of land slope through grading.

Factors affecting time of concentration and travel time

Surface roughness: One of the most significant effects of urban development on flow velocity is less retardant to flow. That is undeveloped areas with very slow and shallow overland flow through vegetation be come modified by urban development: the flow is then delivered to streets, gutters, and storm sewers that transport runoff downstream more rapidly. Travel time through the watershed is generally decreased.

Channel shape and flow patterns: In small non-urban watersheds, much of the travel time results from overland flow in upstream areas. Typically, urbanization reduces overland flow lengths by conveying storm runoff into a channel as soon as possible. Since channel designs have efficient hydraulic characteristics, runoff flow velocity increases and travel time decreases.

Slope: Slopes may be increased or decreased by urbanization, depending on the extent of site grading or the extent to which storm sewers and street ditches are used in the design of the water management system. Slope will tend to increase when channels are straightened and decreased when overland flow is directed through storm sewers, street gutters, and diversions.

Computation of travel time and time of concentration

Water moves though a watershed as sheet flow, shallow concentrated flow, open channel flow, or some combination of these. The type that occurs is a function of the conveyance system and is best determined by field inspection.

Travel time (T_t) is the ratio of flow length to flow velocity:

$$T_t = \frac{L}{3600\ V} \quad \text{(Eq. \#1)}$$

Where:
T_t = travel time (hr.),
L = flow length (ft.),
V = average velocity (ft/s), and
3600 = coversion factor from seconds to hours.

Time of concentration (T_c) is the sum ot T_t values for the various consecutive flow segments:

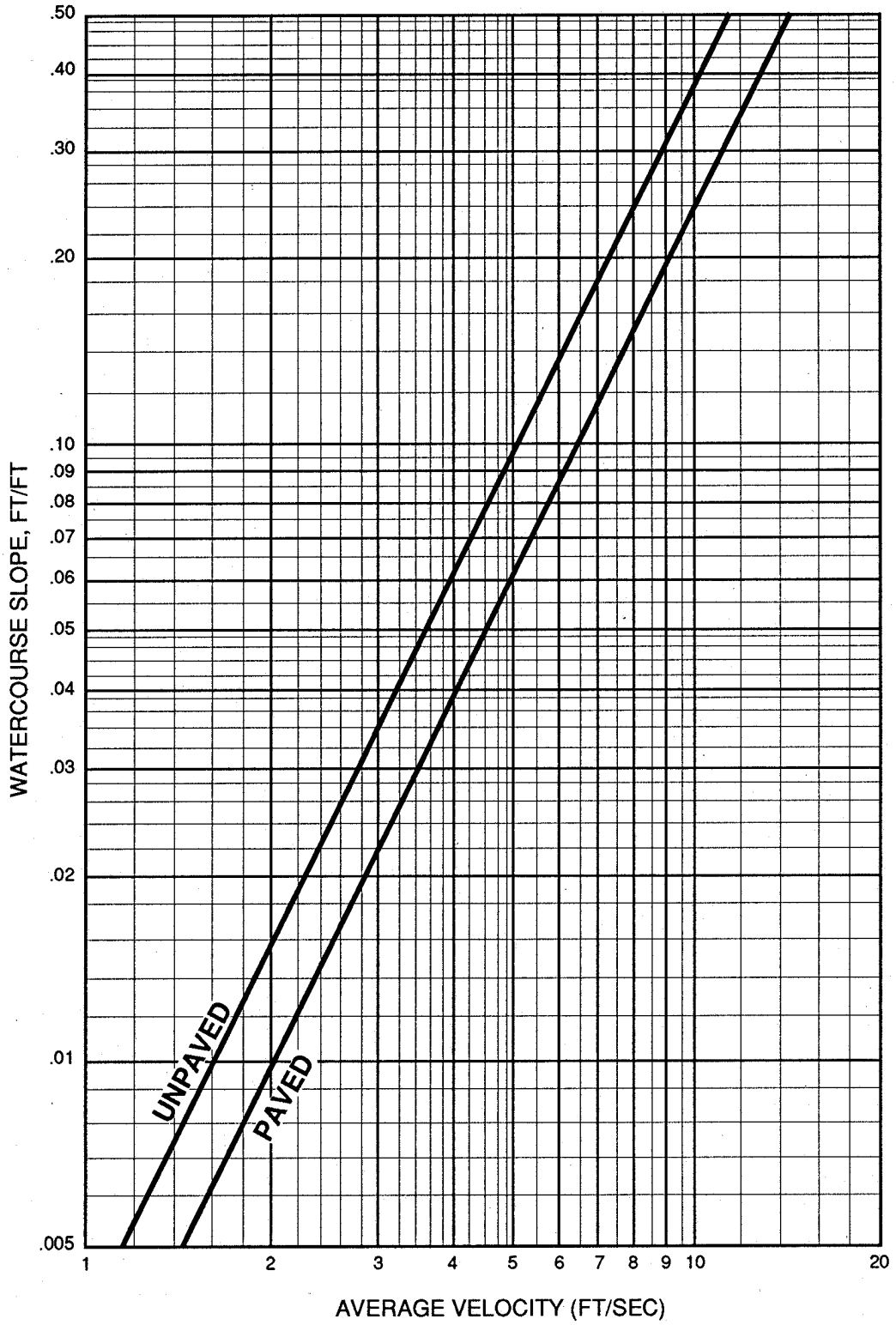
$$Tc = T_{t1} + T_{t2} + \ldots T_{tm} \quad \text{(Eq. \#2)}$$

Where:
T_c = time of concentration (hr) and
m = number of flow segments.

Sheet 1 of 4

APPENDIX B (con't)

Figure B-1. Average Velocity for Estimating Travel Time for Shallow Concentrated Flow



Source: TR-55, Fig. 3-1

Sheet 2 of 4

APPENDIX B (con't)

Time of Concentration and Travel Time: SCS TR55 Procedure

Sheet Flow

Sheet flow is flow over plane surfaces. It usually occurs in the headwater of streams. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact; drag over the plane surface; obstacles such as litter, crop ridges, and rocks; and erosion and transportation of sediment. Use Figure 2.2-14 to compute the travel time (Tt) for sheet flow, maximum length of is flow is 300 feet.

Shallow concentrated flow

After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from Figure B-1, in which average velocity is a function of watercourse slope and type of channel. Tillage can affect the direction of shallow concentrated flow. Flow may not always be directly down the watershed slope if tillage runs across the slope.

After determining average velocity in Figure B-1, use equation #1 to estimate travel time for the shallow concentrated flow segment.

Open channels

Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle sheets. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity is usually determined for bank-full elevation (assume 10 year frequency event in Arizona desert).

Sheet 3 of 4

APPENDIX B (con't)

Time of Concentration and Travel Time: SCS TR55 Procedure

Manning's equation is:

$$V = \frac{1.49 r^{2/3} s^{1/2}}{n} \quad \text{(Eq.\#4)}$$

Where:
- V = average velocity (ft/s)
- r = hydraulic radius (ft) and is equal to a/p_w
- a = cross sectional flow area (ft^2)
- p_w = wetted perimeter (ft)
- s = slope of the hydraulic grade line (channel slope, ft/ft)
- n = Manning's roughness coefficient for open channel flow

Manning's n values for open channel flow can be obtained from standard textbooks such as Chow (1959) or Linsley et al. (1982). After average velocity is computed using equation #4, T_t for the channel segment can be estimated using equation #1.

Reservoirs or lakes

Sometimes it is necessary to estimate the velocity of flow through a reservoir or lake at the outlet of a watershed. This travel time is normally very small and can be assumed as zero.

Limitations

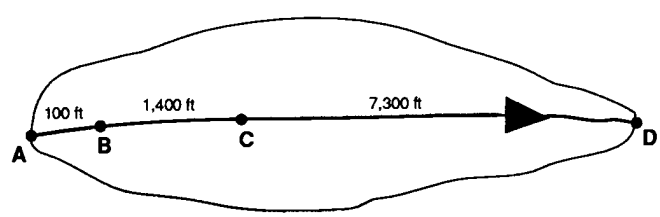
- Manning's kinematic solution should not be used for sheet flow longer than 300 feet. Equation #3 was developed for use with the four standard rainfall intensity-duration relationships (used in TR-55).

- In watersheds with storm sewers, carefully identify the appropriate hydraulic flow path to estimate T_c. Storm sewers generally handle only a small portion of a large event. The rest of the peak flow travels by streets, lawns, and so on, to the outlet. Consult a standard hydraulics textbook to determine average velocity in pipes for either pressure or nonpressure flow.

- The minimum T_c used in TR-55 is 0.1 hour.

Example

The sketch below shows a sample watershed. The problem is to compute T_c at the outlet of the watershed (point D). All three types of flow (overland sheet flow, shallow concentrated flow, and channel flow) occur from the hydraulically most distant point (A) to the point of interest (D). To compute T_c, first determine T_t for each segment, then sum all three T_t's to obtain the watershed or sub-area T_c.



Sheet 4 of 4

APPENDIX C

Precipitation Frequency Maps
Figures 2.2-1 through 2.2-12

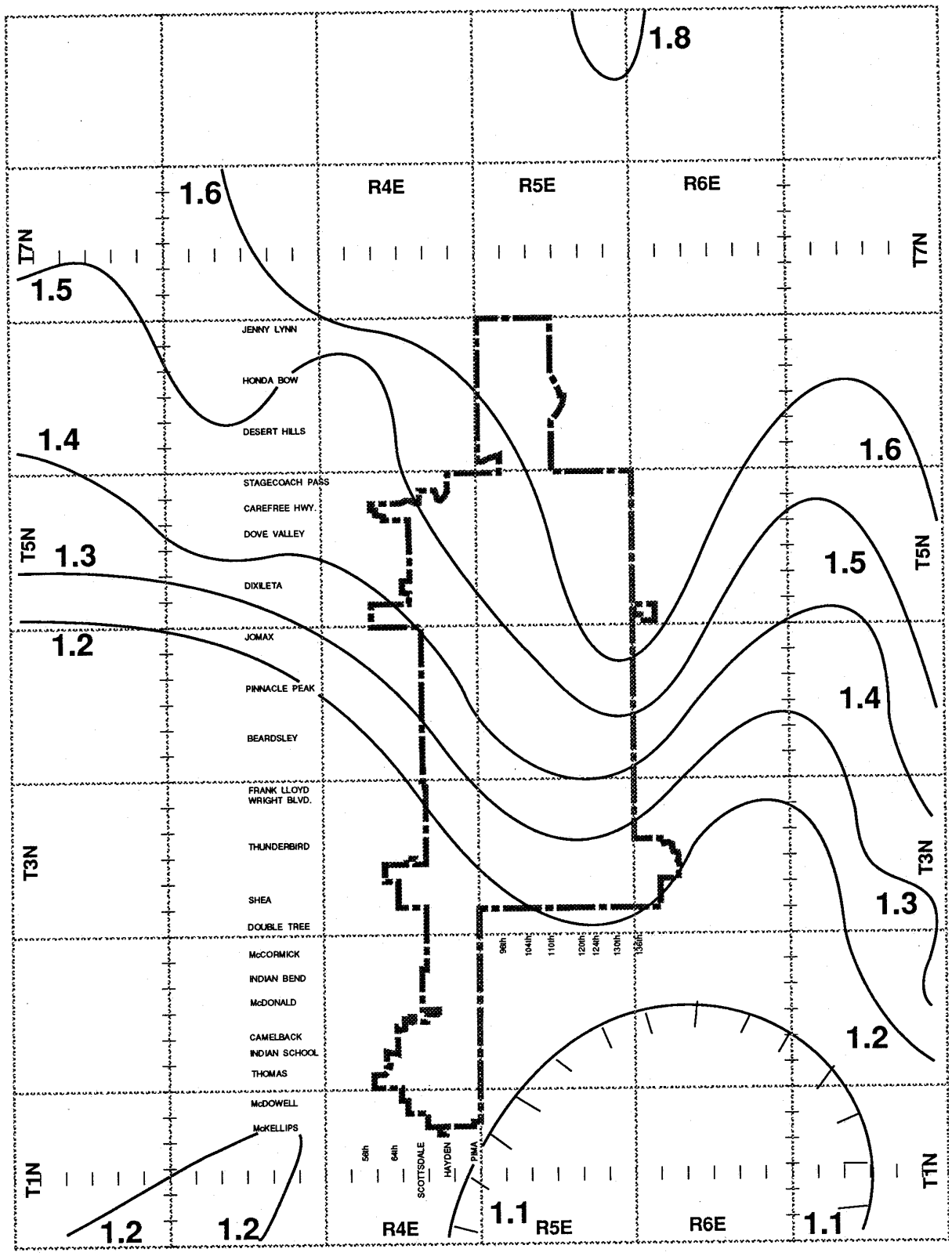


FIGURE 2.2-1

Isopluvials 2 Year 6 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

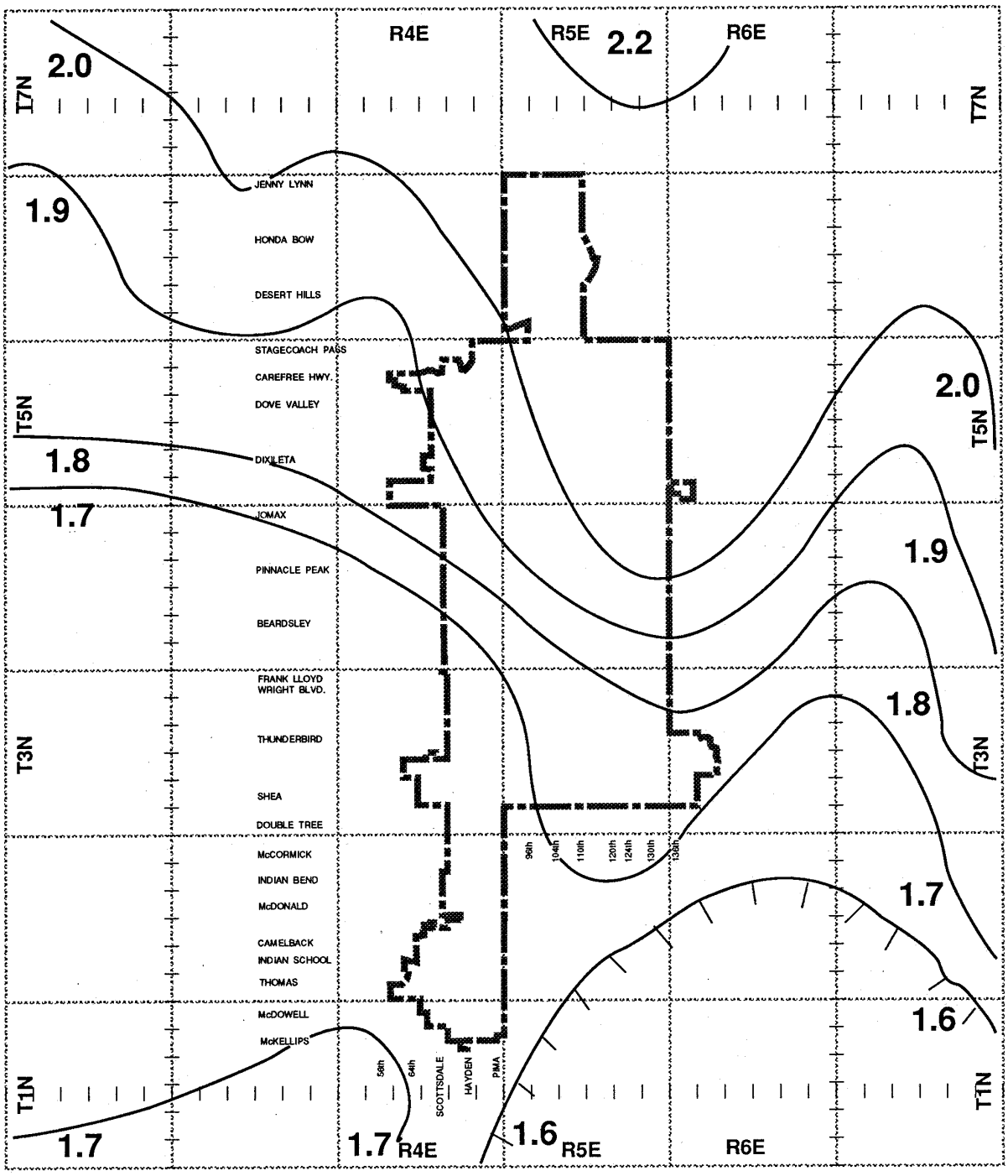


FIGURE 2.2-2

Isopluvials 5 Year 6 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

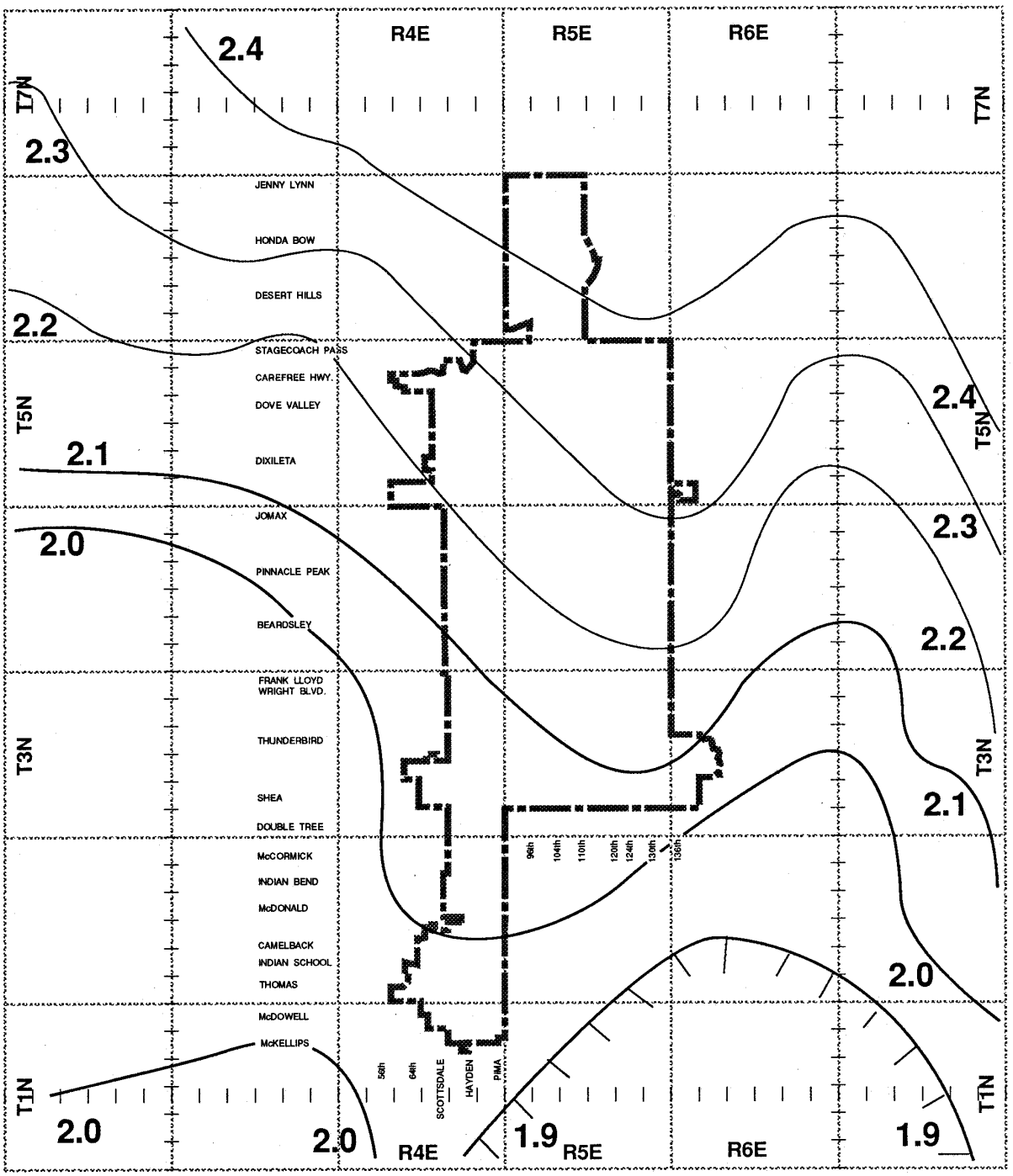


FIGURE 2.2-3

Isopluvials 10 Year 6 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

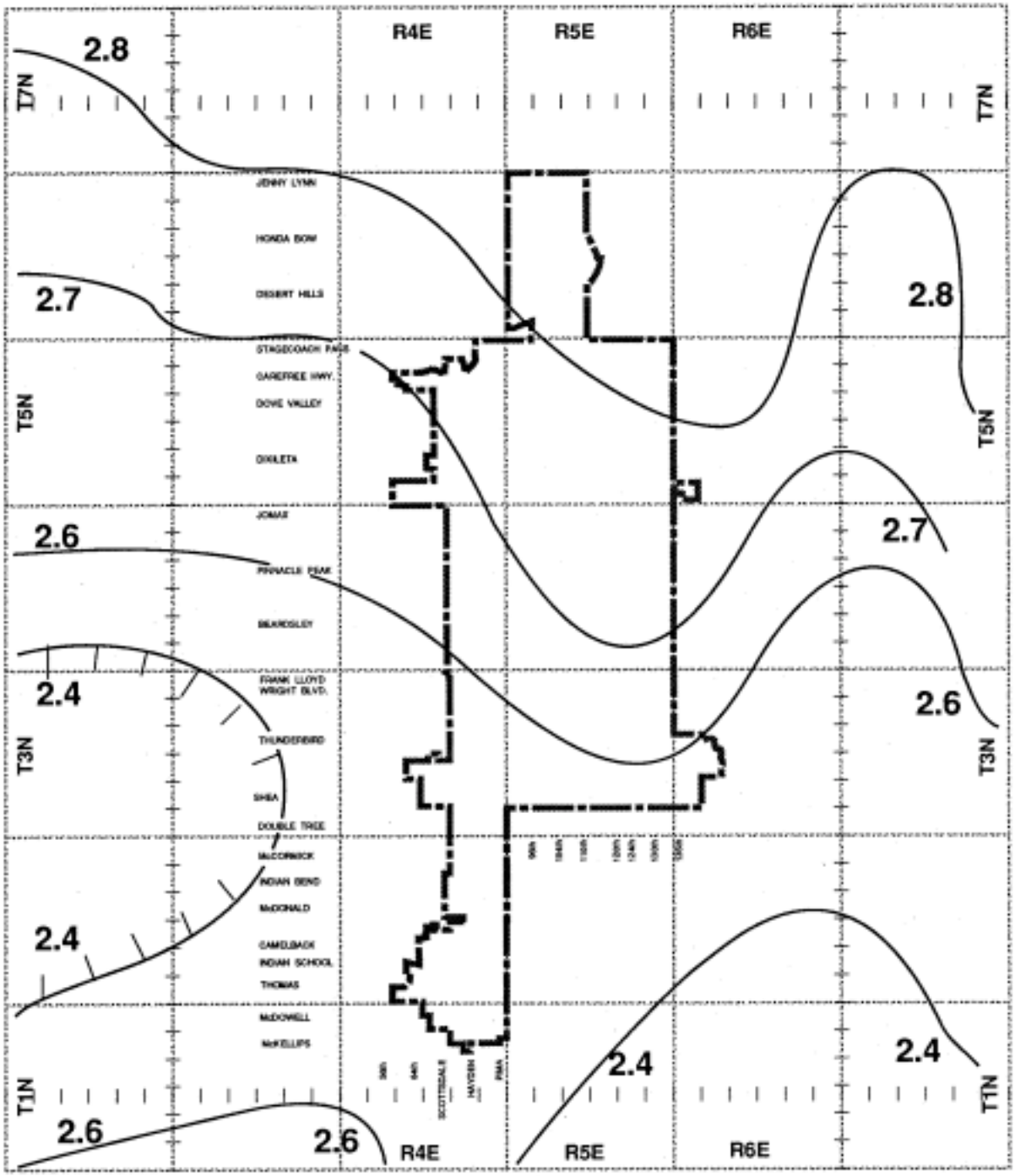


FIGURE 2.2-4

Isopluvials 25 Year 6 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

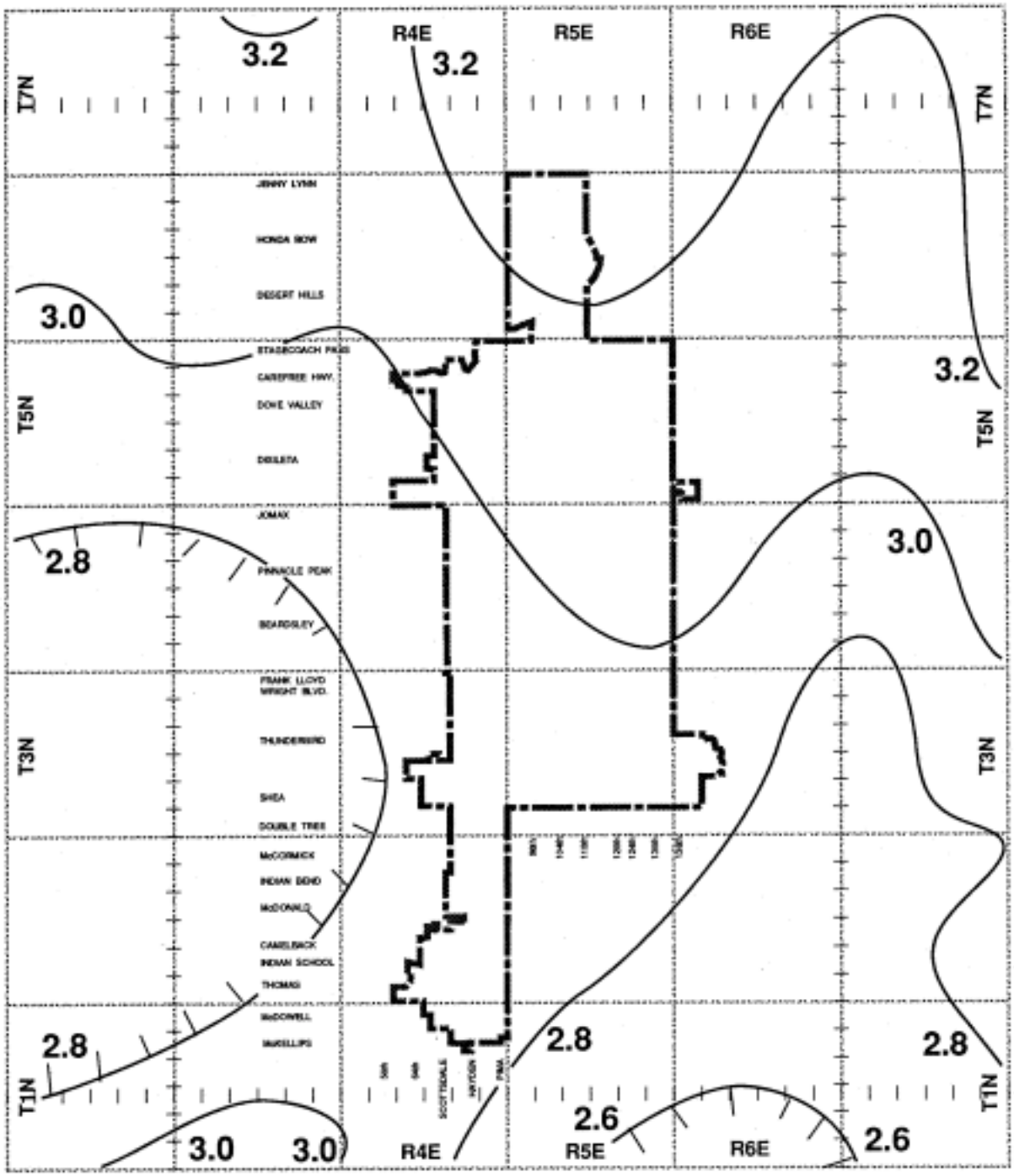


FIGURE 2.2-5

Isopluvials 50 Year 6 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

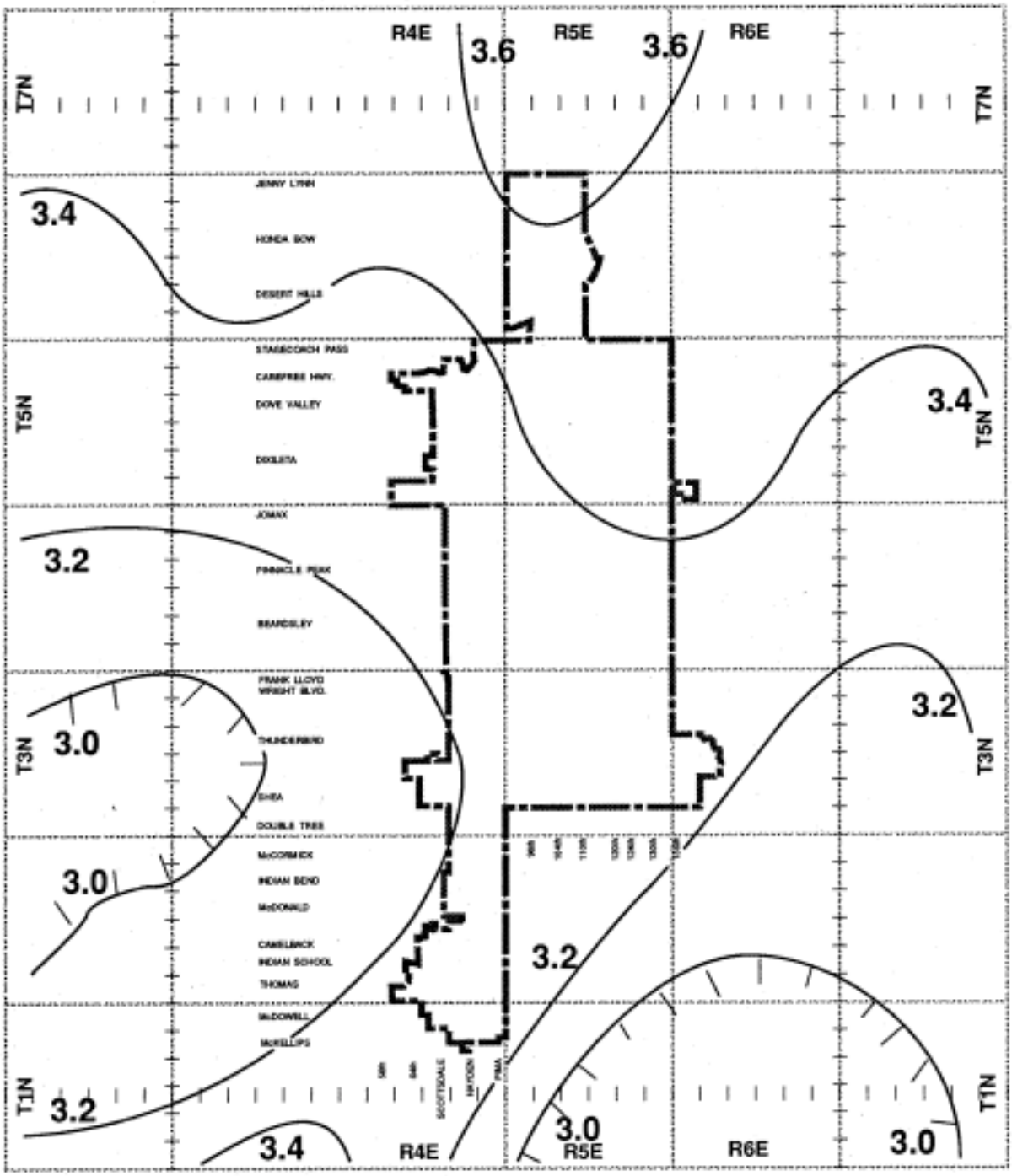


FIGURE 2.2-6

Isopluvials 100 Year 6 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

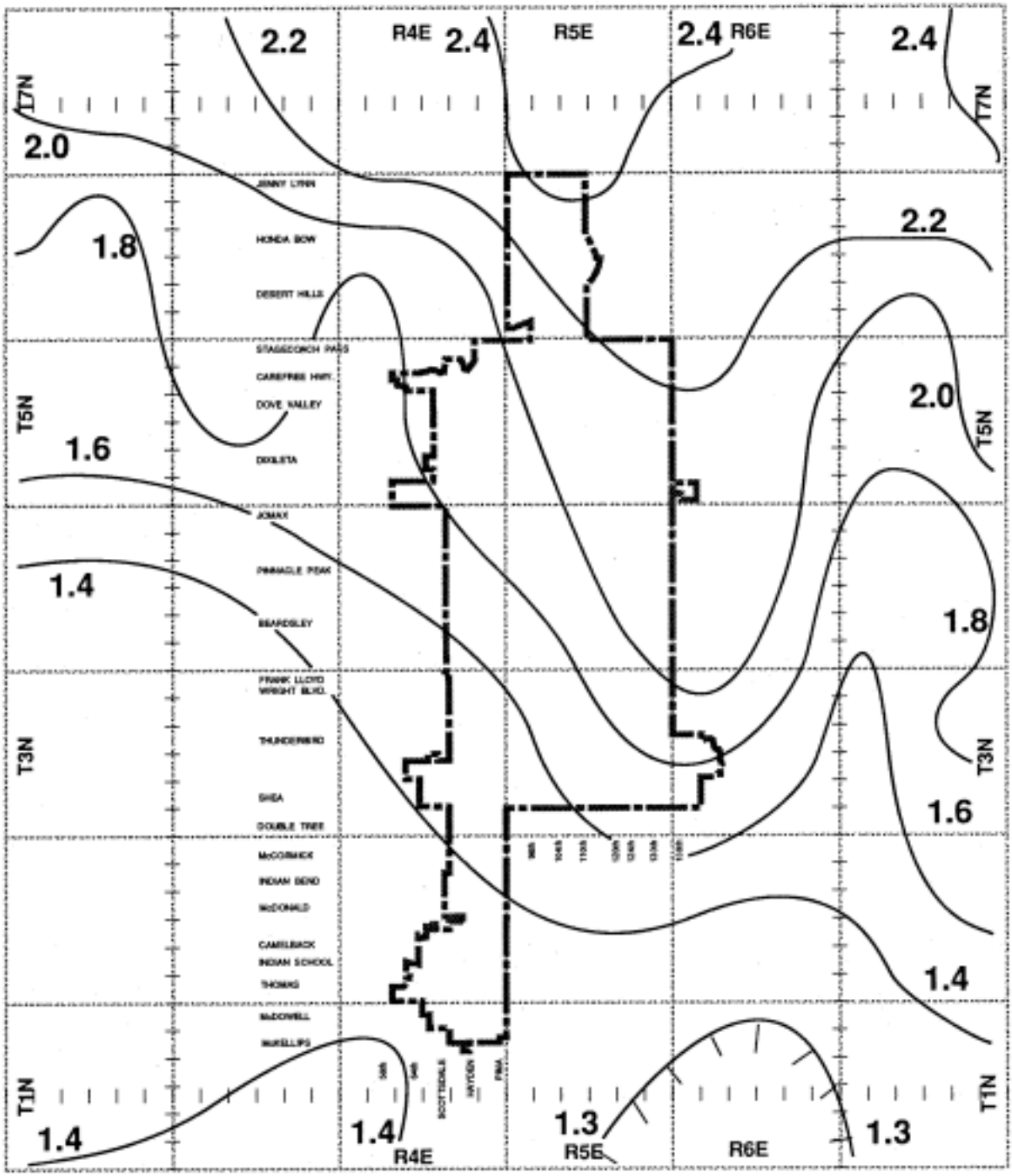


FIGURE 2.2-7

Isopluvials 2 Year 24 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

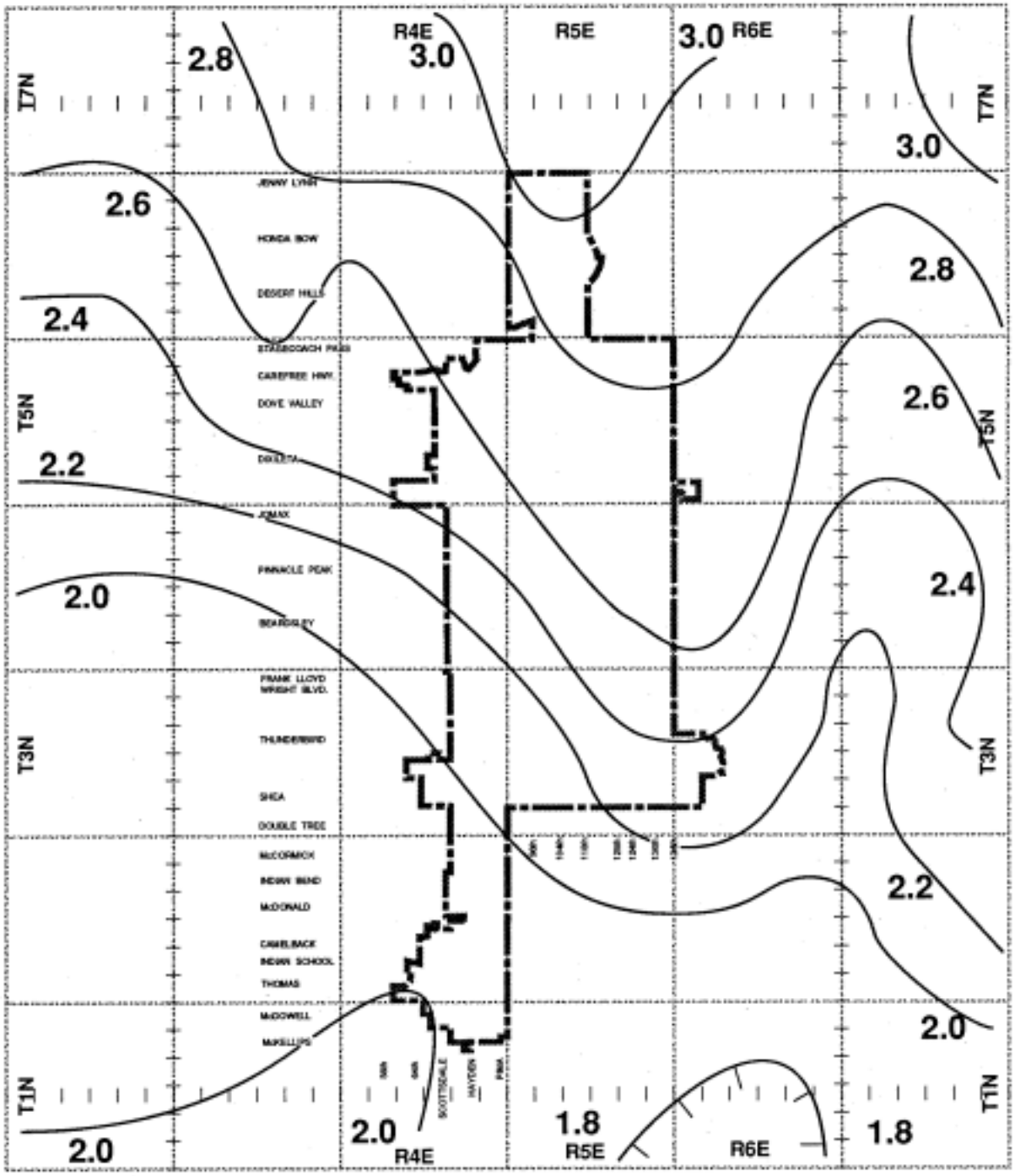


FIGURE 2.2-8

Isopluvials 5 Year 24 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

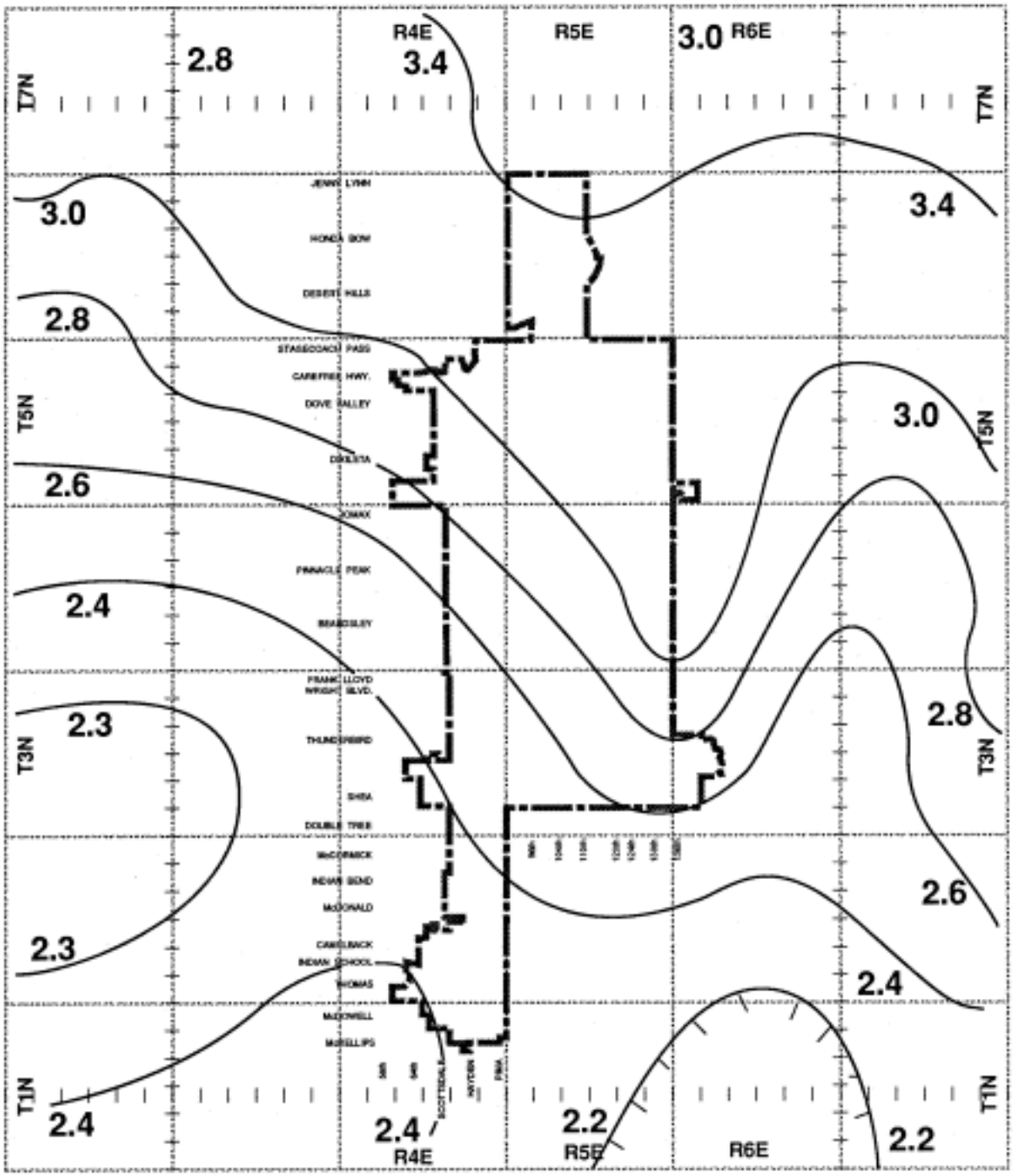


FIGURE 2.2-9

Isopluvials 10 Year 24 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

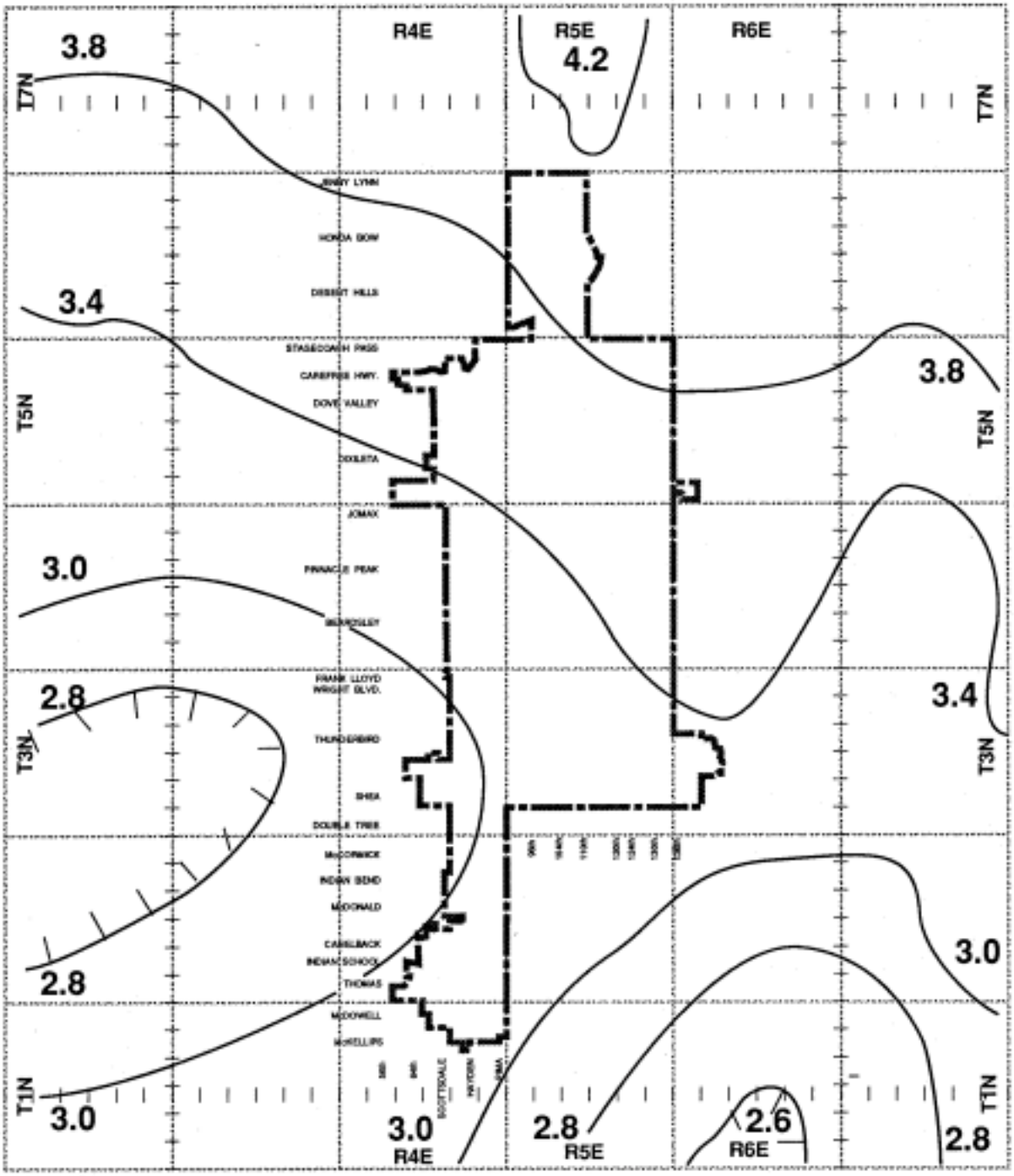


FIGURE 2.2-10

Isopluvials 25 Year 24 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

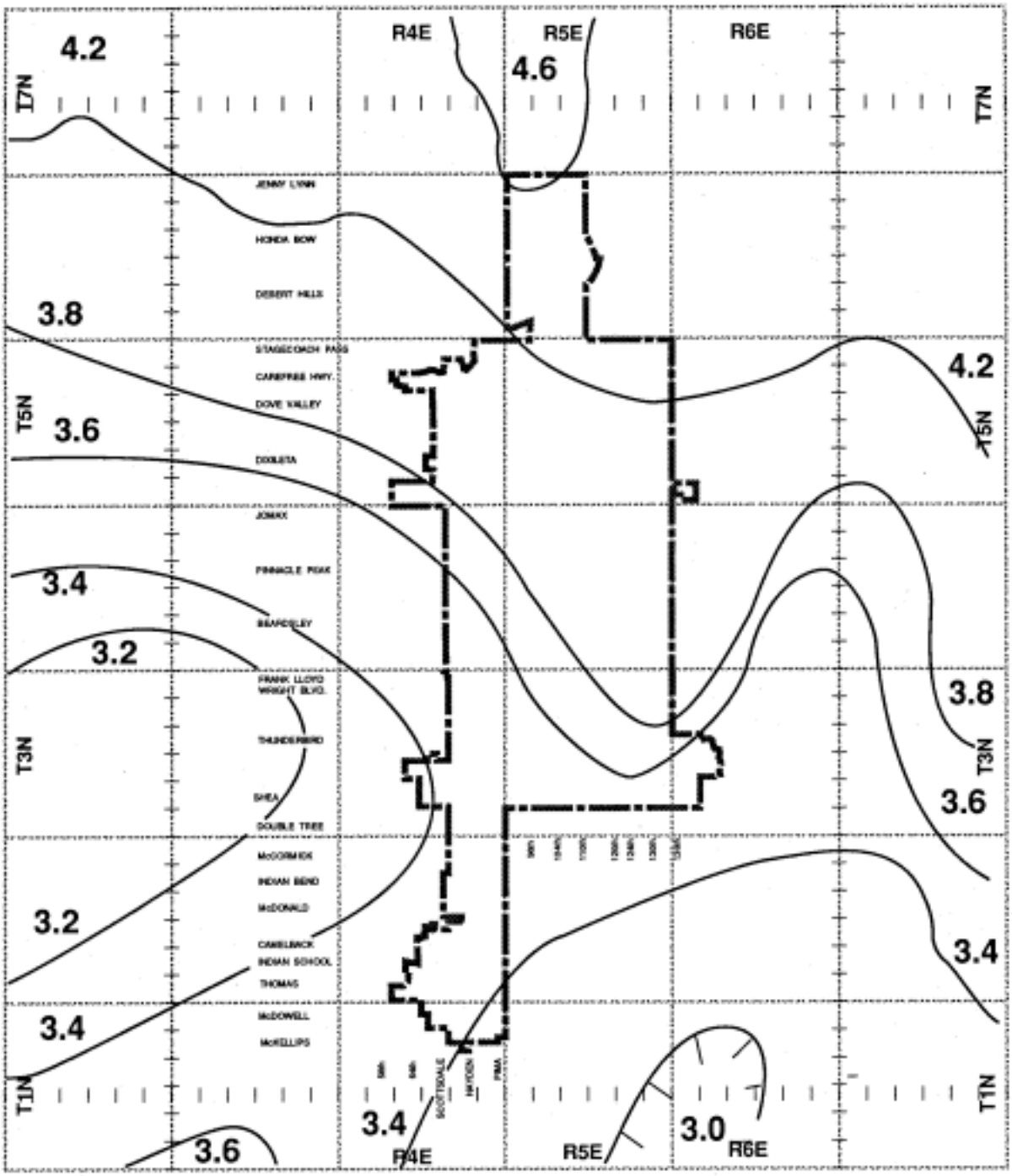


FIGURE 2.2-11

Isopluvials 50 Year 24 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

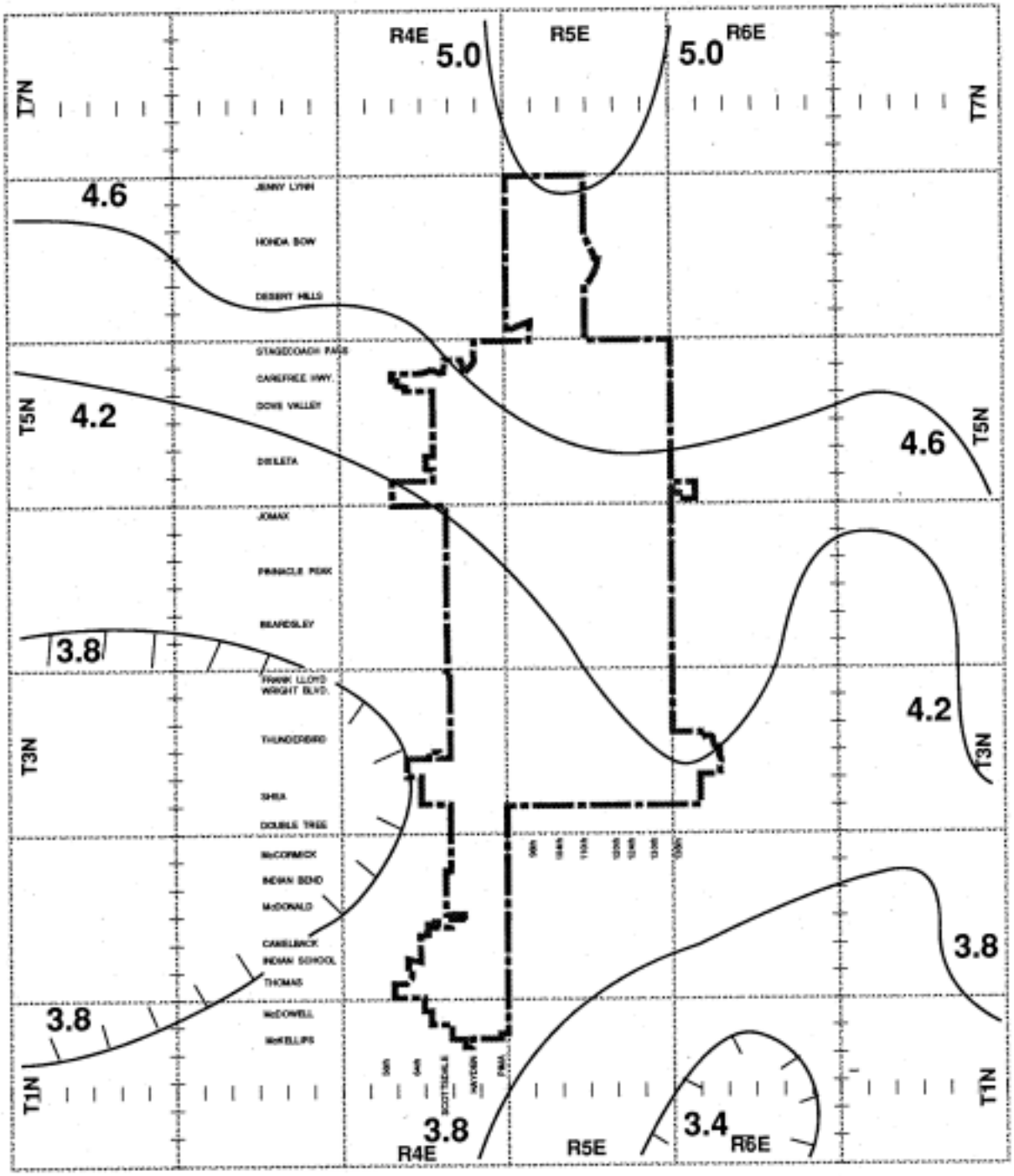


FIGURE 2.2-12

Isopluvials 100 Year 24 Hour Precipitation in Inches

Rainfall Data From NOAA Atlas 2, Vol. VIII

APPENDIX D

Miscellaneous Figures
Figures 2.2-13 through 2.2-21

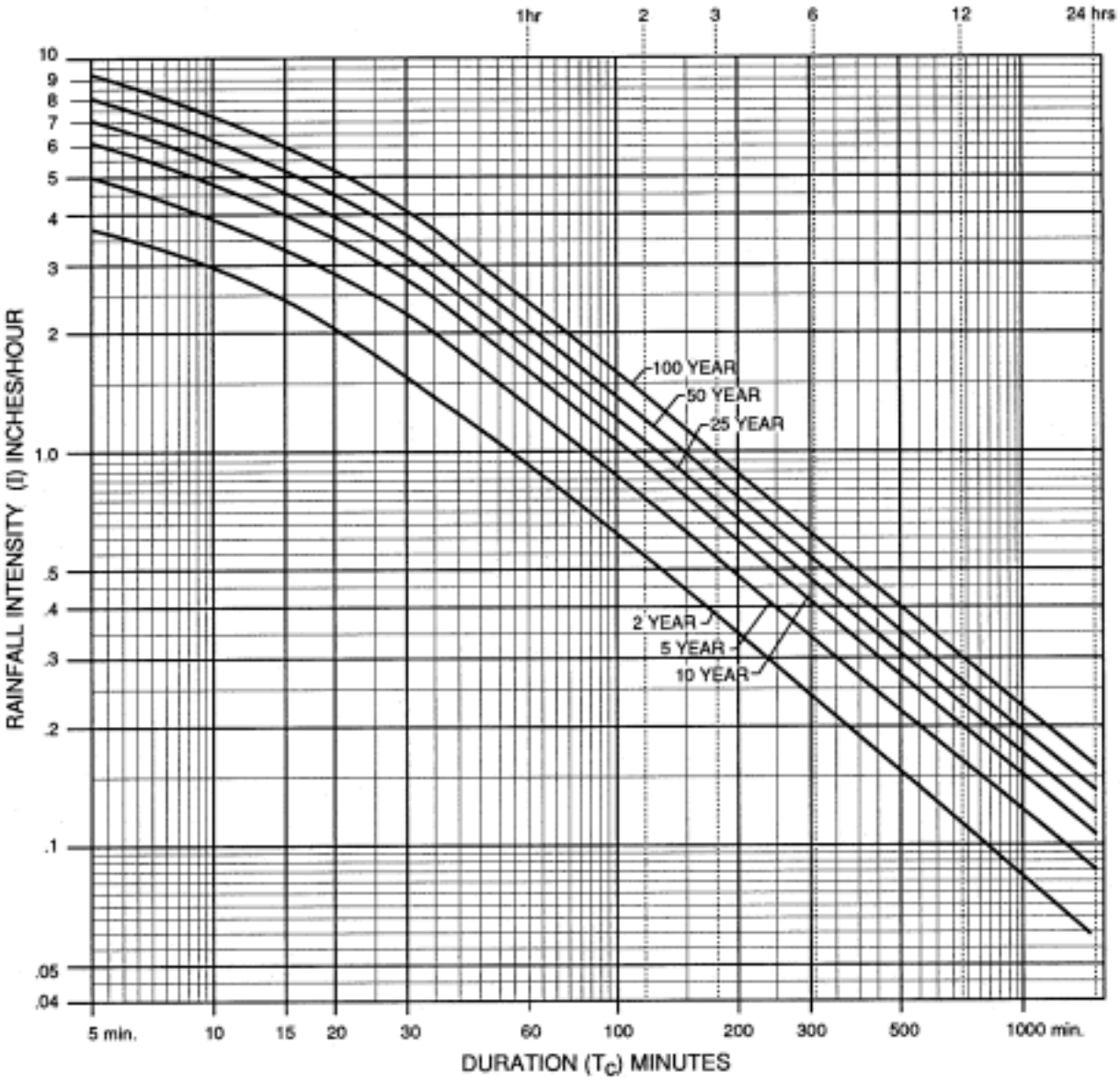
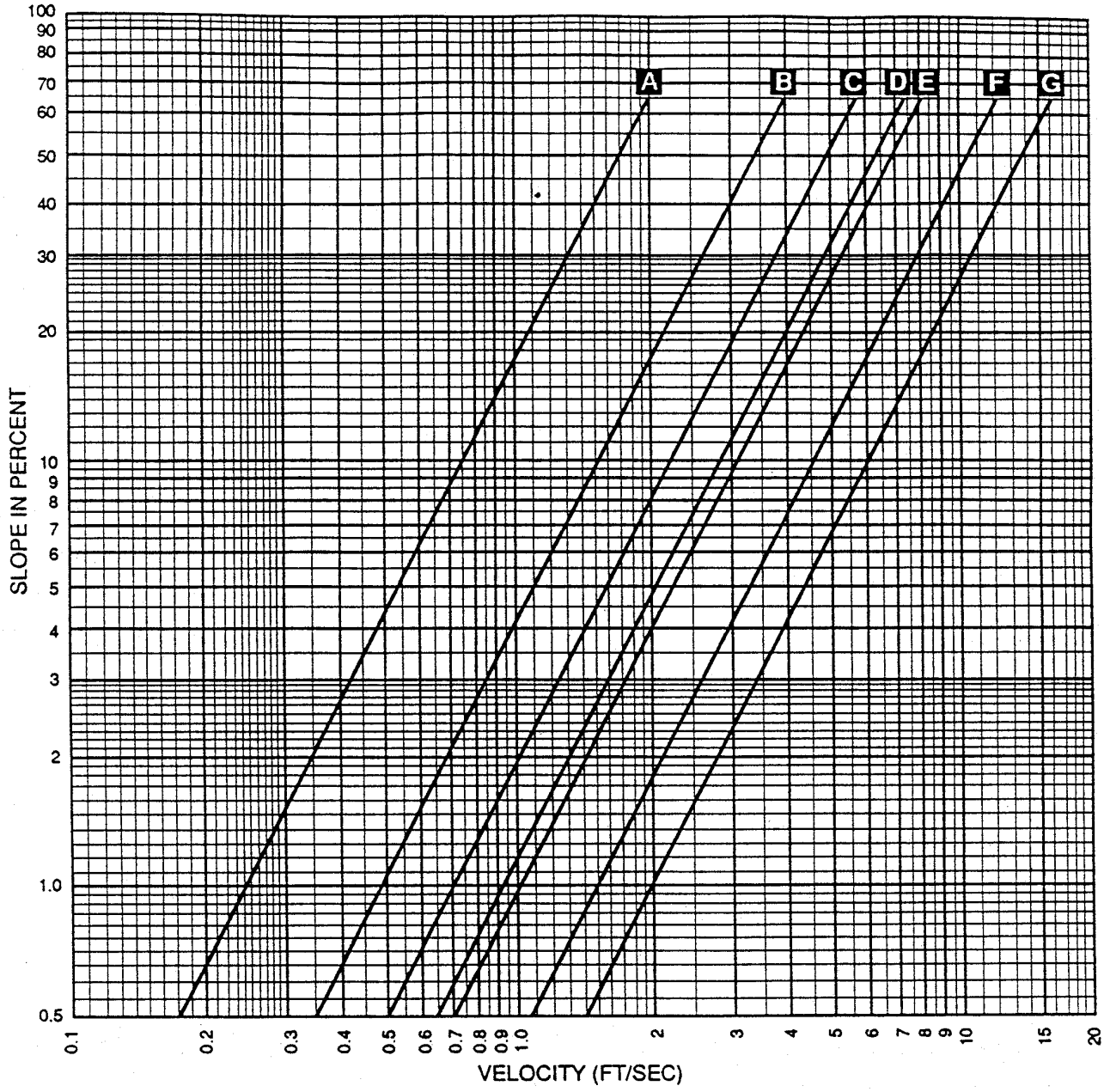


FIGURE 2.2-13

Rainfall Intensity (I) Values for Use in Rational Method

Source: Hydrologic Design Manual for Maricopa County



A Forest with heavy ground litter & hay meadow (overland flow)

B Trash fallow or minimum tillage cultivation; contour or strip cropped & woodland (overland flow)

C Short grass pasture (overland flow)

D Cultivated, straight row (overland flow)

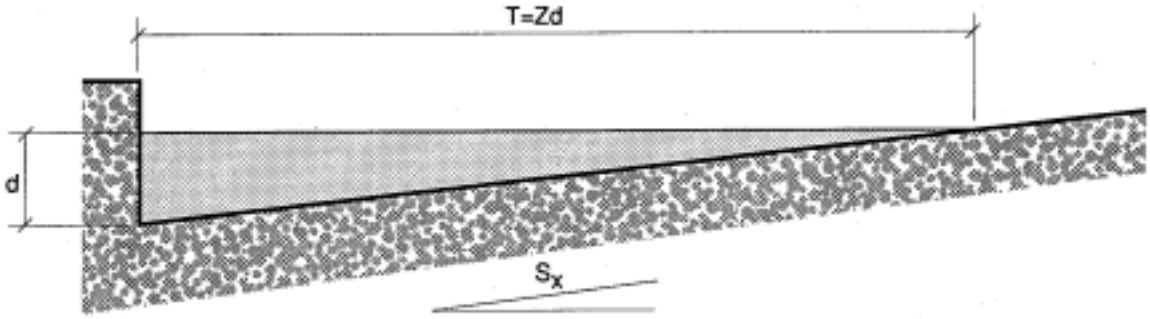
E Nearly bare and untilled (overland flow); alluvial fans western mountain regions

F Grassed waterway

G Paved area (sheet flow); small upland gullies

FIGURE 2.2-14

Overland Flow Velocities for Upland Method of Estimating T_C



$$Q=\left(\frac{0.56}{n}\right)S_x^{1.67}S^{0.5}T^{2.67}{}^{*}$$

Where:

Q = Rate of discharge in cubic feet per second.

n = Manning's channel roughness coefficient.

S_x = Cross slope of gutter.

S = Longitudinal slope of gutter in feet per second.

T = Top width of water surface in feet.

d = depth of flow at curb in feet.

Z = Reciprocal of the cross slope T/d.

Since V=Q/A and $A=\frac{Zd^2}{2}$:

$$V=\left(\frac{1.12}{n}\right)S^{0.5}d^{0.67}\ \text{fps}^{*}$$

If n=0.013 (which is typical for concrete gutters):

$$V=\ 86\ S^{0.5}d^{0.67}{}^{*}$$

If d=6" (0.5') when n=0.013:

$$V=\ 54\ S^{0.5}{}^{*}$$

If d=4" (0.33') when n=0.013:

$$V=\ 41\ S^{0.5}{}^{*}$$

*Does not apply when depth of water is above the top of curb

FIGURE 2.2-15

Flow Velocities in Street Gutters

(Source: Hydraulic Engineering Circular No. 12, U.S. Department of Transportation)

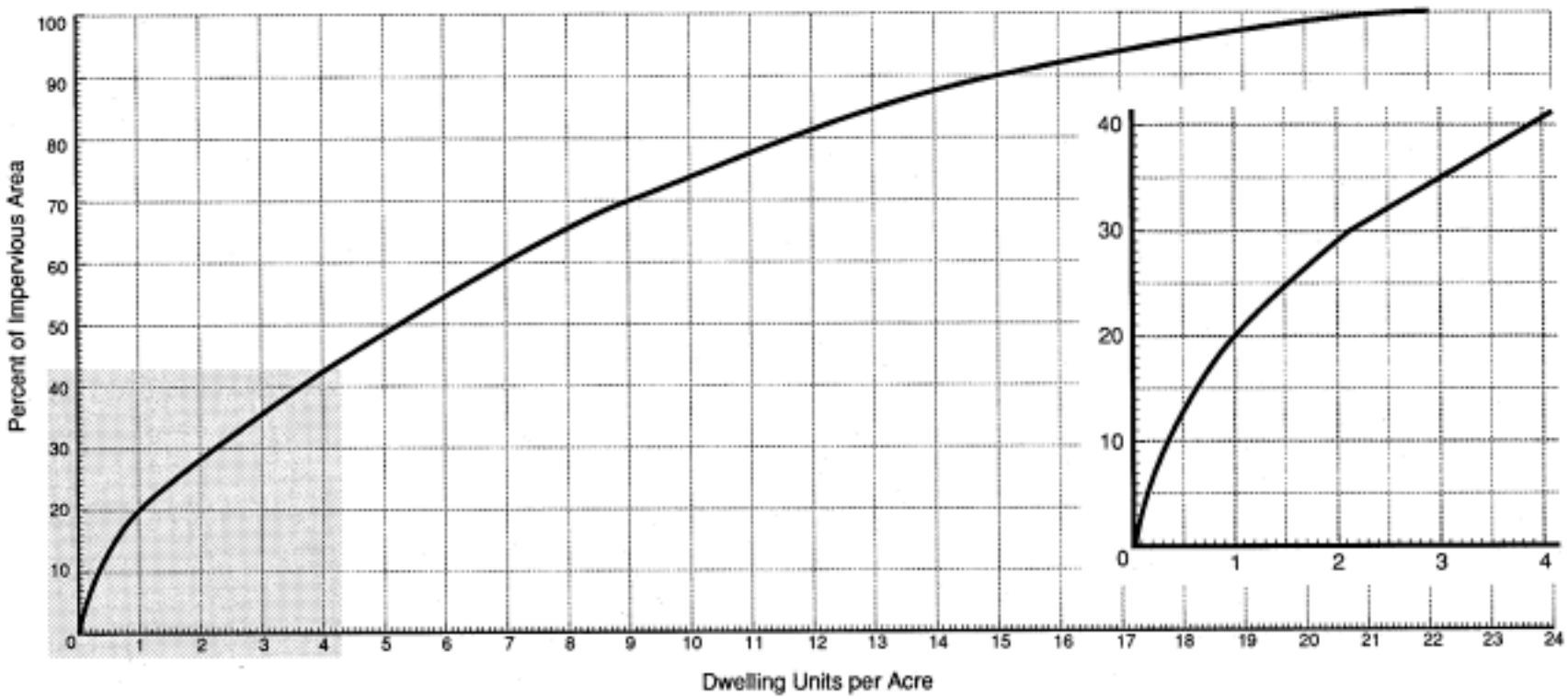


FIGURE 2.2-16

Percent of Impervious Area vs. Dwelling Density

Developed by Water Resources Associates, Inc. from data in Table 2.2a of TR-55, Urban Hydrology For Small Watersheds, and from discussions with Scottsdale city staff.

Runoff Coefficients

Land Use	"C" Value Hydrologic Soil Group B	C	D
Composite Area-wide Values			
Commercial and industrial areas:	0.90		
Residential areas-single family (average lot size):			
R1-1-190:	0.33	0.50	0.58
R1-130:	0.35	0.51	0.59
R1-70:	0.37	0.52	0.60
R1-43:	0.38	0.55	0.61
R1-35 (35,000 sq. ft./lot):	0.40	0.56	0.62
R1-18 (18,000 sq. ft./lot):	0.43	0.58	0.64
R1-10 (10,000 sq. ft./lot):	0.47	0.62	0.67
R1-7 (7,000 sq. ft./lot):	0.51	0.64	0.70
Townhouses (R-2, R-4):	0.63	0.74	0.78
Apartments and condominiums (R-3, R-5):	0.76	0.83	0.87
Specific Surface Type Values			
Paved streets or parking lot (concrete or asphalt), roofs, dirveways, etc.	0.95		
Lawns, golf courses, and parks (grassed areas):	0.33	0.56	0.66
Undisturbed natural desert or desert landscaping (no impervious weed barrier):	0.31	0.48	0.56
Desert landscaping (with impervious weed barrier)	0.83	0.83	0.83
Mountain terrain - slopes greater than 10%:	0.70	0.70	0.70
Agricultural areas (Flood Irrigated Fields):	0.20	0.20	0.20

FIGURE 2.2-17

Runoff Coefficients (C) for use with the Rational Formula

CITY OF SCOTTSDALE

HYDROLOGIC DESIGN DATA RECORD
RATIONAL METHOD

LOCATION DATA

PROJECT: _____ CONCENTRATION POINT: _____

LOCATION: _____

PROJECT NO.: _____ STATION: _____

NAME OF STREAM/WATERSHED: _____

DESIGN DATA

DESIGN FREQUENCY:		2	5	10	25	50	100	YEARS
DRAINAGE AREA:	A1							ACRES
	A2							ACRES
	A3							ACRES
	TOTAL (A)							ACRES
DRAINAGE LENGTH:								FEET
ELEVATION:								
TOP OF DRAINAGE AREA:								FEET
AT STRUCTURE								FEET
DRAINAGE AREA SLOPE:								PERCENT
HYDROLOGIC SOIL GROUP:								

DESIGN COMPUTATIONS

FREQUENCY FACTOR (F):		1.00	1.00	1.00	1.10	1.20	1.25	
TIME OF CONCENTRATION:	T_c							MINUTES
RAINFALL INTENSITY (I):								INCHES/HOUR (Figure 2.2-13)
RUNOFF COEFFICIENT (C):	C1							
	C2							
	C3							
WEIGHTED RUNOFF COEFFICIENT (C_W):	C_W							
PEAK DISCHARGE $Q_p = C_W IA(F)$:								cfs

COMPUTED BY: _____ DATE: _____

CHECKED BY: _____ DATE: _____

FIGURE 2.2-18
Hydrologic Design Data Record

Runoff Curve Numbers for Urban Areas[1]

Cover type and hydrologic condition	Average % Impervious Area[2]	Curve numbers for hydrologic soil group			
		A	B	C	D
Fully developed urban areas with vegetation established					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover less that 50%)		68	79	86	89
Fair condition (grass cover 50-75%)		49	69	79	84
Good condition (grass cover greater than 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roads, driveways, etc. (excld. right-of-way)		98	98	98	98
Steets and roads:					
Paved; curbs and storm sewer (excld. right-of-way)		98	98	98	98
Paved; open dithces (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1 to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	Not Applicable in Scottsdale			
Industrial	85				
Townhouse, duplexes	65				
Multi-Family	85				
Residential districts by average lot size: (See Figure 2.2-16)					
Developing Urban Areas					
Newly graded areas (pervious areas only, no vegetation)[5]:		77	86	91	94

[1]Average runoff condition, and $I_a = 0.2S$; Table 2-2a, 210-VI-TR55, Second Ed., June 1986.
[2]The average percent impervious area shown was used to develop the compsite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition (not applicable in Scottsdale).
[3]CN's shown are equaivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
[4]Composite CN's for natural desert landscaping should be computed based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
[5]Composite CN's to use for the design of temporary measures during grading and construction shoud be computed based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

FIGURE 2.2-19

Runoff Curve Numbers for Urban Areas[1]

Runoff Curve Numbers for Arid and Semiarid Rangelands[1]

Cover type and hydrologic condition	Hydrologic Condition[2]	Curve numbers for hydrologic soil group			
		A	B	C	D
Herbaceous - mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen - mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper - pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub - major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mequite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

[1]Average runoff condition, and $I_a = 0.2S$; Table 2-2d, 210-VI-TR55, Second Ed., June 1986.
[2]Poor: <30% ground cover (litter, grass, and brush overstory).
Fair: 30 to 70% ground cover (not applicable in Scottsdale)
Good: >70% ground cover (not applicable in Scottsdale).
[3]Curve Numbers for group A have been developed only for desert shrub.

FIGURE 2.2-20

Runoff Curve Numbers for Arid and Semiarid Rangelands[1]

CN for Condition II	CN for Condition I	CN for Condition III	CN for Condition II	CN for Condition I	CN for Condition III
100	100	100	54	34	73
99	97	100	53	33	72
98	94	99	52	32	71
97	91	99	51	31	70
96	89	99	50	31	70
95	87	98	49	30	69
94	85	98	48	29	68
93	83	98	47	28	67
92	81	97	46	27	66
91	81	97	45	26	65
90	78	96	44	25	64
89	76	96	43	25	63
88	75	95	42	24	62
87	73	95	41	23	61
86	72	94	40	22	60
85	70	94	39	21	59
84	68	93	38	21	58
83	67	93	37	20	57
82	66	92	36	19	56
81	64	92	35	18	55
80	63	91	34	18	54
79	62	91	33	17	53
78	60	90	32	16	52
77	59	89	31	16	51
76	58	89	30	15	50
75	57	88			
74	55	88	25	12	43
73	54	87	20	9	37
72	53	87	15	6	30
71	52	86	10	4	22
70	51	86	5	2	13
69	50	85	0	0	0
68	48	84			
67	47	84			
66	46	83			
65	45	82			
64	44	82			
63	43	81			
62	42	80			
61	41	79			
60	40	78			
59	39	78			
58	38	77			
57	37	76			
56	36	75			
55	35	75			

FIGURE 2.2-21

Curve Numbers (CN) for Antecedent Moisture Conditions I, II, and III

Section 2.3

HYDRAULICS
DESIGN STANDARDS AND POLICIES
REVISED DECEMBER 1999

CHAPTER 2
DRAINAGE

SECTION 2.3
HYDRAULICS

CONTENTS

SECTION	PARAGRAPH TITLE	PAGE
2-301	**INTRODUCTION**	**1**
2-302	**HYDROLOGY**	**1**
	Table 2.3-1 Hydrology Design Criteria	**2**
2-303	**STREET DRAINAGE**	**3**
	A. Design Criteria for Streets and Gutters	**3**
	1. Pavement Encroachment	**3**
	2. Theoretical Capacity	**3**
	3. Longitudinal Street Grades	**3**
	B. Design Criteria for Intersections	**3**
	C. Design Criteria for Roadside Ditches	**3**
	Figure 2.3-3 Typical Cross Section for Roadside Ditches	**4**
	D. Catch Basins	**4**
	1. Grated Catch Basins	**4**
	2. Scuppers	**4**
	3. Slotted Drains	**4**
2-304	**STORM DRAINS**	**4**
	A. Separation of Storm Drain Systems from Water and Sewer Lines	**4**
	B Sizing	**4**
	C. Natural Watercourses	**5**
2-305	**CULVERTS AND BRIDGES**	**5**
	A. Inverted Siphons	**5**
	B. Culvert Profile	**5**
	C. Private Bridges and Culvert Crossings	**5**
2-306	**OPEN CHANNELS**	**5**
	A. General	**5**
	B. Floodplains	**6**
	C. Drainage Easements	**6**
	D. Artificial Channels	**6**
	1. Unlined Earthen Channels	**6**
	2. Lined Channels	**6**
	3. Channel Alignment	**7**
	E. Scour Analysis	**7**
	F. Maintenance	**8**
	1. Access	**8**
	2. Responsible Party	**8**
	G. Safety	**8**

SECTION	PARAGRAPH TITLE	PAGE
2-307	**HYDRAULIC STRUCTURES (RESERVED)**	**8**
2-308	**DETENTION AND RETENTION FACILITIES**	**8**
	A. Interaction with Other Components of a Drainage System	**8**
	1. Waiver Requests	**8**
	2. Design Criteria	**8**
	B. Hydrology	**8**
	C. Basin Location	**9**
	D. Detention/Retention Facility Inlet and Outlet Structures	**9**
	1. Methods for Draining Stormwater Storage Facilities	**9**
	2. Drain Time	**10**
	3. Parking Lot Storage	**10**
	4. Embankment Design Criteria	**10**
	5. Underground Storage (Reserved)	**10**
	E. Operation and Maintenance	**10**
	F. Volume Certification	**10**
2-309	**PUMP STATIONS (RESERVED)**	**10**

SECTION 2.3
HYDRAULICS

2-301 INTRODUCTION

The design of drainage and flood control facilities in the city of Scottsdale shall meet the design criteria and guidance contained in the current Drainage Design Manual for Maricopa County, Volume II Hydraulics, (produced by the Flood Control District of Maricopa County) as supplemented by this manual section.

This manual contains additional clarifications or modifications specific to the design of facilities within the city of Scottsdale (COS). Specific COS requirements in the following subsections correspond to the appropriate chapter in the FCDMC Drainage Design Manual. (Example COS 2-30**2 Hydrology** corresponds to FCDMC's Chapter 2 Hydrology). Entries only exist in sections where supplemental guidance and or design criteria go beyond that contained in the FCDMC Manual.

2-302 HYDROLOGY

The determination of flood hydrology for designing stormwater facilities in the city of Scottsdale shall be performed according to the procedures set forth in the city of Scottsdale Design Standards and Policies Manual, Section 2.2. The following Table 2.3-1 outlines the minimum hydrology design criteria for stormwater management and drainage facilities within the city of Scottsdale. Facilities should not be designed using hydrology data from city master drainage plans developed for planning purposes. Hydrology data from any other source must be thoroughly reviewed and, as the design engineer, if you choose to use this data for design purposes you are accepting responsibility for any related liability that might result from its use.

Table 2.3-1 Hydrology Design Criteria *(italics represent citations from Floodplain and Drainage Ordinance)*

Drainage Feature	Peak Frequencies		
	10 Year	**50 Year**	**100 Year**
Street With Curb & Gutter	Runoff contained within street curbs. For collector and arterial streets one 12-foot dry driving lane must be maintained in each direction.	N/A	Runoff to be contained below the finished floor of building. *Runoff to be confined to road right of way or to drainage easements.* [37-42, (4)] *dmax=8 inches above the street.* [37-42, (4)]
Street Without Curb & Gutter (Dirt Roads, Ribbon Curbs)	Runoff contained within the roadside channels with the water surface elevation below the roadway pavement's subgrade.	N/A	Same as Street with Curb and Gutter.
Street with Storm Drain System	Pipes or roadside channels are added if the 10-year runoff exceeds street capacity.	N/A	Storm drains systems are used if 100-year runoff inundates the building's first floor. *Catch basins, scuppers, etc. to be provided to remove water so as not to exceed dmax =8".* [37-42, (4)]
Cross Road Culvert or Bridge for Major Collector & Arterial Streets	N/A	*Runoff to be conveyed by culvert or bridge under road with no flow overtopping the road*. [37-42, (3) a. 2]	*Runoff to be conveyed by culvert and by flow over the road with maximum 6-inch flow depth over the road.* [37-42, (3) a. 2]
Cross Road Culvert or Bridge for Local and Minor Collector Streets	*Runoff to be conveyed by culvert or bridge under road with no flow overtopping the road.* [37-42, (3)a.1]	*For a 25-year frequency storm runoff to be conveyed by culvert or bridge and by flow over the road with maximum 6-inch flow depth over the road.* [37-42, (3) a.1]	Maximum depth over road 12 inches.
Any street, watercourse crossing, that provides the only access to a residential area.	N/A	N/A	*All lots and structures must be accessible by at least one route with the depth of flow no greater than one foot during the 100-year runoff event*. [37-42, (3) a. 3]
FEMA Floodplain Channel (1)	N/A	N/A	100-year peak discharge
Open Channel for Offsite Flow Through Development	N/A	N/A	100-year peak discharge
Detention/ Retention Storage Basin	N/A	N/A	100-year 2-hour storm for determining on-site retention volume

2-303 STREET DRAINAGE

A. Design Criteria for Streets and Gutters

1. Pavement Encroachment
   Typical street sections used in city of Scottsdale are shown in Section 3.1, Geometrics, of the city's Design Standards and Policies Manual. See Figures 3.1-2 through 3.1-7, in Section 3.1.

2. Theoretical Capacity
   A Manning's "n" value of 0.015 (normal asphalt) or 0.016 (rough asphalt) shall be used for street flow unless special conditions exist which must be clearly documented in the Drainage Design Report.

3. Longitudinal Street Grades
   The desirable minimum longitudinal street grade is 0.4% to ensure that the gutters will function properly. Whenever possible, longitudinal street grades greater than or equal to this minimum shall be provided. It is recognized that this desirable grade is not always attainable, particularly with projects involving existing streets. In such situations, the absolute minimum longitudinal street grade is 0.2%.

   From an environmental standpoint, maximum street grades should not exceed 10%. Additionally, when planning street grades, emergency vehicle access needs to be considered in the design. Any slope less than 0.4% or greater than 10% needs specific review and approval by city staff.

B. Design Criteria for Intersections
   Valley Gutters: are permitted to transport runoff across local streets when a storm drain system is not required. However, valley gutters are generally not acceptable across collector or arterial streets. In unusual cases, valley gutters may be necessary in order to move street drainage across a Collector Street. In such situations, the valley gutter shall be a minimum of eight feet in width in order to lessen the impact on traffic.

C. Design Criteria for Roadside Ditches
   Non-Raised Curb Streets (ribbon curbs, dirt roads): The purpose of roadside ditches is to collect intercepted overland flow, cut slope runoff, and pavement runoff, but not concentrated offsite flow. For any street that does not have a raised curb, a minimum six inch deep V-shaped grader ditch shall be installed on both sides of the street at the edge of the road shoulder; unless it can be demonstrated and is documented in the project drainage report why the ditches are not necessary. An exception requires specific city staff approval. Roadside ditches must be shown on plan sheets (arrows in the direction of flow) as well as on cross section details. See typical cross section in Figure 2.3-3.

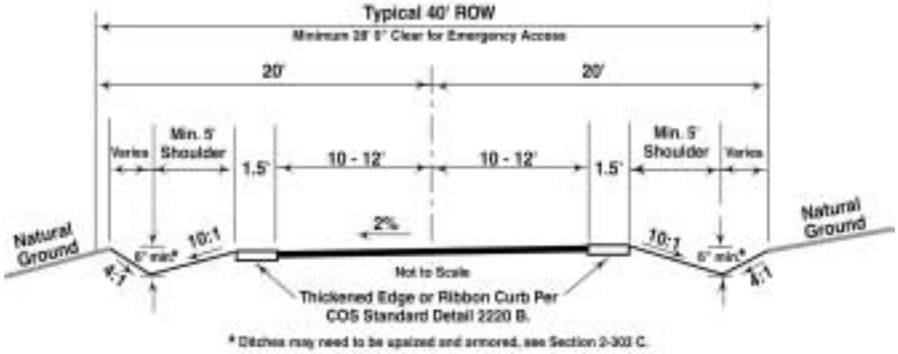


Fig. 2.3-3 Typical Cross Section for Roadside Ditches for Non-Raised Curb Street with Crown or Straight Cross Slope

Ditches must intercept and safely convey flow to the nearest recognized watercourse. If more than normal sheet flow runoff from the road cross section or cut slopes is intercepted or accumulated in the roadside ditches before it can be safely discharged then the ditches need to actually be sized. If velocities exceed 4-5 feet per second, then appropriate erosion or scour protection must be provided. Ditches are necessary to prevent runoff and debris from washing onto the roadway to prevent erosion of roadside areas adjacent to the edge of pavement or curbing; and to prevent runoff from the road surface flowing into front yards, driveways, garages, and homes.

D. Catch Basins

1. **Grated Catch Basins:** MAG, ADOT, and City of Phoenix catch basin details are acceptable if modified to be “bicycle friendly” (wheel can’t drop into space between bars on the grates).
2. **Scuppers:** MAG Standard Detail 206 shall be used as basis of scupper design unless prior approval of another design is obtained from city staff.
3. **Slotted Drains:** The use of slotted drains for shallow sheet flow conditions is permitted in the city of Scottsdale. Slotted drains may also be used in other situations with city staff approval.

2-304 STORM DRAINS

A. Separation of Storm Drain Systems from Water and Sewer Lines
Horizontal separation of storm drains and water or sewer lines shall be a minimum of 6 feet. Vertical separation of storm drains and sanitary sewers should be 2 feet (sanitary sewer below) unless the sewer line is manufactured from ductile iron with mechanical joints or equal. Concrete encasement may also be required by the city Water Resources Department. Vertical separation of storm drain and water line (water line below) shall be 3 feet clear. Separation is measured from the outside of the two pipes.

B. Sizing
The minimum pipe size of a storm drain lateral shall be 18 inches. In situations where debris may be expected, the city’s Drainage Planning staff should be consulted for applicable debris criteria.

C. Natural Watercourses
Washes and even man-made channels carry a continuous supply of sediment and debris. It is almost impossible to collect and filter out this debris without a constant clogging and maintenance problem.

1. In the ESL area, intercepting a natural wash with a capacity of 50 cfs or greater, with the intent of collecting it and directing it into a pipe or an underground storm sewer system is prohibited by ordinance.

2. In all other areas of the city, avoid, if possible, the interception of an off-site natural wash with the intent of collecting it and putting it into a pipe or an underground storm sewer system.

3. If there is no alternative to the routing of an open channel into a piped system, water should be first routed into a sediment or debris basin. Periodic maintenance of the debris basin will be required and responsibility clearly assigned to the HOA on the plat, grading and drainage plan, and in the drainage report. The capacity of the conduit should be 100 percent of the design discharge plus 30 percent to accommodate any sediment and debris.

2-305 CULVERTS AND BRIDGES

A. Inverted Siphons
Inverted siphons shall only be used when no other solution is available. City staff approval is required.

B. Culvert Profile
If a culvert is placed more than 0.5 feet below the natural wash invert, the capacity of the culvert must be reduced by the cross section area below this depth.

C. Private Bridges and Culvert Crossings
It is recommended that homemade drainage structures be restricted to crossing small channels whose source originates onsite (on-lot). The homeowner should use either dip crossings or free span bridges that do not constrict the flow capacity of the channel. Homemade drainage structures are discouraged and can be disastrous for the homeowner, neighbors, and adjacent streets. If undersized or installed improperly culverts can create a backwater into adjacent homes or property; cause a diversion of flow; or cause excessive scour and erosion. See Section 2.1, Figure 2.1-2 for proper installation. A minimum pipe size of 15 inches is recommended to avoid clogging or plugging.

Professional advice is always recommended. However, when attempting to cross a larger wash whose source originates off-site, a registered civil engineer should be consulted.

2-306 OPEN CHANNELS

A. General
Open channels are defined as watercourses which may be natural or manmade (artificial). Natural washes or streams generally have an active low flow channel and an adjacent floodplain. For purposes of these guidelines the open channel or watercourse is assumed to include the entire area needed to convey the entire100-year flood, its channel and floodplain. Construction of any kind within a within a dedicated drainage easement requires a City Encroachment Permit.

The city of Scottsdale is a member of the National Flood Insurance Program and must administer floodplain use in accordance with the federal program (FEMA) requirements. Within the city of Scottsdale, County Floodplain use permits or drainage permits are not required. In Scottsdale, floodplains and drainageways, including FEMA designated floodplains, are regulated through site development plan requirements. This is done as part of the standard building permits application process or by a right-of-way Encroachment Permit.

B. Floodplains
In Environmentally Sensitive Land (ESL) areas, the 100-year floodplain shall be delineated for watercourses having a capacity of 50 cfs or greater. In all other parts of the city, the 100 year floodplain shall be delineated for all watercourses having a capacity of 25 cubic feet per second (cfs) or greater (COS Ordinance Sec. 37-42.(2)). Delineated floodplain limits shall be clearly shown on all site development plans.

C. Drainage Easements

1. Encroachment Permits are required to enter and use any portion of a designated drainage easement.

2. Drainage easements must be dedicated to the city to the extent of the 100-year floodplain for all watercourses having: 50 cubic feet per second (cfs) capacity or greater in ESL areas; and 25 cfs or greater throughout the rest of the city; and for any watercourse with a peak discharge of 50 cfs or greater for the 100 year flood event.

3. Maintenance of drainage easements is generally the responsibility of the individual property owner or Homeowner's Association. Maintenance responsibilities must be clearly recorded on the Final Plat and noted on the Grading and Drainage Plan.

4. Any modification or proposed abandonment of a drainage easement needs specific advanced review and approval by city staff per the easement release procedures described in Section 2.1, 2-102 A. 3.

D. Artificial Channels

1. Unlined Earthen Channels

   a. In general, the maximum permissible velocity for channel design south of the Central Arizona Project Canal (CAP) is 5.0 fps.

   b. In general, the maximum permissible velocity north of the CAP is 4.0 fps.

   c. Vegetation growth or artificial revegetation must be incorporated into the design through either a reduction in the cross sectional area of the channel and/or an increase in the roughness coefficient. Any vegetation growth that reduces the design flow capacity of the wash shall be removed through routine maintenance.

2. Lined Channels

   a. The design flow capacity of the wash or channel must not be reduced by the placement of lining or landscaping material, including revegetation. The material must be inlaid or located below the design invert (bottom) of the channel. Do not place material on top of the designed finished grade of the channel cross section.

The design of the channel must include any embelishments that will reduce the carrying capacity.

b. The channel surface material (roughness coefficient) or cross sectional area may not be changed without a plan revision and re-approval by city staff.

c. If only the channel banks are being lined, the lining material must extend down a minimum of 3 feet below the channel invert or to the calculated scour depth.

3. Channel Alignment

a. Avoid designing turns in open channels greater than 45 degrees. If curves or bends can't be avoided the "run-up" on the outside of curves must be calculated and incorporated into the channel's design freeboard.

b. Channels should be located a separate drainage tract whenever possible. Avoid designing channels in a location that goes from back yard to back yard, unless outside of recorded building envelopes which prohibit the channel from being walled in.

c. Channels through walled in lots, commonly catch debris, and clog, and homeowners often block these openings. It is difficult if not impossible to inspect or insure these channels are properly maintained.

d. Lot lines should end at the edge of the wash floodplain, or man-made channel, not in the middle or on the other side.

e. Building envelopes are not recommended as a substitute for drainage easements. They can help but are too often misunderstood or ignored as a limit to construction of walls or structures.

E. Scour Analysis

Acceptable procedures for the estimation of channel degradation depth are described in Guideline 1 of State Standard 5-96, dated September 1996, published by the Arizona Department of Water Resources (ADWR), Flood Warning and Dam Safety Section. Copies can be obtained from ADWR or the city's Drainage and Floodplain Management staff.

Three levels of analysis are provided within the Guideline. Level I analysis provides an acceptable estimate of the potential scour depth for the design of structures placed near a streambed or along the banks of a channel, for channel reaches that are in general balance with the surrounding system--i.e. no major disturbances (dams, bridges, encroachments, etc.) evident in the vicinity—and where the desire is to establish a "safe" scour depth that can naturally occur within channels composed of erodible material.

Level I analysis requires only the peak discharge for the 100-year flood to estimate total scour depth. **When a Level I analysis is used, the required minimum total scour depth is 3 feet.** If Level I conditions exist and the 100 year peak discharge is 500 cfs or less no calculations are required if the 3 foot scour depth is used. Calculations are required for flows greater than 500 cfs.

Level II or Level III analyses are required when Level I conditions do not exist, or less than 3 feet of scour protection is proposed. These levels are more detailed for more site

specific erosion limits, which require local hydraulic information and sediment size distributions or historical data.

F. Maintenance

1. **Access:** Reasonable access for maintenance should be provided in order to properly maintain open channels. Minimum width of access should be 8 feet. Spacing between vehicular access points should be a maximum of ½ mile, although ¼ mile spacing is preferable. A minimum of one access point per subdivision is required. Non-vehicular access points shall be provided every 660-foot maximum. If the facility is to be city maintained the above minimum requirements are mandatory.

2. **Responsible Party:** Maintenance of drainage facilities within the city of Scottsdale is usually the responsibility of the property owner or the Subdivision's Homeowners Association. Specific maintenance responsibilities should be part of the dedication on the Recorded Plat and noted on the Grading and Drainage Plan.

G. Safety
The city of Scottsdale requires fencing (railing) at vertical drops of two feet or greater around an inlet or outlet works. Access for maintenance should be maintained to the extent practicable.

2-307 HYDRAULIC STRUCTURES (RESERVED)

2-308 DETENTION AND RETENTION FACILITIES (STORMWATER STORAGE FACILITIES)

A. Interaction with other Components of a Drainage System

1. Waiver Requests
The cumulative effects on the entire upstream as well as the downstream watershed must be evaluated. Do not assume storage can be waived just because an area is small relative to the entire watershed or because the project is at the very downstream end of the watershed. These are common arguments for waivers; however they are only valid if the remainder of the watershed is already developed, and if downstream receiving channels and or storage facilities have adequate capacity. If not, the cumulative effects of waiving storage on many small individual projects within the same watershed can result in major downstream flooding problems.

2. Design Criteria
Development must store runoff from rainfall events up to and including the one hundred-year, two-hour duration event. Multi-frequency storm control must be incorporated into basin design. Rainfall runoff from storms of all frequencies should enter and depart from property in substantially the same manner as under pre-development conditions (COS Sec: 37-42). As a minimum the 2, 10, and 100-year events should be analyzed.

B. Hydrology
The Uniform Drainage Policies and Standards for Maricopa County, Arizona (February 25, 1987), states that: "all development shall make provisions to retain the peak flow and volume of runoff from rainfall events up to and including the 100 year, 2-hour duration storm falling within the boundaries of the proposed development". The procedure for determining the volume of runoff from the 2-hour storm is provided in Section 2.2 Hydrology, Chapter 2-204 of The City of Scottsdale Design Standards and Policies Manual. See Section 2.1 for additional guidance.

C. Basin Location

1. On-line basins are generally prohibited unless specific advance approval is obtained from both city project review staff and the city's Floodplain Administrator.

2. Off-site washes shall be routed around and not through stormwater storage basins, whenever possible.

3. Maintenance must be planned for and responsibilities must be clearly stated on the recorded plat and grading and drainage plan if an online basin is permitted or if off-site flows are routed into a storage facility.

4. All storage facilities must have an emergency spillway or overflow point that will safely discharge to a recognized watercourse.

5. On-lot storage on individual single family residential lots is generally prohibited and should not be used as a solution to meet overall subdivision storage requirements. Storage facilities shall be located within a common area tract or drainage easement dedicated to the city, and must have maintenance access from a public right of way.

D. Detention/Retention (Storage) Facility Inlet and Outlet Structures

1. Methods for Draining Stormwater Storage Facilities
   Storage facilities should be drained by positive gravity outlet. The minimum allowable pipe size for primary outlet structures is 18 inches. Water must be discharged into a recognized natural watercourse, open channel, or into a nearby storm sewer system. If discharged into a storm sewer system the maximum discharge is 1 cfs and water should be discharged directly into a catch basin or other inlet.

   Water cannot be discharged into a City Street, gutter or alley without specific prior approval of city staff. Water shall only be allowed to be discharged into a city street, if its flow is no more than 1 cfs and it can be conveyed safely via a gutter or roadside ditch to a storm sewer inlet or recognized watercourse, without flowing across a city street or intersection.

   Methods for draining facilities are listed in the following order of preference:

   a. Positive Gravity Outlet

   b. Pump Station

   c. Dry Wells
      Dry wells are only permitted as a last resort and need prior city staff approval. Dry wells are not appropriate for use in flow-through systems or in facilities receiving offsite flow. Dry wells must be designed per FCDMC Design Manual Vol. III design requirements.

   d. Natural Infiltration (Basin Floors)
      Designing a basin to drain solely by natural infiltration through the bottom of the basin is prohibited. Basin floor infiltration is not dependable. The soil characteristics that accurately reflect conditions of the finished basin are difficult to analyze and basins are not properly maintained to retain their infiltration capacity.

2. Drain Time
   All storage facilities should be designed such that the stored runoff shall be discharged completely from the facility within 36 hours following the storm event. This is a city Ordinance requirement related to Maricopa County Health Department Standards. Drain time must be engineered to ensure the effectiveness of the basin and should not be designed to drain in less than 24 hours. An orifice plate over the minimum size pipe may be used to control the outflow rate.

3. Parking Lot Storage
   Up to 50% of the required storage volume may be provided in parking areas if the following conditions are met:

   a. Storage system shall store the first 30% of the required runoff volume off paved areas (to avoid nuisance water constantly ponding on the pavement).

   b. Interference with pedestrian traffic must be minimized in the design of the storage facility.

   b. Depth of water shall not exceed six inches within the parking area.

4. Embankment Design Criteria
   Embankments are small dams that can be a serious potential downstream flood hazard. Detention or Retention facilities should be constructed below the natural ground surface whenever possible. The only above ground storage allowed is that created behind a designed road fill. The use of any other embankment to impound Stormwater runoff requires specific prior approval by city staff. If approval is obtained, all the design requirements contained in the FCDMC Manual Sec. 8.3.3 must be completely and thoroughly followed. In addition, except for designed road fill, the owner/developer must provide the city as-built certification by a registered Geotechnical or Civil Engineer, experienced in dam technology, that the embankment was designed, and constructed properly, is stable, and will safely impound the design volumes of water.

5. Underground Storage (Reserved)

E. Operation and Maintenance
   Maintenance of storage facilities within the city of Scottsdale is usually the responsibility of the property owner or the Subdivision's Homeowners Association.
   Specific maintenance responsibilities shall be clearly indicated on the recorded Final Plat and noted on the Grading and Drainage Plan.

F. Volume Certification
   The property owner will provide the city with certified as-built dimensions of the basins and the actual volume of storage provided. Either a civil engineer or land surveyor who is registered to practice in the State of Arizona must base this on "as-built" topographic surveys. The as-built volumes must reflect permanent finished landscaping in place. The volumes shall be certified by the Design Engineer that the volumes provided meet or exceed the required design volumes per COS Ordinance and the approved Drainage Plan. The volume of storage provided must equal or exceed the approved design volumes before the city will issue Letters of Acceptance for maintenance of any public facilities.

2-309 PUMP STATIONS (RESERVED)

Chapter 3

Transportation
Design Standards and Policies
Revised December 1999

Chapter 3, Transportation, describes the geometric requirements for each street classification defined by the Circulation Element of the General Plan. This chapter also presents the criteria and procedures to be used when preparing traffic signal plans and traffic signing and pavement marking design in the City of Scottsdale. Transit facility and bikeway design guidelines are also presented in this chapter. Chapter 3 also contains guidelines for the design of the structural section of flexible pavements, which are to be constructed in Scottsdale's public rights-of-way.

Section 3.1

Geometrics

Design Standards and Policies
Revised December 1999

Chapter 3
Transportation

Section 3.1
Street Geometrics

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
3-101	General Comments	1
	A. Use of National Standards	
	B. Street Types	
	C. Street Classifications	
3-102	Design Standards	3
	A. Street Right-of-Way Requirements	
	B. Pavement Cross-Section Slopes	
	C. Medians	
	D. Curbs	
	E. Selection of a Design Speed	
	F. Superelevation in Curves	
	G. Horizontal Curves	
	H. Vertical Alignment	
	I. Combined Horizontal and Vertical Curves	
	J. Intersections	
3-103	Street Access and Driveways	13
	A. Driveway Spacing	
	B. Driveway Location Limitations	
	C. Protection of Access	
	D. Residential Development Driveways	
	E. Commercial and Industrial Development Driveways	
	F. Driveway Grades	
	G. Declaration Lanes	
3-104	Sidewalks	15
3-105	Bridges, Retaining Walls, and Structural Clearances	16
	A. Bridges	
	B. Retaining Walls	
	C. Structural Clearances	
3-106	Side Slopes	18
	A. Side Slopes Standards	
	B. Slope Rounding	
3-107	Construction of Less than Ultimate Cross-Section Improvements	18

Section	Paragraph Title	Page
3-108	Construction of Half-Streets A. Design of Cross-Section for Half-Streets B. Design of Half-Street to Join Existing Street Pavement C. Culverts Under Half-Streets	18
3-109	Pavement Transitions A. Transition to a Wider pavement Section B. Transition to a Narrower Pavement Section	19
3-110	Frontage Roads	19
3-111	Subdivision Street Planning A. Existing and Proposed Streets B. Street Abandonment C. Cul-de-Sac Street Lengths D. Dead-End Streets E. Bubbles F. Alleys G. Offset Intersections H. Intersecting Tangents	19
3-112	Special Standards for a Development A. Preliminary Design Report for a Development B. Final Design Report Special Standards C. City Review and Approval of Special Standards	21

FIGURE LIST

FIGURE	DESCRIPTION
3.1-1	Hillside Area Street Design
3.1-2	Parkway/Expressway
3.1-3	Arterial Streets
3.1-4	Couplet Streets
3.1-5	Collector Streets
3.1-6	Local Streets
3.1-7	Local Commercial and Industrial Streets
3.1-8	Basic Design Data for Streets
3.1-9	Median Grading
3.1-10	Cut-Off Wall
3.1-11	View Obstructions on Horizontal Curves
3.1-12	Vertical Curve Relationships
3.1-13	Intersection Sight Distance Requirements
3.1-14	Traffic Safety Triangle on Corner Property
3.1-15	Auxiliary Lanes
3.1-16	Median Opening for Intersections

3.1-17 Residential Driveways
3.1-18 Commercial/Industrial Driveways – Type CL
3.1-19 Commercial/Industrial Driveways – Type CH
3.1-20 Commercial/Industrial Driveways – Type CI
3.1-21 Driveway Grade Standards
3.1-22 Pavement Width Transitions
3.1-23 Subdivision Street Planning
3.1-24 Cul-de-Sac Street Length
3.1-25 Bubbles for Streets
3.1-26 Alley Widths and Intersections

SECTION 3.1
STREET GEOMETRICS

3-101 GENERAL COMMENTS

This section describes the geometric requirements for each street classification: parkway, expressway, major arterial, minor arterial, couplet, major collector, minor collector, local collector, local residential, local commercial and local industrial. While the Circulation Element of the General Plan is a broad based planning tool, Section 3.1 is a tool for use by the design engineer in the application of the General Plan. The requirements described herein are primarily based on safety considerations; therefore, standards that provide a greater degree of safety may be used within reasonable economic limits, but standards that provide a lesser degree of safety may not be used without approval from the Transportation Department General Manager.

While every effort has been made to ensure the accuracy and completeness of these guidelines, the City of Scottsdale shall not be held responsible for any errors or omissions. It shall be the sole responsibility of the design engineer to ensure a proper design and the accuracy and completeness of construction documents containing his or her signature.

A. Use of National Standards

1. Geometric Design Standards
   The American Association of State Highway and Transportation Officials (AASHTO) policy on highway design is an approved reference and is to be used together with this manual.

2. Traffic Control Standards
   All traffic control devices shall be in accordance with the Manual on Uniform Traffic Control Devices (MUTCD) prepared by the U.S. Department of Transportation; City of Scottsdale Design Standards and Policies, Section 3.4 - Bikeways; and Section 3.6 - Traffic Signs and Markings.

B. Street Types

The Circulation Element of the General Plan defines six basic types of streets. These are Freeway, Parkway, Expressway, Arterial, Collector, and Local.

1. Freeways

   Freeways will be designed to safely handle very large volumes of through traffic. Direct access will be limited to widely spaced interchanges. Design, construction, and operations shall be provided by the Arizona Department of Transportation.

2. Parkways

   Parkways are high-volume, high-capacity facilities that provide for regional mobility rather than local traffic movements. Direct access is limited. Parkways have scenic easements that give the added attraction of desert landscaping along these regional routes.

3. Expressways

   Expressways provide for efficient movement of large volumes of through traffic. Direct access is limited to designated intersections.

4. Arterial Streets

   Arterial streets with raised medians provide regional continuity and carry large volumes of traffic between areas of the City and through the City. Full access to abutting commercial and multi-family land uses is limited to median openings. Single-family residential developments may not have direct access to an arterial street.

5. Collector Streets

   Collector streets provide for traffic movement between arterial and local streets, with some direct access to abutting commercial and multi-family land uses. Center left-turn lanes are provided to allow for greater access. Driveway access should be evenly spaced.

6. Local Streets

   Local streets provide direct access to abutting land uses, handle local traffic, and provide access to the collector street system. Local streets normally will not be connected to arterial streets.

   Deciding the location of local collector, residential, commercial and industrial streets is usually part of the development site planning process. Frequently, planning for local streets is influenced by the plans for adjacent developments, which have recently been approved. Project Review will review each preliminary proposal for development and will specify any changes needed to conform with previously planned and approved street alignments. Project Review will also specify the classification for each street involved in the plan.

C. Street Classifications

There are ten street classifications based upon the type and level of use for which the streets are intended. Following is a listing of each street classification followed by the number of the figure that depicts the standard street cross-section for that classification. Design criteria for streets located within the Hillside or Upper Desert/Lower Desert areas are specified in the Development Design Guidelines for Environmentally Sensitive Lands. Figure 3.1-1 depicts the areas within the City where these criteria apply.

STREET CLASSIFICATION	FIGURE
Parkway	3.1-2
Expressway	3.1-2
Major Arterial	3.1-3
Minor Arterial	3.1-4
Couplet	3.1-4
Major Collector	3.1-5
Minor Collector	3.1-5
Local Residential	3.1-6
Local Commercial/Industrial	3.1-7

3-101 DESIGN STANDARDS

Figure 3.1-8 lists most of the design standards data necessary for the design of streets within the City of Scottsdale. Subsequent paragraphs in this booklet discuss this data and provide other standards that could not be included in the table.

A. Street Right-of-Way Requirements

The right-of-way requirements shown in figures 3.1-2 through 3.1-7 are based on the space needed for the street when it is constructed to meet ulitmate development requirements. The right-of-way must also provide space for utilities, cut or fill slopes, sidewalks, bicycle paths, trails, traffic control devices and information signs, fire hydrants, landscaping, transit facilities, and other public facilities that must be located adjacent to street pavements.

Right-of-way widths in excess of the standard widths may be required in special circumstances such as when:

1. Cut or fill slopes cannot be confined within the standard width;

2. Minimum sight distance lines on horizontal curves are not within the standards;

3. Minimum sight distances at intersections are not within the standards;

4. Auxiliary lanes are to be provided.

B. Pavement Cross-Section Slopes

1. Typical Street Cross-Sections

Undivided streets should have a normal crown that is a two-way cross-slope with the cross-section high point on the street centerline. Divided streets should have cross-slope on each pavement section. The high point of each slope on each pavement section shall occur on the edge of the pavement nearest to the median. Unusual conditions may cause cross-slope requirements to vary, but normally, the desirable cross-slope is 2%, with a maximum cross-slope of 3%. Any deviation from the desirable cross-slope is subject to review by the Transportation Department.

2. Cross-Sections in Street Dip Sections
While dip sections are discouraged, where storm drainage runoff flows must cross the street, dip sections are needed. The pavements through the dip section should have a one-way slope (no crown), curbing and medians must not be raised, and cut-off walls shall be installed in accordance with City of Scottsdale standard details. Transitions back to normal street cross-slopes will be needed at both ends of the dip section.

C. Medians

1. Median Widths
The width of a median is measured from back of median curb to back of median curb. If the median has no curb, the width is measured between the centers of the continuous, painted median stripes. Median widths are specified in Figure 3.1-8. In special circumstances, the Transportation Department may approve widths other than those listed, but in no case shall a median be constructed with a width less than 3 feet.

2. Paved Medians
A median less than 4 feet wide should be paved. The paved surface should be crowned and have the same cross-slope as the street pavement. Acceptable paving materials are portland cement concrete or concrete pavers.

3. Unpaved and Landscaped Medians
Medians that are 4 feet or more in width are normally not paved. The grading of the unpaved areas should be as shown in Figure 3.1-9. If a median is to be landscaped, it shall be not less than 5 feet wide. Landscaping and other median features shall not restrict sight distance for left turning vehicles on the through street. Median landscaping shall not restrict sight distance in the vicinity of intersections for side street traffic, refer to Figure 3.1-8 and 3.1-13.

D. Curbs

1. Vertical Curbs
Vertical curbs are required for all streets except local residential streets (see Figures 3.1-2 through 3.1-7 and 3.1-8). Vertical curbs may be used where roll curbs are specified if drainage considerations make such use desirable.

Vertical curbs with gutter are to be constructed in accordance with City of Scottsdale standard details. Vertical curb and gutter type shall match the adjacent pavement slope to the gutter cross slope direction. The curb height shown on the standard detail is 6 inches, but the following variations may be used where appropriate.

a. Where fire lane or public maintenance vehicle access to abutting property must be provided over the curb, use City of Scottsdale mountable curb and gutter.

b. If special drainage requirements make a higher curb necessary, the height may be increased to 8 inches maximum and the width of the gutter may be increased to 24 inches.

2. Roll Curb, Ribbon Curb, Maricopa Edge
Roll curb is preferred for local residential streets except where vertical curb is required, and is to be constructed in accordance with MAG Standard Details. Ribbon curb may be used in lieu of roll curb for local residential streets. When ribbon curb is

used, drainage runoff from the road shall not drain with the road but shall be directed to roadside drainage ditches. See Chapter 2.3 Section 2-303 C - “Design Criteria for Roadside Ditches,” and Figure 2.3-3 for a typical cross section. For local rural roads, a Type A Maricopa Edge may be used. The pavement width of the local rural road shall be twenty-four (24) feet. When a Maricopa edge is used, drainage runoff from the road shall not drain with the road but shall be directed to roadside drainage ditches.

3. Cut-Off Walls
   In locations where dip sections are permitted to allow drainage flows to cross roadways, cut-off walls conforming to City of Scottsdale standard details must be installed. Cut-off walls must be at least 3 feet deep and have a top that is flush with the pavement surface. The exposed portion of the cut-off wall will have the appearance of a ribbon curb, with the same width as the street's regular curb and gutter (see Figure 3.1.10). The cut-off walls must extend across the flow path in the dip section to protect the pavement structure during runoffs flows from a 100-year storm. Transitions will be needed between the regular curbs and the cut-off walls at each end of the dip section.

4. Curb Returns
   Vertical curb shall be used through the curb return from PC to PT regardless of whether the tangent curb sections are vertical or roll curb. All curb returns shall be provided with sidewalk from PC to PT of the same width as that provided for the sidewalk behind the tangent curb sections. If no sidewalk is provided behind the tangent curb sections, the curb return sidewalk shall be at least 4 feet wide.

   a. Curb Return Radii
      The radii for curb returns measured to the back of the curbs shall be 25 feet for intersections that involve either a local collector street or local residential street. The radii for curb returns measured to the back of curbs shall be 30 feet for all other street intersections.

   b. Sidewalk Ramp at Curb Return
      A sidewalk ramp shall be constructed at all curb returns in accordance with MAG Standard Details for a 30' curb return radius or for a 25’ curb return radius. If a traffic signal exists or is planned, the ramp and apron must provide access to the pedestrian push button.

E. Selection of a Design Speed
   The design of geometric features such as horizontal and vertical curves will depend upon the design speed selected for the street. The choice of the design speed is primarily determined by the street classification. The design speed is the maximum speed for the safe operation of a vehicle that can be maintained over a specific section of a street when conditions are so favorable that the design features of the street govern. Design speeds for the various classifications of streets may be found on Figure 3.1-8. The use of design speeds other than those shown in Figure 3.1-8 must be approved by the Transportation Department General Manager.

F. Superelevation in Curves
   Superelevation is discouraged on horizontal curves in the portion of the city outside the Environmentally Sensitive Lands area.

   1. 0.02 ft/ft Superelevation

Superelevation of 0.02 ft/ft may be used when the standard radius cannot be provided due to circumstances beyond the control of the engineer and the general alignment cannot be changed.

2. Superelevation Greater than 0.02 ft/ft
   Superelevation greater than 0.02 ft/ft may not be used except when approved by the Transportation Department General manager. In no case shall a superelevation exceed 0.06 ft/ft.

3. Transition for Superelevation

   a. The length of superelevation transition shall be based on the superelevation rate and the width of rotation. The axis of rotation shall generally be about the pavement centerline. The transition lengths for a superelevation of 0.02 ft/ft are provided in Figure 3.1-8. For other superelevations, refer to the AASHTO publication, A Policy on Geometric Design of Highways and Streets.

   b. With respect to the beginning or ending of a horizontal curve, one-third (1/3) of the transition should be on the curve and two-thirds (2/3) of the transition should be on the tangent pavement section.

4. Drainage on Superelevated Curves
   Whenever superelevation is allowed on a divided street, a storm drainage system to collect the runoff along the median curb shall be provided. In no case shall nuisance water from the higher traveled way be allowed to cross the lower traveled way.

G. Horizontal Curves
Horizontal alignments should provide for safe and continuous operation of motor vehicles at a uniform design speed for substantial lengths of street. A horizontal curve is required when the angle of change in horizontal alignment is equal to or greater than one degree. The nature of the surrounding development and topography, and the street classification will establish the factors that determine the radius of a curve.

1. Minimum Radii of Curvature
   The minimum radius of curvature will be determined by the design speed or by the stopping sight distance.

   a. Minimum Radii Based on Design Speed
      Figure 3.1-8 contains the minimum radius of curvature for each street classification with and without a superelevation of 0.02 ft/ft. Wherever possible, the radii used in design should be larger. If stopping sight distance conditions require a larger radius than that shown in Figure 3.1-8, then that larger radius becomes the minimum radius for the curve.

   b. Consideration of Stopping Sight Distance
      When walls, buildings, bridge piers, cut slopes, vegetation, or other obstructions are near the roadway on the inside of a curve, they can block a driver's view of the road ahead. If they are too close, the driver will not have sufficient distance along the curved roadway to stop when a hazardous condition comes into view. For design, the driver's eye is 3.5 feet above the center of the inside lane (the driving lane closest to the inside of the curve) and that the hazardous condition is an object 0.5 feet high in the center of the inside lane. The clear distance, "M," is measured from the center of the inside lane to the view obstruction. Figure 3.1-11 depicts these relationships and a table of minimum stopping sight distances for various design speeds.

2. Reduced Design Speeds on Curves
   The reduction of a street design speed on a curve should be avoided. However, where physical restrictions prohibit increasing the radius of the curve or the clear distance, "M," the design speed for the curved section may be reduced. In such circumstances, signing in accordance with MUTCD is required. The difference between the design speed for the roadway approaching the curve and the design speed for the curve shall not be greater than 10 miles per hour. The design speed for a curved roadway section must not be reduced if the reduction would occur at the end of a long tangent or at any location where high approach speeds may be expected.

3. Compound Curves
   Compound curves should be avoided. However, if site conditions make the use of a compound curve unavoidable, the minimum lengths for tangents between two curves curving in the same direction are listed in Figure 3.1-8. The shorter radius shall be at least 2/3 the length of the long radius when the shorter radius is 1,000 feet or less. Compound curves are not permitted when design speeds require the shorter radius to be greater than 1,000 feet.

4. Tangent Sections Between Curves in the Same Direction
   On two-lane roads, tangent sections are needed between two curves in the same direction. If the pavement cross-sections through, the curves do not have superelevation. (The minimum lengths for tangent sections are listed in Figure 3.1-8.) If superelevation is provided in the curved portions of the roadway, then the tangent lengths will be determined by the superelevation transition lengths indicated in Figure 3.1-8.

5. Tangent Sections Between Reverse Curves and Approaching Intersections
   A tangent section must be provided between two curves that curve in the opposite direction. A tangent section must also be provided between an intersection and a curve. Minimum lengths for tangent sections between reverse curves without superelevation are provided in Figure 3.1-8. If the curve radii are at least 50% greater than the radii required by the design speed, the tangent sections may not be required depending on grades, topography, and vegetation. If superelevation is provided for the curves, then the superelevation transition lengths indicated in Figure 3.1-8 will determine the minimum length of tangent sections between reverse curves.

H. Vertical Alignment
   A vertical curve is required when grade changes are equal to or greater than 1.5%. All sections of a street's vertical alignment must meet passing and stopping sight distance requirements for the design speed established for the street. For further details, see the AASHTO publication, A Policy on Geometric Design of Highways and Streets.

1. Longitudinal Street Grades
   For parkways, expressways, and arterial streets the maximum grade is 6%--for collector and local streets the maximum grade is 9%. The minimum longitudinal street grade for all streets is 0.4%. Wherever possible, longitudinal street grades greater than or equal to the minimum grade shall be provided. Where necessary, grades less than 0.4% may be used with written approval from a City of Scottsdale drainage planner.

2. Vertical Curves
   Properly designed vertical curves should provide adequate sight distance, safety, and effective drainage.

a. Type of Curve
A parabolic vertical curve is to be used. Figure 3.1-12 provides all necessary mathematical relations for computing a vertical curve, either crests or sags.

b. Sight Distance Requirements
Sight distance is the continuous length of street ahead visible to the driver. For vertical alignment design, two sight distances are considered: passing sight distance and stopping sight distance. Stopping sight distance is the minimum sight distance to be provided at all points on multi-lane streets and on two-lane streets when passing sight distance is not economically obtainable. Stopping sight distance shall also be provided in the vicinity of intersections. Figure 3.1-8 lists the minimum passing and stopping sight distances for the various street classifications and design speeds.

1) Stopping Sight Distance
The minimum stopping sight distance is the distance required by the driver of a vehicle, traveling at a given speed, to bring the vehicle to a stop after an object on the road becomes visible. Stopping sight distance is measured from the driver's eyes, 3.5 feet above the pavement surface, to an object 0.5 feet high on the roadway, or currently accepted AASHTO standards.

2) Passing Sight Distance
Passing sight is the minimum sight distance that must be available to enable the driver of one vehicle to pass another vehicle safely, without interfering with the speed of an oncoming vehicle traveling at the design speed should it come into view after the overtaking maneuver is started. The sight distance available for passing at any one place is the distance at which a driver whose eyes are 3.5 feet above the roadway surface can see the top of an object 4.25 feet high on the road, or currently accepted AASHTO standards.

c. Minimum Vertical Curve Lengths
Minimum vertical curve lengths are determined by sight distance requirements for a given design speed.

1) Crest Vertical Curve Lengths
Minimum crest curve lengths are determined by either the stopping sight distance or the passing sight distance, whichever provides the greatest curve length.

a) The minimum crest vertical curve lengths must only meet stopping sight distance requirements on streets with two or more through travel lanes per direction.

b) Two-Lane Streets
Passing sight distance requirements should be met on streets with one through travel lane per direction. When crest curve construction in accordance with passing sight distance requirements would result in the creation of drainage problems or excessive cuts or fills, the curve length may be reduced with the installation of appropriate traffic control measures.

c) Minimum Crest Vertical Curve Length Determined by Stopping Sight Distance

The following equations are to be used to determine the minimum crest vertical curve lengths based upon stopping distance requirements:

When $S_s<L$, $L = (AS_s^2)/1329$

When $S_s>L$, $L = (2S_s) - (1329/A)$

Where:
S_s = Stopping sight distance in feet for a given design speed.
L = Length of curve in feet.
A = Algebraic grade difference in percent.

d) Minimum Crest Vertical Curve Length Determined by Passing Sight Distance.

The following equations are to be used to determine the minimum crest vertical curve lengths based upon sight distance requirements:

When $S_p<L$, $L = (As_p2)/3093$

When $S_p>L$, $L = (2S_p) - (3093/A)$

Where:
S_p = Passing sight distance in feet for a given design speed.
L_p = Length of curve in feet.
A = Algebraic grade difference in percent.

2) Sag Vertical Curve Lengths

Minimum sag vertical curve lengths are determined by either the stoping sight distance or comfort factors. The longer of the two possible minimum curve lengths will be used.

a) Minimum Sag Vertical Curve Length Determined by Stopping Sight Distance

The following equations are to be used to determine the minimum sag vertical curve length based upon stopping sight distance requirements:

When $S_s<L$, $L = (As_s^2)/(400 + 3.5S_s)$

When $S_s>L$, $L = (2S_s) - \{(400 + 3.5S_s)/A\}$

Where:
S_s = Stopping sight distance in feet for a given design speed.
L = Length of curve in feet.
A = Algebraic grade difference in percent.

b) Minimum Sag Vertical Curve Length Determined by comfort Factors

The following equation is to be used to determine the minimum sag vertical curve length based upon comfort factors:

$L = (AV^2)/46.5$

Where:
L = Curve length in feet.
A = Algebraic grade difference in percent.
V = Design speed in miles per hour.

I. Combined Horizontal and Vertical Curves

When horizontal and vertical curves are combined, the horizontal curve shall lead and follow the vertical curve. For additional information on this topic, refer to the AASHTO publication, A Policy on Geometric Design of Highways and Streets.

J. Intersections

Although all intersections share certain common elements, they are not subject to generalized treatment. To minimize conflicts and provide for anticipated traffic movements each intersection must be evaluated with regard to its individual characteristics and designed based on the following factors:

- Traffic factors such as capacities, turning movements, vehicle size and operating characteristics, vehicle speed, pedestrian and bicycle movements, transit operations, and accident history.

- Physical factors such as topography, existing conditions, channelization requirements; and available sight distance.

- Human factors such as driving habits, reaction to surprises, decision and reaction time, and natural paths of movement.

1. Angle of Intersection

A right-angle intersection provides the shortest crossing distance for intersecting traffic streams. It also provides the most favorable condition for drivers to judge the relative position and speed of intersecting vehicles. Where special conditions exist, intersection angles may diverge from a right-angle by a maximum of 2 degrees (4 degrees with approval of the Transportation Department General Manager) on parkways, expressways, arterial streets, and major collector streets; and by a maximum of 4 degrees (15 degrees with approval of the Transportation Department General Manager) on minor and local collector streets, couplets, and local streets.

2. Alignment and Profile

Intersections occurring on horizontal or crest vertical curves are undesirable. When there is latitude in the selection of intersection locations, vertical or horizontal curvature should be avoided. A line or grade change is frequently warranted when major intersections are involved. If a curve is unavoidable, it should be as flat as site conditions permit. Where the grade of the through roadway is steep, flattening through the intersection is desirable as a safety measure.

3. Intersection Sight Distance

In order to provide the opportunity for vehicles at an intersection to safely cross or make left or right turns onto a through street, adequate sight distance must be provided. Sight lines are to be drawn on roadway and landscaping plans to represent the areas that must be free of all objects and topography in excess of 24" above the roadway surface. Figure 3.1-13 depicts the technique used to determine driver's eye locations; a line is then drawn to connect these two points. Continuous unobstructed line of sight must be provided along this line and throughout the approach to the intersection, providing an unobstructed sight triangle to the side street driver. Vegetation placed within the sight triangle shall be of a low variety that remains below 24" when mature. Trees can be considered within the triangle as long as the canopy is above 7 ft. and if it is a single trunk variety.

a. Right-Angle Intersections
If the street intersection legs meet at an angle of 88 to 90 degrees, the sight distances shown in Figure 3.1-8 are to be used with Figure 3.1-13 to calculate the sight triangle. The intersection sight distance shown on Figure 3.1-8 for all street classifications except local industrial was determined assuming passenger car traffic. If high volumes of truck traffic are anticipated on other than local industrial street, the procedures in the AASHTO publication, A Policy on Geometric Design of Highways and Streets should be consulted to determine the necessary sight distances.

b. Skewed Intersections
For skewed intersections where the intersection angles are less than 88 degrees, sight distances must be calculated in accordance with the procedures described in Chapter 9 of the AASHTO publication, A Policy on Geometric Design of Highways and Streets.

c. Intersections within or near a curve
Distances S_1 and S_2 shown in Figure 3.1-13 shall follow the street alignment when the intersection is within or near a horizontal curve.

d. Traffic Safety Triangles
Traffic Safety Triangles should be used as a means to limit the height of structures, vegetation, and other improvements on corner properties immediately adjacent to intersections. **Safety triangles are not to be used as a substitute for intersection sight distance!** Safety triangles provide additional visibility around corners for all intersection approaches, and should be applied to the design of perimeter walls and landscape features. Items within the safety triangle shall be no higher than 24" measured from the roadway surface. Figure 3.1-14 depicts the method used to determine the safety triangle location.

4. Intersections with an Unpaved Leg

If an intersection has a leg that is unpaved, the paving to be placed in the intersection shall extend to the end of the normal curb return location on the unpaved leg at a minimum.

5. Valley Gutters at Street Intersections

a. Locations of Valley Gutters

Valley gutters may only be used across minor and local collector streets, and local residential streets. Exceptions must be approved by the Transportation Department General Manager.

b. Valley Gutter Widths
Valley gutters should be constructed in accordance with City of Scottsdale standard details.

6. Turning Lanes
   A separate turning lane permits separation of conflicting traffic movements and removes turning vehicles from the intersection area. Right turn lanes shall be provided on streets classified as Major Arterial or higher, at all street intersections and at driveways where warranted. For left turn lanes at signalized intersections, dual turn lanes should be considered when the turn volume exceeds 200 vehicles per hour, the opposing through volume exceeds 1,000 vehicles per hour, or the delay to left turning vehicles exceeds 45 seconds. Abrupt reduction of alignment and sight distance standards should be avoided. Figure 3.1-15 shows separate left and right turn lanes. The length of these lanes depends on several factors and must be determined on a case-by-case basis and approved by the Transportation Department.

7. Median Design
   Raised medians are required on parkways, expressways, arterial streets, and couplets to separate traffic flows, channelize left turns, and reduce conflicts. On collector streets, flush or painted medians provide space between the through traffic lanes for left turning vehicles. Required median widths are listed for each street classification in Figure 3.1-8.

   a. Raised Medians
      Raised medians, where required, must be provided in accordance with the applicable City of Scottsdale standard details, with the appropriate median width as noted above.

      1) Spacing and Location of Median Openings
         If a street has a raised median, it is not possible to provide an opening in the median for every street intersection or driveway location. Full median openings should occur at not less than 1/4-mile intervals on parkways, expressways, and major arterial streets. Partial median openings, which allow only left turns off the major street, are acceptable at 1/8-mile spacing. On minor arterials and couplets, full median breaks should be no closer than 1/8-mile intervals. In built up areas, where reasonable alternate access is not available, median openings may be provided at smaller intervals with the approval of the Transportation Department.

      2) Configuration of Median Openings
         If the street intersection legs intersect at an angle of 88 to 90 degrees, the configuration of the median opening is to be determined by the information on Figure 3.1-16. If the streets intersect at an angle less than 88 degrees, the median opening configuration will have to be determined to the satisfaction of the Transportation Department General Manager.

      3) Cross-Slope
         The cross-slope in the median opening shall be limited to 0.02 ft/ft. Median openings on curves with superelevation exceeding 0.02 ft/ft will not be permitted.

   b. Flush Medians
      Flush, painted medians are required on major, minor, and local collector streets. Median widths for these streets are listed in Figure 3.1-8.

3-102 STREET ACCESS AND DRIVEWAYS

A. Driveway Spacing

The following table lists the minimum driveway spacing measured from driveway centerline to driveway centerline, which is acceptable for the indicated types of land use:

LAND USE	STREET TYPE	DRIVEWAY TYPE*	MINIMUM SPACING
Single Family	All	S-1	50 feet
Multi-Family	All	M-1	165 feet
		M-2	330 feet
Commercial	Minor Collector/Local	CL-1	165 feet
	Major Collector/Minor Arterial	CH-1	330 feet
	Major Arterial	CH-1	660 feet
		CH-2, CH-3	1320 feet
Industrial	Minor Collector/Local	CI	165 feet
	Major Collector/Minor Arterial	CH-1	330 feet
	Major Arterial	CH-1	660 feet
		CH-2, CH-3	1320 feet
	Parkway/Expressway	CH-2, CH-3	1320 feet

* See City of Scottsdale Standard Details and Figures 3.1-17 through 3.1-20

A maximum of one driveway opening shall be permitted to a particular site or parcel from each of any one or two abutting streets. One additional driveway entrance may be permitted by the Transportation Department when projected travel demands indicate it is in the interests of good traffic operation and adequate street frontage exists to maintain the above guidelines.

B. Driveway Location Limitations

A new access driveway will not be allowed (measured to the driveway centerline):

1. within 30 feet of any commercial property line except when it is a joint-use driveway serving two abutting commercial properties and access agreements have been exchanged between, and recorded by, the two abutting property owners;

2. when the total width of all driveways serving a property exceeds 50% of the curb line frontage;

3. within 50 feet of the right-of-way line of an intersecting non-arterial street;

4. within 100 feet of the right-of-way line of an intersecting arterial street;

5. within 100 feet of an approved median opening location on an arterial street;

6. less than the minimum spacing as established by the table under paragraph 3-103A;

7. when adequate sight distance cannot be provided to vehicles on the driveway attempting to access the street (see Figure 3.1-13).

C. Protection of Access

Except at approved access points, for proper control of driveway access, a vehicular non-access easement shall be granted to the City along all arterial streets when abutting property develops.

D. Residential Development Driveways

1. Single Family Residential Development

Driveways serving single family residential units should be S-1 type driveways as shown on Figure 3.1-16. Only one driveway per lot street frontage is allowed except where the street frontage is of sufficient length to maintain a separation of 50 feet between driveways. The minimum driveway length is 20 feet, measured from the face of the garage opening to the back of sidewalk or the back of curb if no sidewalk is provided.

2. Multi-Family Residential Development

The M-1 and M-2 type driveways shown on Figure 3.1-17 are to be used to serve multi-family developments. Type M-1 is a low-volume driveway serving more than three off-street parking stalls for more than two dwelling units. Type M-2 is a high volume driveway serving more than 50 dwelling units and is normally on a major collector or an arterial street. With the Transportation Department General Manager's approval, Type M-1 and M-2 driveways may be widened up to 10 feet on the egress side to provide for a separate left-turn lane. The minimum driveway length is 20 feet, measured from the entrance to the off-street parking area to the back of sidewalk, or to the back of curb if no sidewalk is provided.

3. Limitations on Residential Access

Residential properties that have frontage on a local street as well as on an arterial or collector street shall only access the local street.

In some instances, residential parcels fronting only on arterial or collector streets may be given access if alternate public access is not available. When such access is allowed, the driveway must be circular or it must have a turn-around area to ensure that there is no need for backing onto the street.

E. Commercial and Industrial Development Driveways

Driveways for commercial and industrial development are shown on Figures 3.1-18 through 3.1-20. Figure 3.1-18 depicts the "CL" type driveways, Figure 3.1-19 depicts the "CH" type driveways, and Figure 3.1-20 depicts the "CI" type driveways. The minimum length for a commercial or industrial driveway is 30 feet, measured from the entrance to the off-street parking area to the back of sidewalk or the back of curb if no sidewalk is provided.

1. Commercial Driveways

The "CL" and "CH" type driveways shall be used to serve commercial properties. A "CL" type driveway is to be used for low-volume driveways on low volume streets. A "CH" type driveway is to be used for driveways on arterials, major collectors, and high volume minor collectors or at other locations when required by the Transportation Department. The CH-2 and CH-3 type driveways are to be used at all access driveways opposite median openings.

2. Industrial Driveways
   The CL-1 and CH-1 type driveways shall be used to serve industrial properties. Except under unusual circumstances, other "CL," "CH," and "CI" driveways are not allowed in industrial areas. When the Transportation Department allows them, the related requirements of commercial driveways shall apply. Generally, industrial access is not permitted on arterial or major collector streets; however, if the Transportation Department allows such access, commercial driveway standards shall apply.

F. Driveway Grades
   Driveway profile standards are illustrated in Figure 3.1-21.

G. Deceleration Lanes
   Figure 3.1-15 depicts a deceleration lane. Deceleration lanes are required at all street intersections on Parkway, Expressway and Major Arterials. Deceleration lanes may be required on Minor Arterial and Collector streets, when required by the Transportation Department.

   Deceleration lanes are required in conjunction with driveways on Parkway, Expressway and Major Arterials. Deceleration lanes for driveways may be required on Minor Arterial and Collector streets, and may require additional right-of-way. The lane length must be determined on a case-by-case basis and must be approved by the Transportation Department. To determine the need for a deceleration lane on streets classified as Minor Arterial or Collector, use the following criteria:

   1. At least 5000 vehicles per day using or expected to be using the street;
   2. The 85th percentile traffic speed on the street is at least 35 mph; or 45 mph for a two lane (one lane each direction) roadway;
   3. At least 30 vehicles will be making right turns into the driveway during a one hour period.

3-103 SIDEWALKS

"This section is currently being re-written. Please contact the Transportation Planning Division for the most recent changes. Also please refer to Figures 3.3-4 through 3.3-8, MAG Standard Details 230 & 231, and COS Standard Details 2232 for related issues."

Sidewalks will be provided on all streets except under any of the following conditions:

A. On single-family residential local streets where all lots or parcel widths are 150 feet or more on both sides and shoulders are provided.

B. On single-family residential local streets where all lots or parcels are 35,000 square feet or more in area and shoulders are provided.

C. Along the side of a street where a bicycle path is required. (The bicycle path will also serve as a sidewalk.)

D. In the outer separation between an arterial street and a frontage road.

E. Along all roadways where an improved shoulder is provided.

F. With the concurrence of the Project Coordination Manager, in an area that has been substantially developed without sidewalks and a required sidewalk would create a spot location.

3-104 BRIDGES, RETAINING WALLS, AND STRUCTURAL CLEARANCES

A. Bridges

1. Bridge Roadbed Width
   The clear width of all bridges, including grade separation structures, shall equal the full width of the physical improvements consisting of sidewalk, street, median, and curb and gutter.

2. Approach Guardrail
   If a vehicular railing or safety-shaped barrier is provided which is within 10b feet of a traveled way with or without a sidewalk, approach guardrails shall be installed on all approach ends in accordance with AASHTO guidelines and paragraph 5.d. below.

3. Cross Slope
   The crown is normally centered on the bridge except for one-way bridges, where a straight cross slope in one direction shall be used. The cross slope shall be the same as for the approach pavement.

4. Median
   On multi-lane divided highways, a bridge median that is 26 feet wide or less shall be decked. The decking of all medians greater than 6 feet wide shall be grated to allow natural light into the structure. Exceptions must be submitted to the Transportation Department for approval.

5. Railings
   The railings to be used are the State of Arizona or State of California Department of Transportation standard design railings. There are four types of railings, which are described below:

   a. Vehicular Barrier Railings
      The primary function of these railings is to retain and redirect errant vehicles.

   b. Combination Vehicular and Pedestrian Railings
      These railings perform the dual function of retaining both vehicles and pedestrians on the bridge. They consist of two parts: 1) a concrete barrier railing with a sidewalk, and 2) a metal hand railing or fence-type railing.

   c. Pedestrian Railings
      These railings prevent pedestrians from accidentally falling from the structure and, in the case of the fence-type railing, prevent objects from being thrown to the roadway below the bridge.

   d. Bridge Approach Railings

      1) Approach railings are required at the ends of bridge railings exposed to approach traffic. On divided highways, with separate one-way traffic structures, they shall be placed to the left and right of approach traffic.

      2) On two-way roadbeds with a clear width less than 60 feet across the structure, approach railings shall be placed on both sides of the structure.

3) When the clear width is 60 feet or more, approach railings shall be placed only to the right of approach traffic.

4) Several types of approach railings are available, including Metal Beam Guardrail, Bridge Approach Guardrail (Types I and II), and Safety-Shape Barriers. The type of approach railing selected should match the rail to be used on the bridge. When long runs of guardrail (such as embankment guardrail) precede the bridge, the guardrail should connect to the bridge railing and thus serve the approach railing function.

5) Approach railings shall be flared at their exposed end. The greatest flare offset possible should be used commensurate with the approach roadway. For detailed information, refer to the AASHTO publication, Roadside Design Guide.

B. Retaining Walls

1. Types and Uses
Recommend types of retaining walls include reinforced concrete and structural masonry. Heavy timber construction is not encouraged except when approved by the Transportation Department General Manager. The walls shall also include integral attachments for railings and weep drainage where applicable.

2. Aesthetic Considerations
In general, the materials and design of retaining walls shall match or blend with the adjacent natural features, landscaping, and/or buildings. The surface of the retaining wall should have a low light reflectance. Suggested surface treatments include exposed aggregate, stucco or mortar wash, and native stone, or other surfaces as approved by the Development Review Board.

The height of retaining walls shall not exceed 6 feet except when approved by the Transportation Department General Manager. If approved to retain above 6 feet, terracing is encouraged and the length of the alignment of the retaining walls should be foreshortened by vertical grooves, periodic offsets, and height changes, or other configurations as approved by the Development Review Board.

3. Safety Railings
A safety railing is required on or adjacent to vertical faces such as retaining walls, wing-walls, abutments, etc., and where the vertical fall is 2 feet or more. The safety railing shall be constructed per City of Scottsdale standard details and shall be placed on tope of the vertical face structure of the vertical drop.

C. Structural Clearances

1. Horizontal Clearance

a. A fixed object other than street lights, signal poles and utility poles, will not be allowed within 10 feet of the traveled way unless approved by the Transportation Department and a safety barrier is provided. A lesser clearance may only be allowed when other controls make the desired clearance unreasonable and appropriate traffic barriers are installed. In no case shall a fixed object be allowed within 2 feet of a traveled way.

b. The horizontal clearance to bridge piers, abutments, and retaining walls on all streets shall be not less than 10 feet from the edge of the traveled way.

2. Vertical Clearance
   The minimum vertical clearance shall be 16.5 feet over the entire width of the traveled way of an arterial street or major collector street. On other streets, the minimum shall be 14.5 feet. Exceptions must be submitted to, and approved by, the Transportation Department General Manager.

3-106 SIDE SLOPES

A. Side Slope Standards
   Side slopes should be designed for functional effectiveness, ease of maintenance, and pleasing appearance. For areas greater than 10 feet back of curb, slopes of 4:1 or flatter shall be provided. Steeper slopes may be approved in areas more than 30 feet back of curb when soils are not highly susceptible to erosion, or when a cut is not more than 4 feet. Consult the AASHTO publication, Roadside Design Guide for further details. Cuts or fills greater than 4 feet must be reviewed by the Development Review Board.

B. Slope Rounding
   The top of all cut slopes shall be rounded where the material is other than solid rock. A layer of earth overlaying a rock cut also shall be rounded. The top and bottoms of all fill slopes for, or adjacent to a traveled way, sidewalk, or bicycle path shall also be rounded.

3-107 CONSTRUCTION OF LESS THAN ULTIMATE CROSS-SECTION IMPROVEMENTS

A full street cross-section is required for the interior streets of a development and a complete half-street cross-section for the perimeter streets. However, if the street is a major arterial, four of the six lanes of the full street or two of the three lanes of the half-street may be required. The determination as to whether the unconstructed lanes will be on the outer edge of the cross-section or adjacent to the median location will be made on a case-by-case basis and approved by the Transportation Department.

3-108 CONSTRUCTION OF HALF-STREETS

A. Design of Cross-Section for Half-Streets
   Half-street construction shall consist of a minimum 24-foot wide pavement section. In the event half-street construction is to be provided, the engineer shall design the full cross-section of the street. The plans shall include in dashed lines the half-street, which will be constructed in the future. The half street construction shall provide adequate transitions and tapers to the adjoining roadways.

B. Design of Half-Street to Join Existing Street Pavement
   The half-street shall be designed to match existing construction as much as possible unless doing so is likely to create an unsatisfactory condition. If changes are needed to correct conditions on an existing half-street in order to properly construct the other half of the street, the solutions must be developed with Transportation Department staff on a case-by-case basis. The plans for the new half-street must contain sufficient information on the profile and cross-sections of the existing street to demonstrate that the new construction will match the old construction, result in a full street with proper cross-sections.

C. Culverts Under Half-Streets

A culvert to be provided in conjunction with half-street construction must extend beyond the edge of the traveled way a minimum of 10 feet into the area where the other half of the street will be constructed in the future. The 10-foot distance is measured perpendicular to the street alignment. The culvert capacity, flow line slope and alignment must be based upon the ultimate design requirements for the culvert if it were to be built under the full cross-section where it could be considerably longer.

3-109 PAVEMENT TRANSITIONS

When development causes the widening of a portion of the pavement of an existing road, pavement transitions are required at each end of the widened portion. Design of the various features of the transition between pavements of different widths should be consistent with the design standards of the superior facility. The transitions should be made on a tangent section whenever possible. Locations with horizontal and vertical sight distance restrictions should be avoided. Whenever feasible, the entire transition should be visible to the driver of a vehicle approaching the narrower section. Intersections at grade within the transition area should be avoided.

A. Transition to a Wider Pavement Section

A transition from a narrower cross-section to a wider cross-section shall have a length that is five times the street design speed in miles per hour. See Figure 3.1-22.

B. Transition to a Narrower Pavement Section

A transition from a wider cross-section to a narrower cross-section shall have a length equal to the difference of the two widths in feet times the street design speed in miles per hour or the 85th percentile speed in miles per hour, whichever is greater. Figure 3.1-22 illustrates this requirement.

3-110 FRONTAGE ROADS

Frontage roads for residential access are not encouraged and must be approved by the Transportation Department. Frontage road geometrics shall be based upon specific project requirements, but generally shall not be less than 20 feet in width.

3-111 SUBDIVISION STREET PLANNING

Subdivision street plans should produce the minimum number of intersections and wash crossings, and discourage through traffic. Figures 3.1-23 illustrates a number of concepts associated with desired subdivision street design. The following paragraphs describe certain other concepts and requirements.

A. Existing and Proposed Streets

Existing streets and proposed streets of the Circulation Element of the General Plan, any applicable Master Circulation Plan or Area Plan should be incorporated into the design of new subdivisions. Exceptions shall be approved by the Transportation Department and may require the approval of the Transportation Commission.

B. Street Abandonment

An existing street may be abandoned if it is not a street indicated in the Circulation Element of the General Plan or an Area Plan, and will not eliminate reasonable access to existing properties. The abandonment should alleviate a significant traffic problem and not create a new problem. If a street is approved to be abandoned, the abandonment must occur prior to the submittal of a final plat to the City Council.

C. Cul-de-Sac Street Lengths

A cul-de-sac street is a street that serves more than one property owner and has only one direct access to the public street system. The following requirements apply to both public and private streets. The length of a cul-de-sac is measured between the centerline of an intersecting street and the radius point of the cul-de-sac as shown on Figure 3.1-24. The minimum length of a cul-de-sac is two times radius R1, as illustrated on Figure 3.1-24. A cul-de-sac street shall not be longer than 1,500 feet and it shall not serve more than 25 single-family dwelling units.

D. Dead-End Streets

Dead-end streets will be required where a street connection is necessary to serve adjacent properties that will develop at a future date. When a dead-end street is required and it serves more than four lots, a temporary cul-de-sac shall be provided. In addition, the minimum/maximum length of a dead-end street shall be the same as that of a cul-de-sac street.

E. Bubbles

Bubbles are areas on the roadway expanded to provide a turn-around and additional access or lot frontage on minor collector and local streets. Bubbles are required at intersections where each street extends in only one direction from the intersection. Bubbles are permitted between intersections to improve accessibility to odd-shaped sites or on minor collector streets where direct access is not permitted. The design of a bubble shall be in accordance with either design depicted in Figure 3.1-25.

The bubble radii shown on Figure 3.1-25 are for local residential streets. Radii for cul-de-sac bubbles for other street classifications are shown in Figure 3.1-24. The use of bubbles (except for on a cul-de-sac) on other than local residential streets must be approved by the Transportation Department. Radii appropriate for these bubbles will be established as part of that approval.

F. Alleys

Alleys are discouraged and must be approved by the Transportation Department. However, alleys may be required where other alleys exist within an area or the extension of existing alley or alley system is necessary. Dead-end alleys will not be permitted.

1. Alley Widths

   Residential alleys abutting single-family uses shall be 16 feet in width. For other abutting uses, an alley 20 feet in width shall be provided.

2. Alley Intersections

   Alley intersections and sharp changes in alignment should be avoided. When intersections or alignment changes are allowed, the inside corners shall be cut off on each side to provide a tangent section between the two sides at least 20 feet long as shown in Figure 3.1-26.

3. Alley Paving
   All alleys are to be paved full width with at least 2 inches of asphaltic concrete over 6 inches of A.B.C.

G. Offset Intersections
   Street jogs with centerline offsets less than 250 feet shall not be permitted along arterial and major collector streets, or on minor collector and local commercial and industrial streets where interlocking left turns will occur. Offsets as small as 125 feet are allowed on minor collector and local commercial and industrial streets where interlocking left turns will not occur and on local residential streets.

H. Intersecting Tangents
   A tangent section of roadway is desirable prior to an intersection on a curvilinear street. Minor street intersections with major streets shall have a minimum tangent outside the intersecting right-of-way. See Figure 3.1-8 for design criteria.

3-112 SPECIAL STANDARDS FOR A DEVELOPMENT

A special set of standards for a development that differs from the standards described herein may be desired by a developer. In such a case, a qualified traffic engineer, registered in the State of Arizona, must prepare a preliminary and final traffic design report and secure City approval of the reports before plans incorporating the special standards can be submitted for review and approval.

A. Preliminary Design Report for Special Standards
   A preliminary design report shall be submitted prior to or at the time of preliminary plat submittal. At a minimum, the preliminary report must address the following subjects:

   - Vehicle Trip Generation
   - Roadway Classification
   - Design Speeds
   - Auxiliary and Additional Lane Requirements
   - Parking Requirements
   - Pedestrian, Bicycle, and Equestrian Requirements
   - Traffic Control Device Requirements
   - Special Features and their Influence
   - Transit Facility Requirements
   - Pavement Design

B. Final Design Report for Special Standards
   A final design report shall be submitted prior to or concurrently with the improvement plan submittal. The report shall include a refinement of the preliminary design report and additionally address the following subjects as a minimum:

   - Horizontal and Vertical Alignment
   - Intersection Location
   - Traffic Control Devices
   - Treatment of Special Features

C. City Review and Approval of Special Standards
The following factors will be considered by the City in its review of the report:

- Relationship of the proposed standards to National, State and city standards
- Similarity of the proposed standards to standards utilized in other communities
- Comparison of the proposed standards with alternatives
- Sensitivity of the proposed standards to safety, environmental, and law enforcement concerns

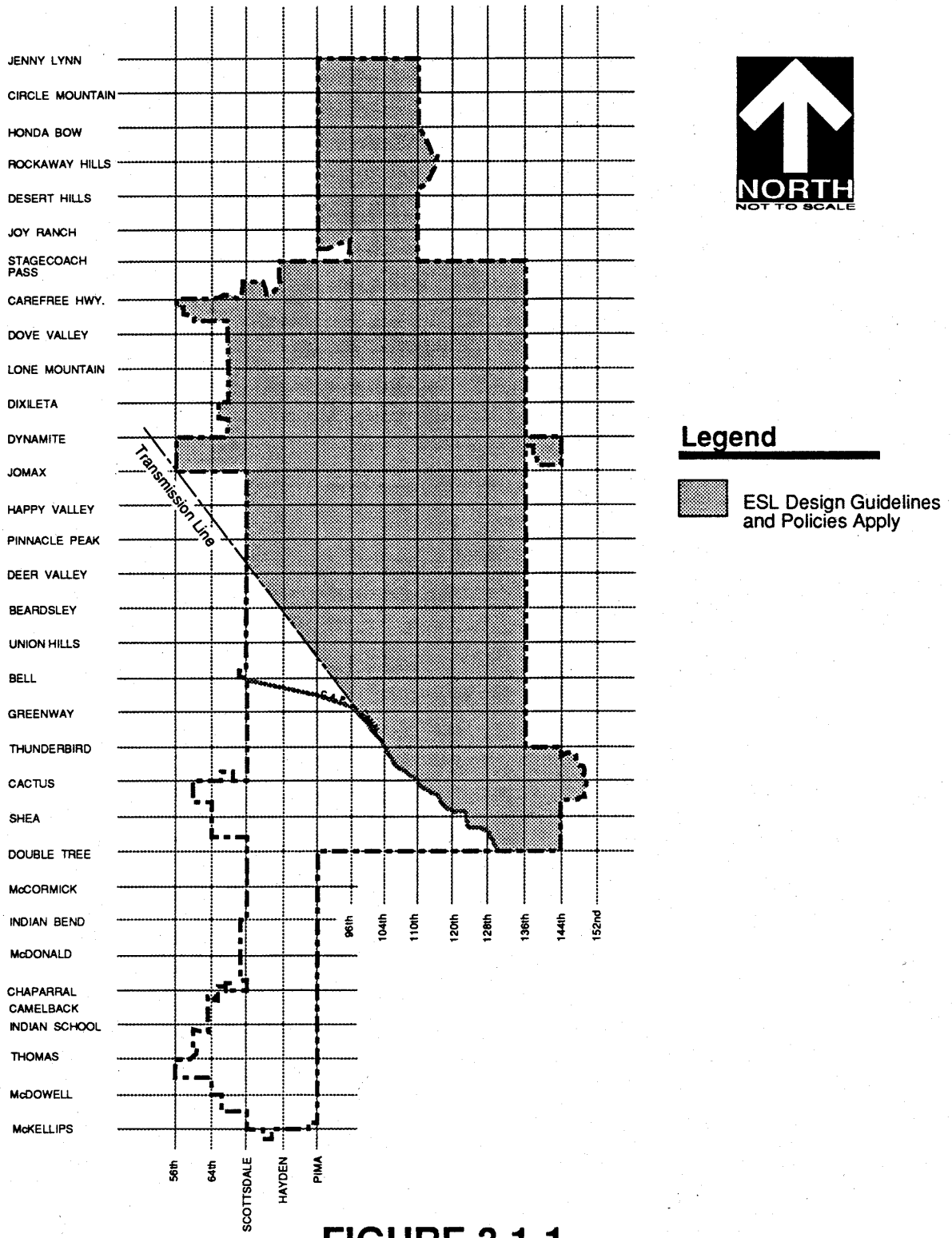
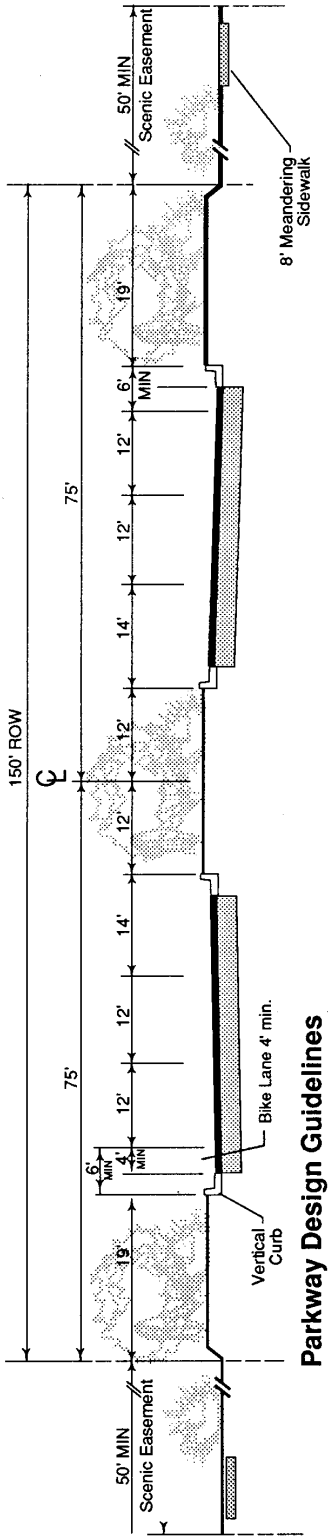
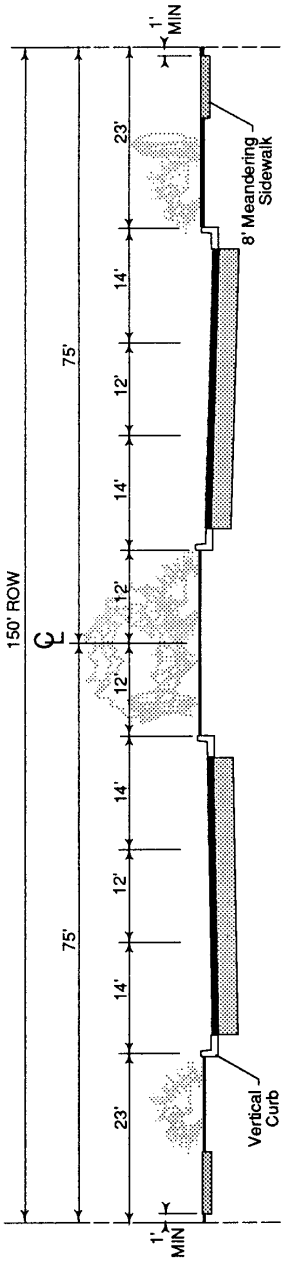


FIGURE 3.1-1
Hillside Area Street Design



Parkway Design Guidelines

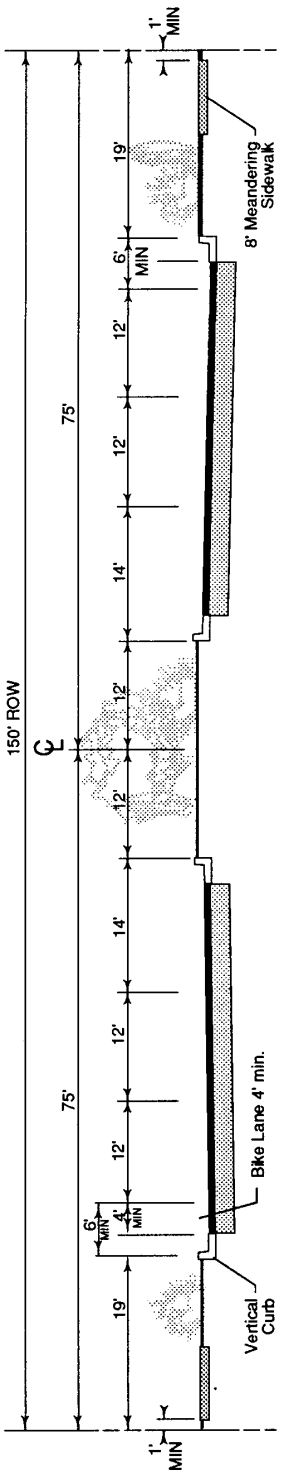
- Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.
- Cross-sections may vary to fit surrounding topography.
- ADT: 35,000 - 55,000 vpd
- Design Speed: 55 mph
- Minimum Grade: 0.4%
- Maximum Grade: 9.0%



Expressway Design Guidelines

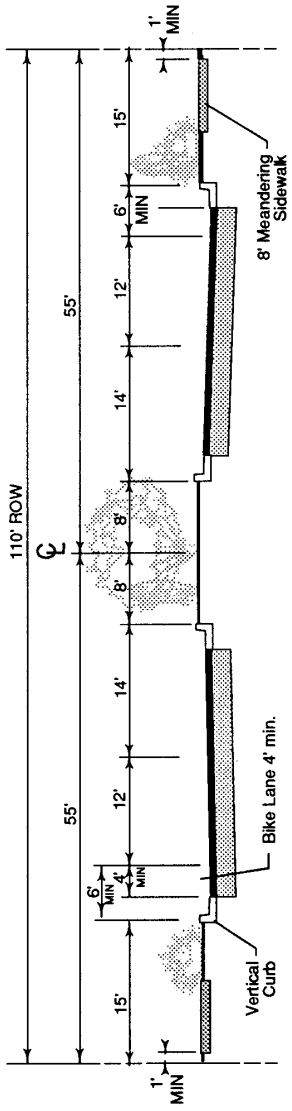
- Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.
- Cross-sections may vary to fit surrounding topography.
- ADT: 35,000 - 55,000 vpd
- Design Speed: 55 mph
- Minimum Grade: 0.4%
- Maximum Grade: 9%

FIGURE 3.1-2
Parkway/Expressway



Major Arterial Design Guidelines

- Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.
- Cross-sections may vary to fit surrounding topography.
- ADT: 35,000 - 55,000 vpd
- Design Speed: 55 mph
- Minimum Grade: 0.4%
- Maximum Grade: 9.0%

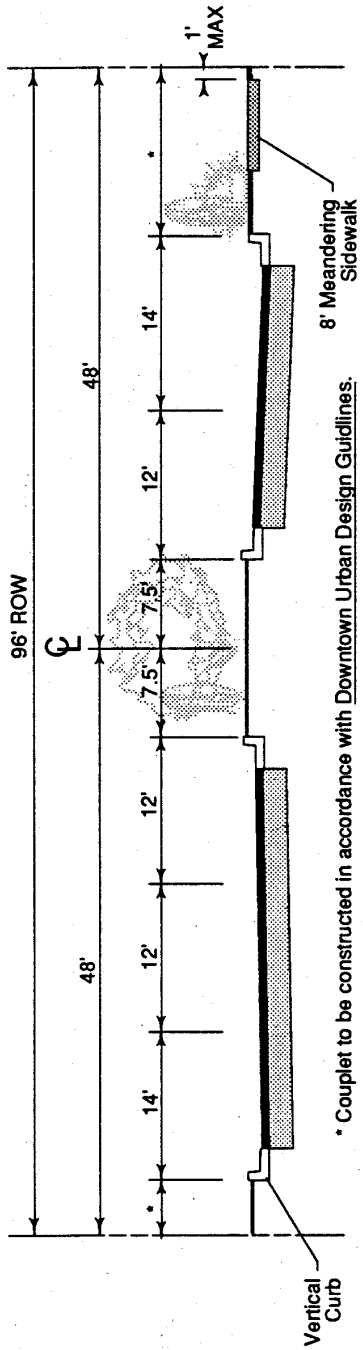


Minor Arterial Design Guidelines

- Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.
- Cross-sections may vary to fit surrounding topography.
- ADT: 25,000 - 35,000 vpd
- Design Speed: 55 mph
- Minimum Grade: 0.4%
- Maximum Grade: 9.0%

FIGURE 3.1-3
Arterial Streets

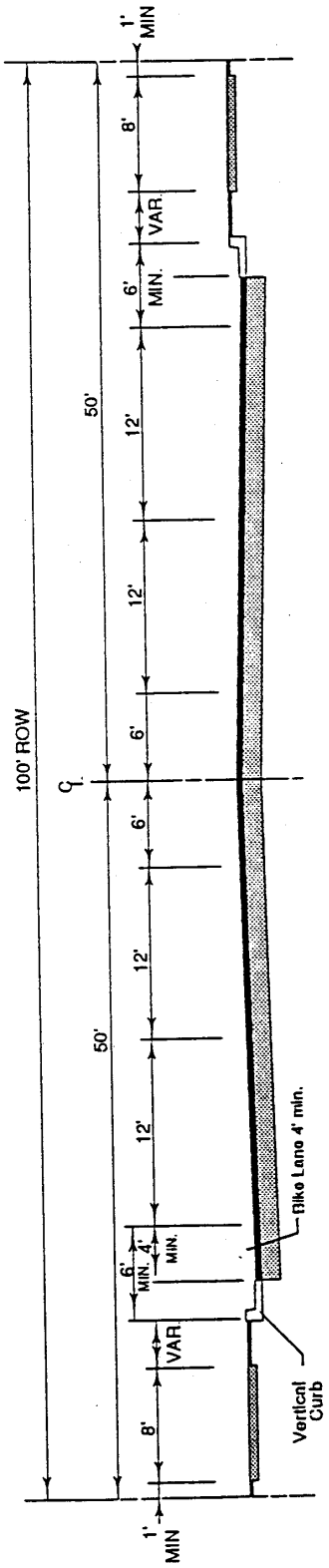
Figure 3.1-3 Updated 10/20/00



Couplet Street Design Guidelines

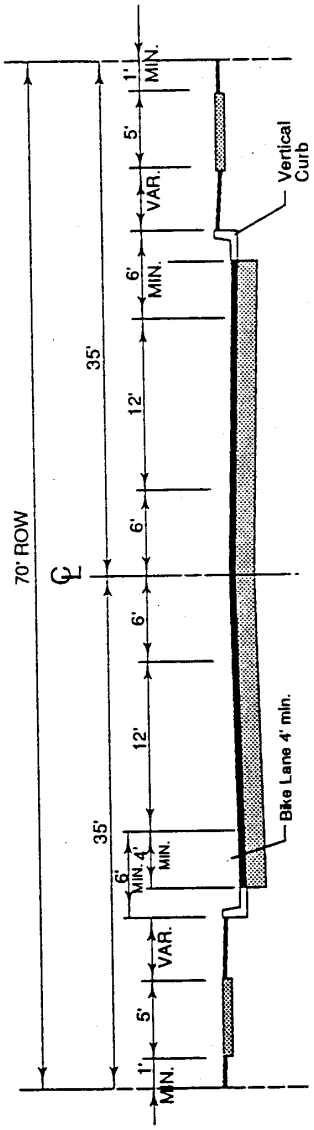
- Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.
- Cross-sections may vary to fit surrounding topography.
- ADT: 25,000 - 35,000 vpd
- Design Speed: 45 mph
- Minimum Grade: 0.4%
- Maximum Grade: 9.0%

FIGURE 3.1-4
Couplet Streets



Major Collector Design Guidelines

- Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.
- Cross-sections may vary to fit surrounding topography.
- ADT: 15,000 - 30,000 vpd
- Design Speed: 45 mph
- Minimum Grade: 0.4%
- Maximum Grade: 9.0%

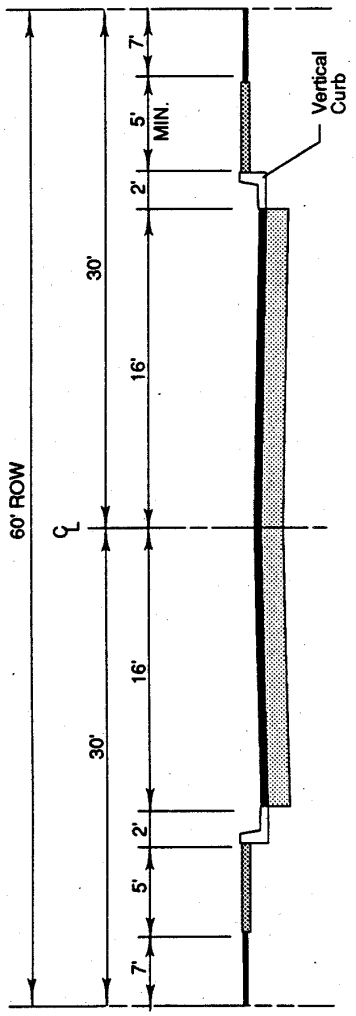


Minor Collector Design Guidelines

- Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.
- ADT: 5,000 - 15,000 vpd
- Design Speed: 35 mph
- Minimum Grade: 0.4%
- Maximum Grade: 12.0%

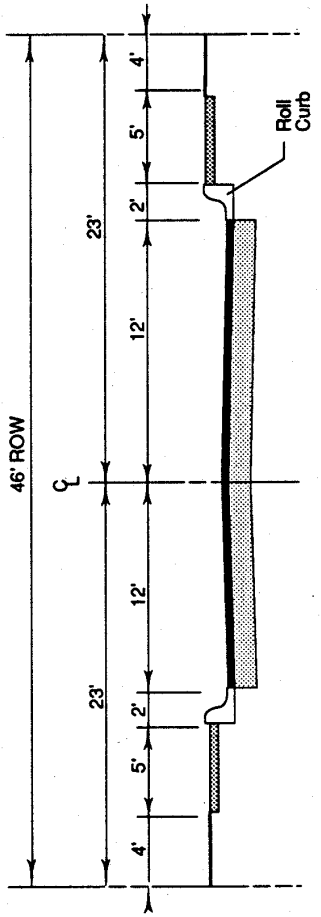
FIGURE 3.1-5
Collector Streets

Figure 3.1-5 Updated 10/20/00



Local Collector Design Guidelines

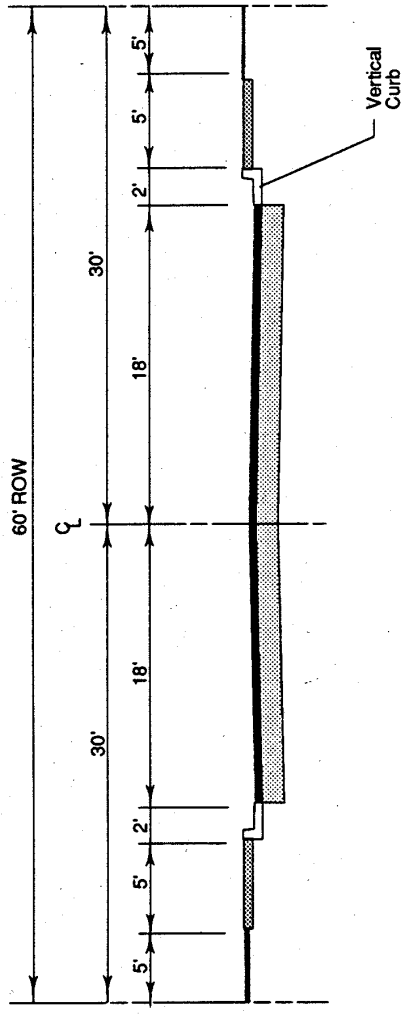
- *Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.*
- *ADT: 1,500 - 5,000 vpd*
- *Design Speed: 30 mph*
- *Minimum Grade: 0.4%*
- *Maximum Grade: 12.0%*



Local Residential Guidelines

- *Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.*
- *ADT: 1,500 vpd Max.*
- *Design Speed: 20 mph*
- *Minimum Grade: 0.4%*
- *Maximum Grade: 15.0%*

FIGURE 3.1-6
Local Streets



Design Guidelines

- Auxiliary turn lanes may be required at intersections with additional R.O.W. requirements.
- ADT: 1,500 - 5,000 vpd
- Design Speed: 20mph
- Minimum Grade: 0.4%
- Maximum Grade: 15.0%

FIGURE 3.1-7

Local Commercial and Industrial Streets

FIGURE 3.1-8
Basic Design Data for Streets

Street Design Element	Paragraph	Pkwy	Expwy	Major Arterial	Minor Arterial	Couplet	Major Collector	Minor Collector	Local Collector	Local Residential	Local Commercial	Local Indrustrial
Full right-of-way width, ft. (see note 2)	3-102A	150	150	150	110	96	100	70	60	46	60	60
Pavement width, ft., measured from back of outside curb to back of outside curb. (see note 2)		112	104	108	80	79	72	40	36	28	40	40
Median width, ft. (C-curbed median and P-painted median) (see note 2)	3-102C	24C [1]	24C [1]	24C [1]	16C [1]	15C [1]	12P	12P	12P	None	None	None
Type of curb (V-vertical curb and R-rolled curb) (see note 2)	3-102D	V	V	V	V	V	V	V	V	R	V	V
Design speed, miles per hour	3-102E	60	60	55	55	35	45	35	30	20	20	20
Length of transition for 2% superelevation, ft.	3-102F	350	350	320	240	170	210	135	150	150	150	150
Minimum radius of horizonal curve without superelevation, ft.	3-102G	2400	2400	1800	1800	650	1100	650	450	200	200	200
Minimum radius of horizonal curve with 2% superelevation, ft.	3-102G	1750	1750	1350	1350	500	850	500	350	150	150	150
Minimum length of tangent between reverse curves, ft.	3-102G	350	350	300	300	200	250	200	150	100	100	100
Minimum length of tangent between curves in same direction, ft.	3-102G	700	700	660	660	400	500	400	300	250	250	250
Maximum horizonal curve length, ft.	3-102G	660	660	500	500	400	500	400	250	100	100	100
Stopping sight distance, ft.	3-102H	590	590	500	500	225	365	225	200	125	125	125
Passing sight distance, ft.	3-102H	2100	2100	1950	1950	1300	1650	1300	1100	800	800	800
S1 Intersection sight distance in ft. on driver's left for right turns, left turns and through traffic.	3-102J	725	710	650	610	395	500	325	300	190	200	355
S2 Intersection sight distance in ft. on driver's right for left turns or straight through traffic.	3-102J	950	930	860	780	495	620	415	365	220	240	395
Minimum tangent length approaching intersection	3-102J	350	350	300	300	200	250	200	150	100	100	100

1. Measured from back of curb to back of curb.
2. These first four design elements may not be used for upper desert/lower desert streets, but the remaining design elements listed above apply to upper desert/lower desert streets. Consult Development Design Guidelines for Environmentally Sensitive Lands for the design elements to replace the four elements excluded above from use on upper desert/lower desert streets.

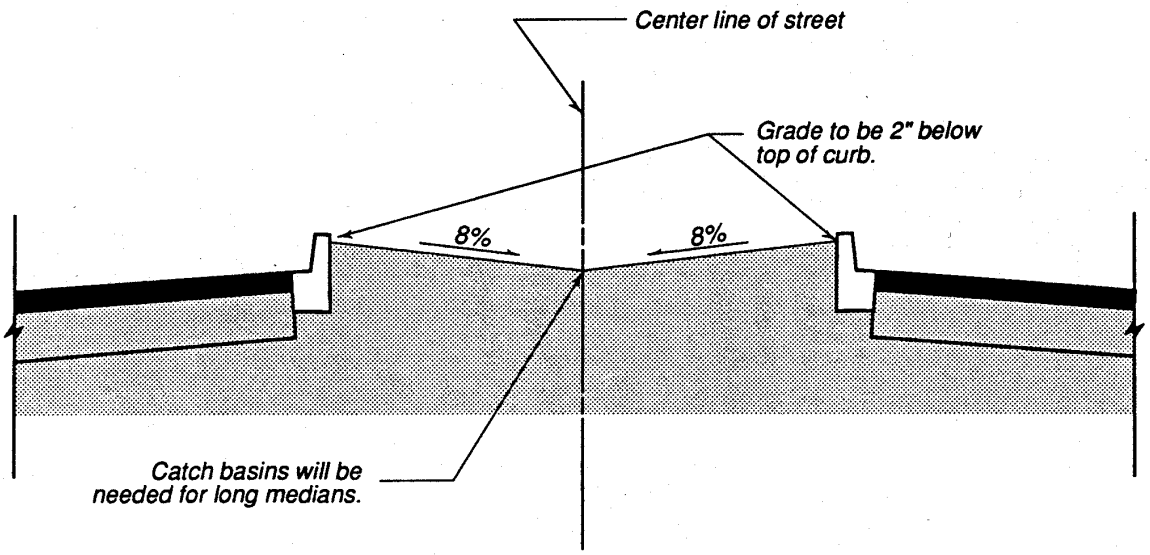


FIGURE 3.1-9
Median Grading

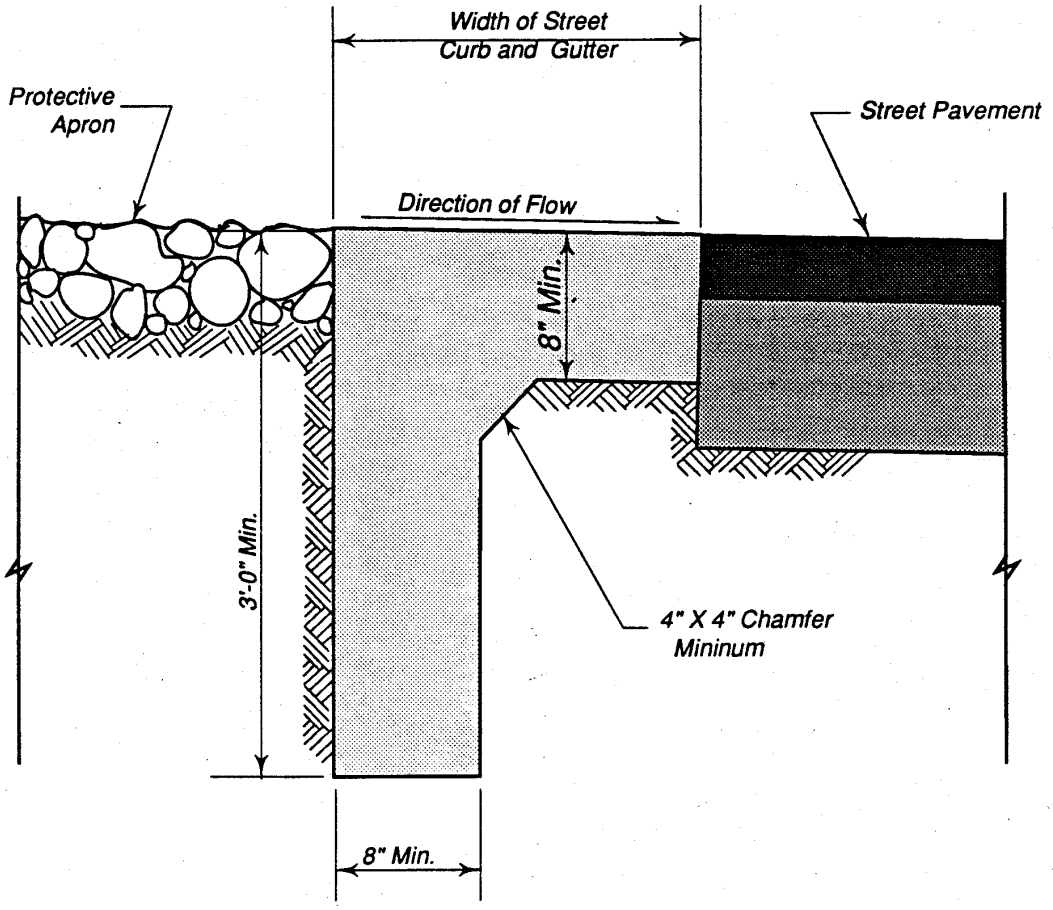
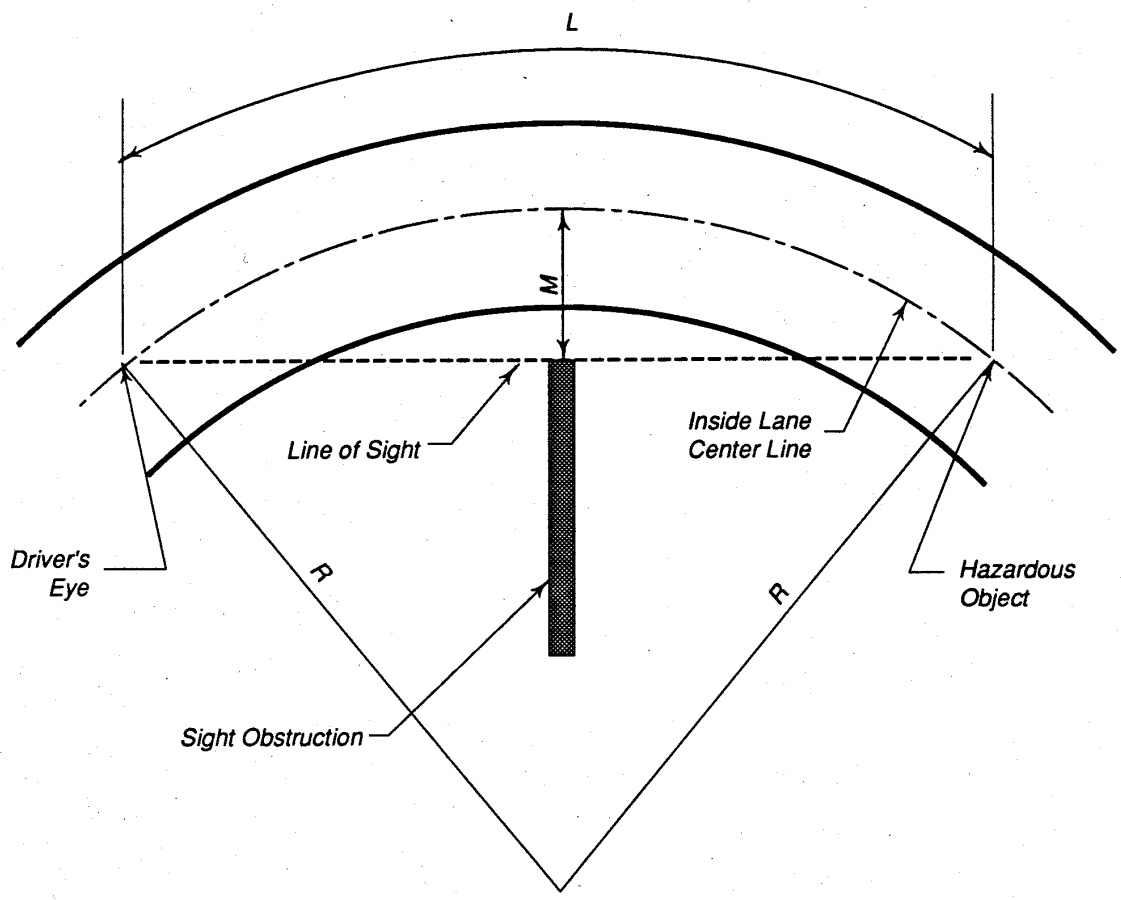


FIGURE 3.1-10
Cut-Off Wall



If the stopping sight distance, S, and the radius to the center of the inside lane, R, are known, the distance, M, is found by the following equation:

M = R[1-COS(28.65 S/R)]

If the radius, R, and the distance, M, are tentatively selected, then the length, L, of the arc in the middle of the inside lane may be found by the following equation:

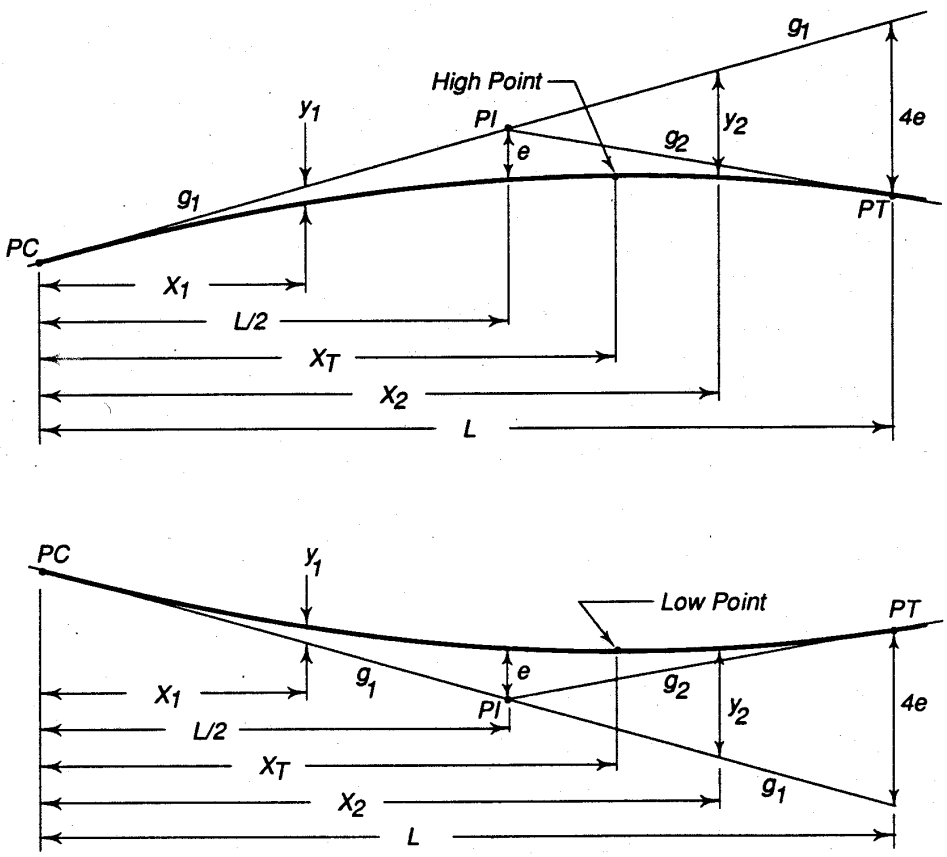
L = (R/28.65)ARCCOS[(R-M)/R]

If the length, L, is less than the stopping sight distance for the desired design speed, either the radius, R, or the distance, M, must be increased.

Design Speed MPH	20	25	30	35	40	45	50	55	60	65
Stopping Sight Distance, S, (ft.)	125	150	200	225	300	365	440	500	590	640

FIGURE 3.1-11

View Obstructions on Horizontal Curves



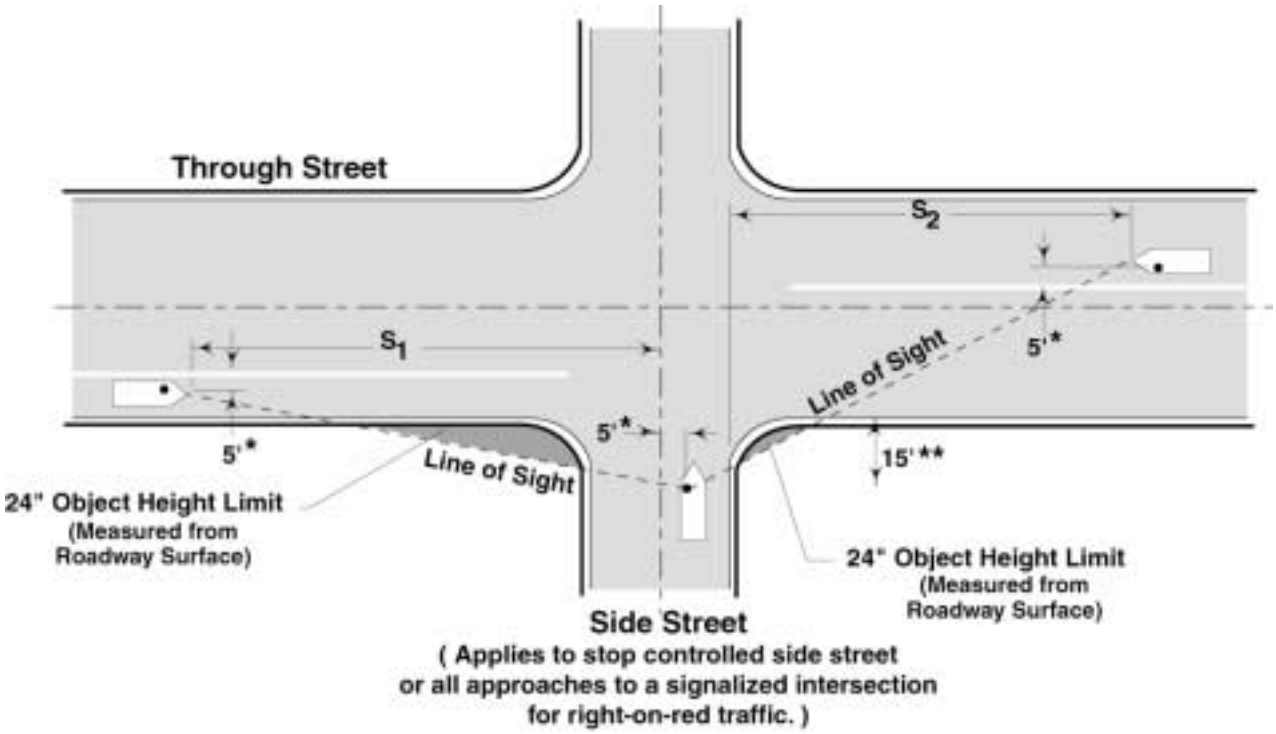
The following equations are for parabolic, vertical curves. The grades g_1 and g_2 must be used with their algerbraic signs (+ or -). If g_1 and g_2 are expressed as percentages, L and X must be expressed in stations. If g_1 and g_2 are expressed as feet per foot, L and X must be expressed in feet. The symbols are defined by the above diagrams.

$A = g_2 - g_1$ $\quad G = g_1 - g_2$ $\quad e = LG/8$ $\quad y = 4e(X/L)^2 = (A/2L)X^2$

The equation below provides the location, x_T, of the curve turning point which is the high point or low point on the curve. This equation is only applicable when g_1 and g_2 are not of the same sign, algebraically.

$$X_T = (g_1 L)/(g_1 - g_2)$$

FIGURE 3.1-12
Vertical Curve Relationships



S_1 = Intersection sight distance in ft. on driver's left for right turns, left turns and through traffic.

S_2 = Intersection sight distance in ft. on driver's right for left turns or straight through traffic.

See figure 3.1-8 for distances S_1 and S_2.

Example:

The side street is a local commercial street, and the through street is a major collector street. The design speed for the major collector is 45 MPH. According to Figure 3.1-8:

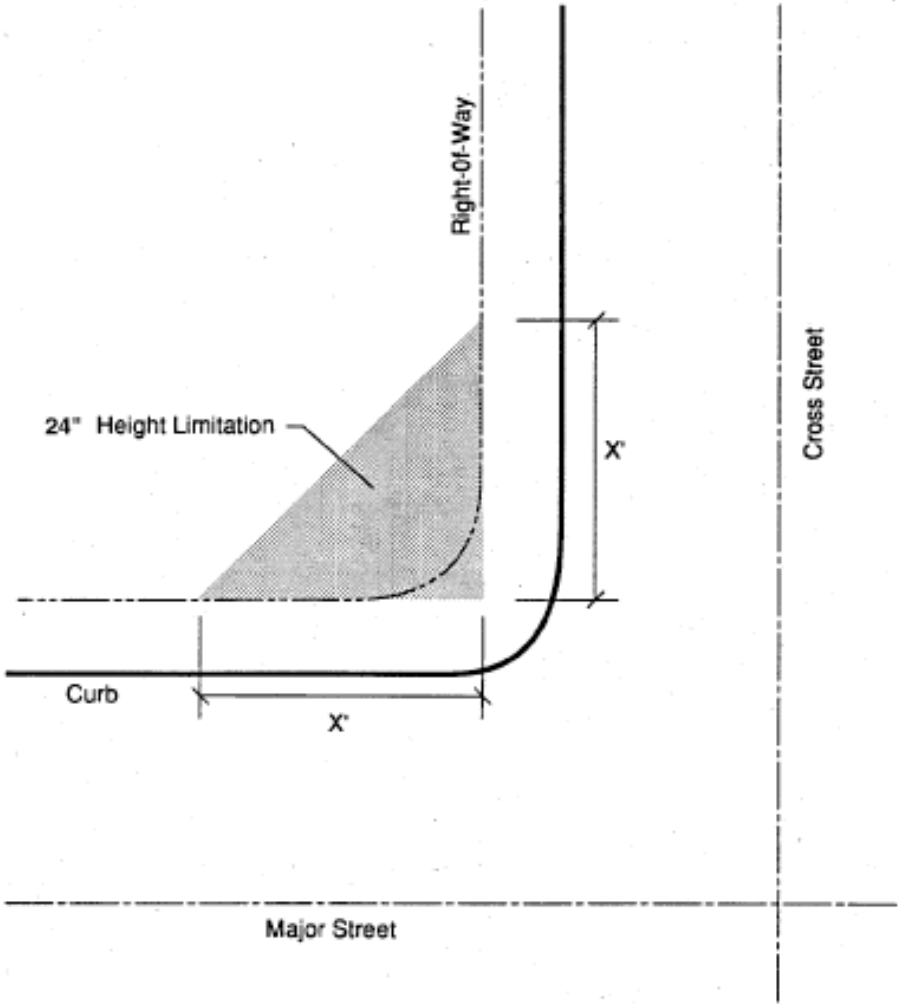
S_1 = 500 ft. S_2 = 650 ft.

* 5 ft. measured to nearest lane line or centerline.

** 15 ft. measured from face of curb or edge of travelway.

FIGURE 3.1-13

Intersection Sight Distance Requirements

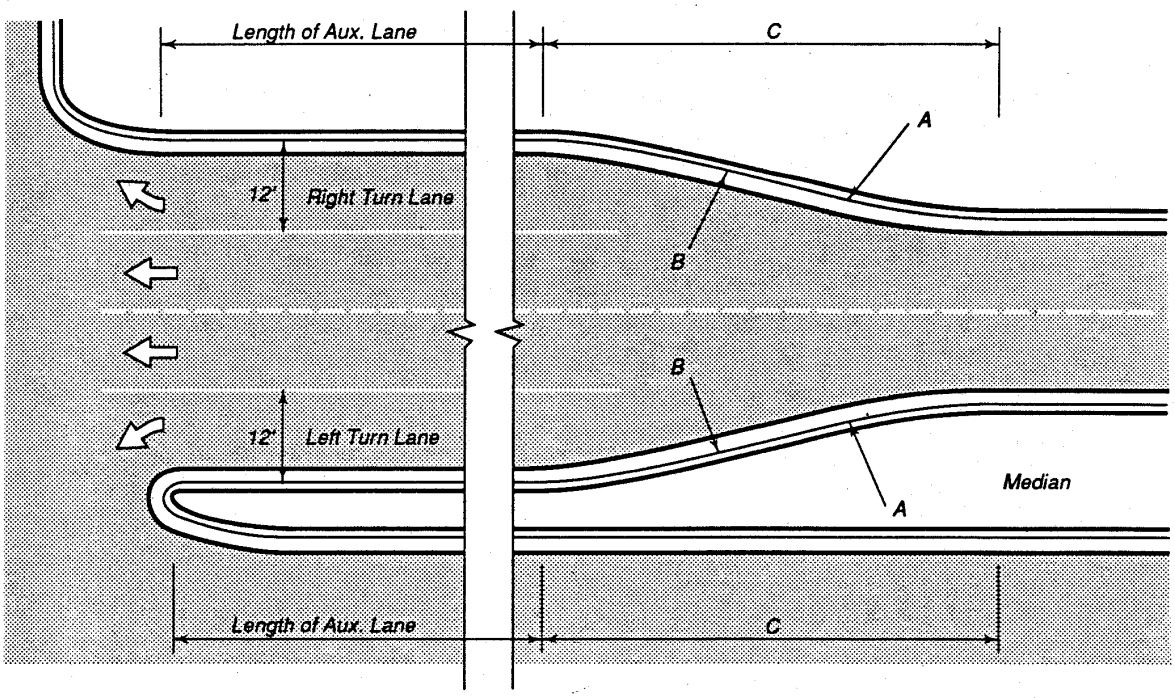


Major Street Classification	X (In feet)
Parkway	25
Expressway	25
Arterials	25
Major Collector	25
Minor Collector	35
Local Streets	35*

*If the standard right-of-way (46' local residential, and 60' local collector) is not available, the safety triangle (X) shall measure 60' on local residential streets and 70' on local collector streets from center lines of the cross streets.

FIGURE 3.1-14

Traffic Safety Triangle on Corner Property

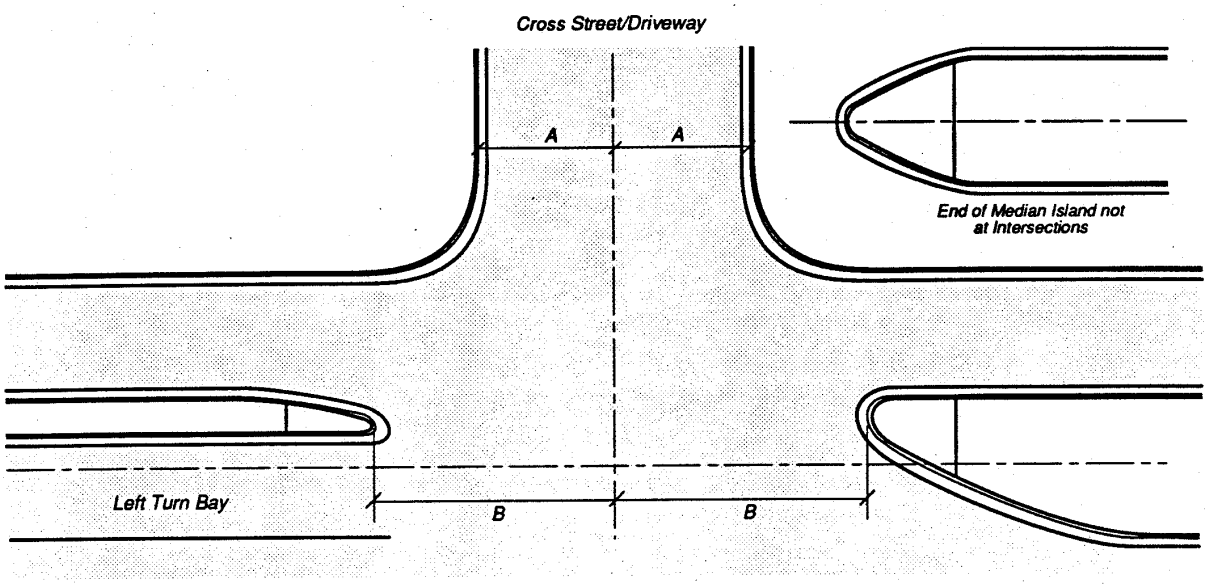


Street Classification	Dimensions in Ft.*		
	A(rad.)	B(rad.)	C
Major Arterial	300	300	153.62
Minor Arterial	300	150	103.23
Collector	150	150	84.00

Auxiliary lane lengths depend on local traffic needs.

**Assuming single left-turn lane; for dual left-turn lanes, consult the City of Scottsdale Standard Details.*

FIGURE 3.1-15
Auxiliary Lanes



B = A + 14; 40' minimum

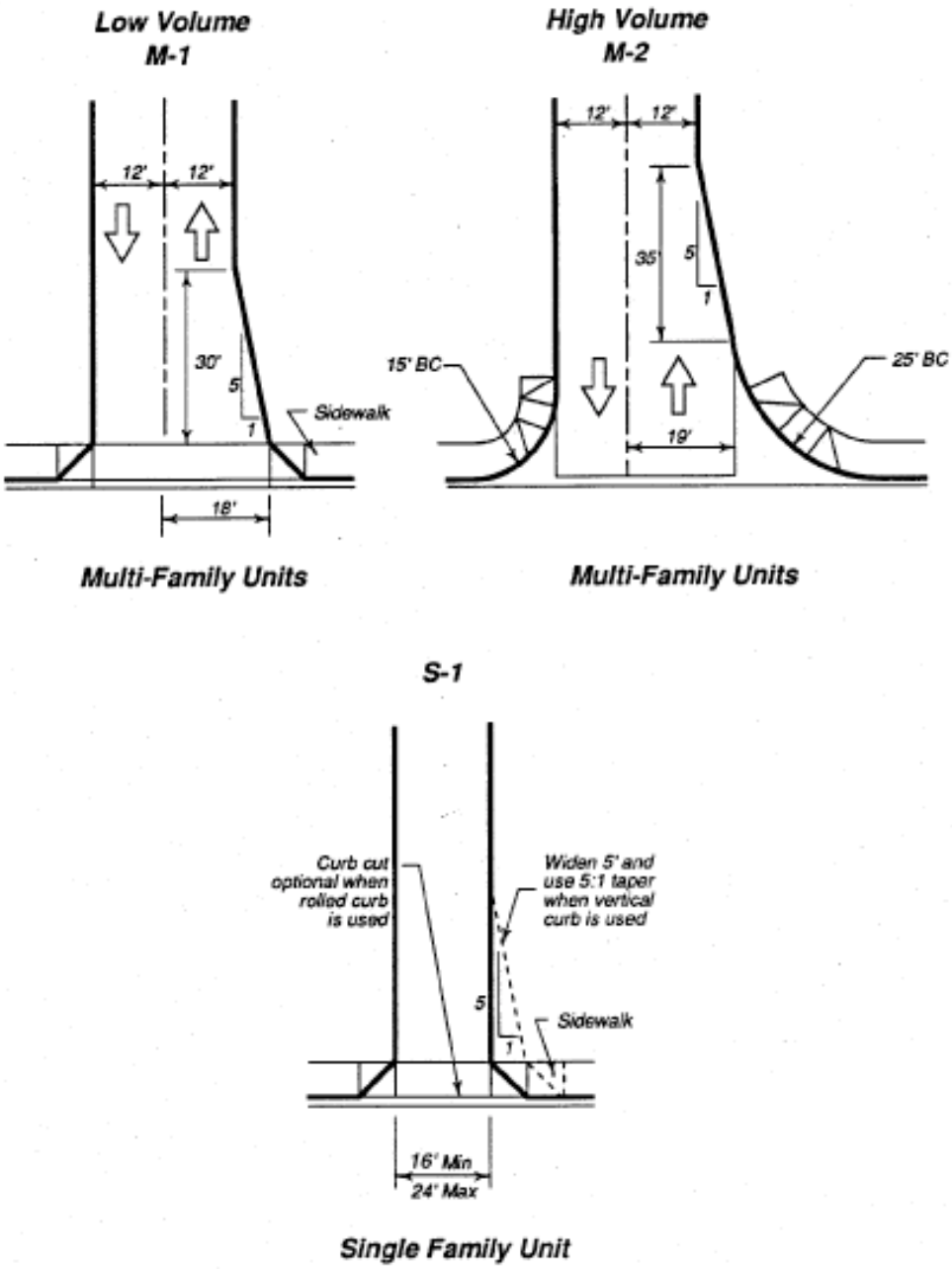
NOTES:

1. This sketch is for a three leg intersection. If the intersection has four legs, the right side will also have an auxiliary lane for left turns, and the median on the right side will have the same configuration as the one on the left side rotated 180 degrees.

2. See City of Scottsdale Standard Details for median dimensions.

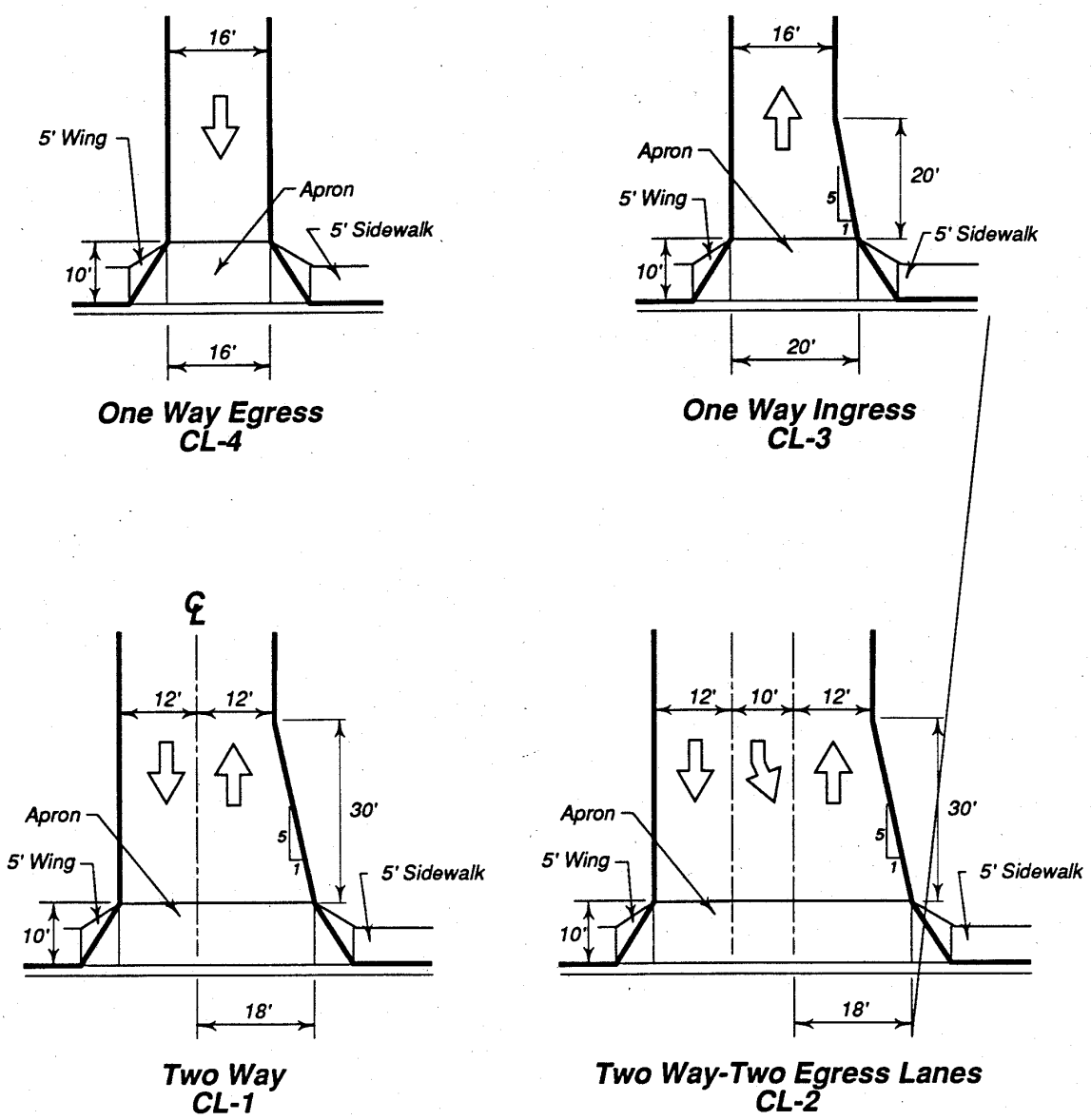
FIGURE 3.1-16

Median Openings for Intersections



NOTE: See City of Scottsdale Standard Details for more specific information.

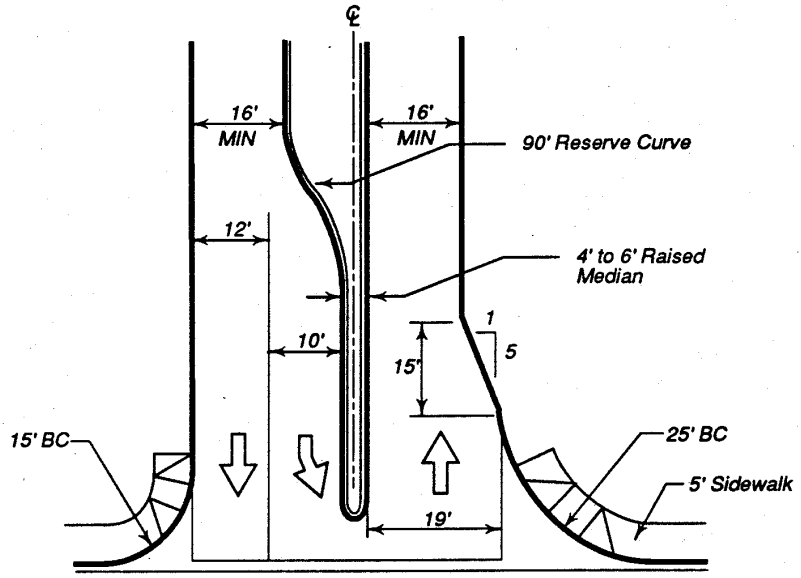
FIGURE 3.1-17
Residential Driveways



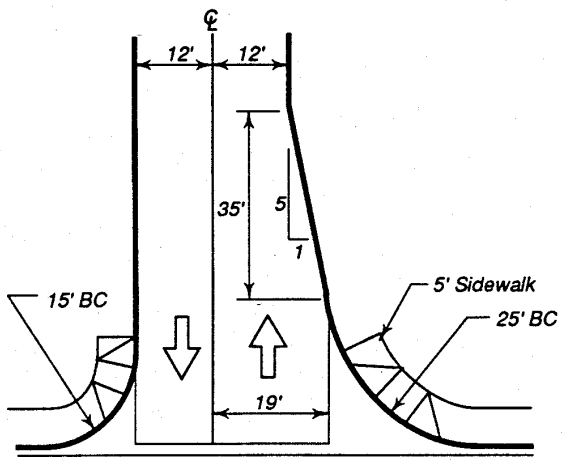
NOTE: See City of Scottsdale Standard Details for more specific information.

FIGURE 3.1-18

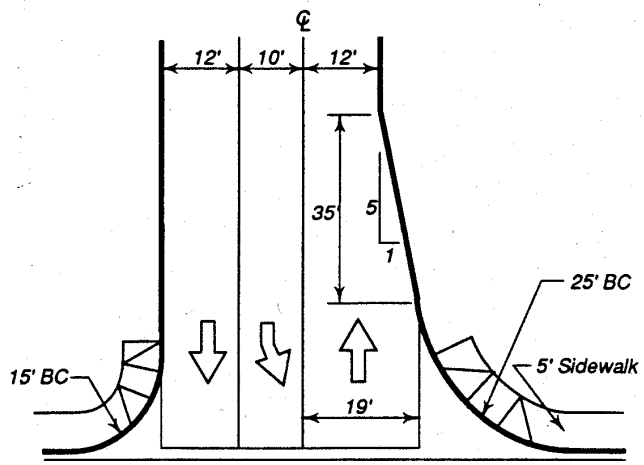
Commercial/Industrial Driveways - Type CL



Two Way Raised Median
CH-3



Two Way
CH-1

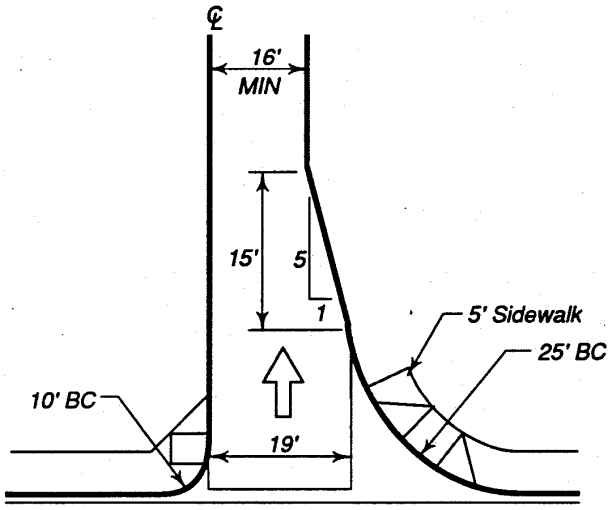


Two Way with Two Egress Lanes
CH-2

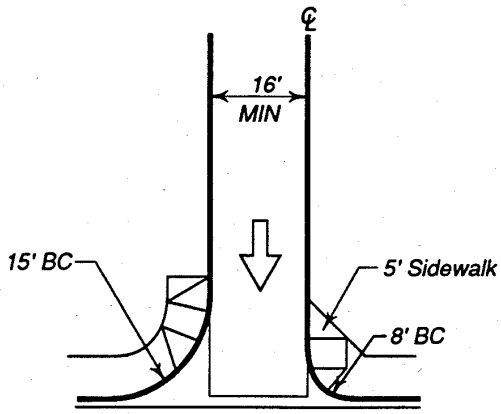
NOTE: See City of Scottsdale Standard Details for more specific information.

FIGURE 3.1-19

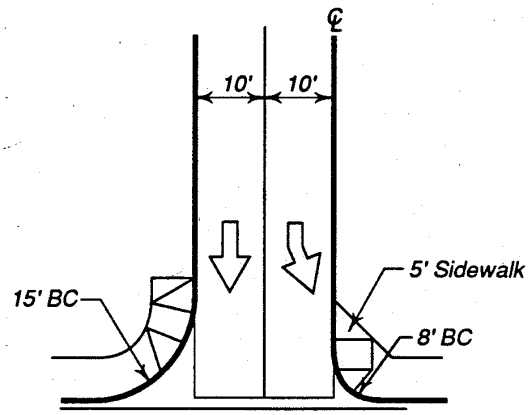
Commercial/Industrial Driveways - Type CH



One Way Ingress
CI-1



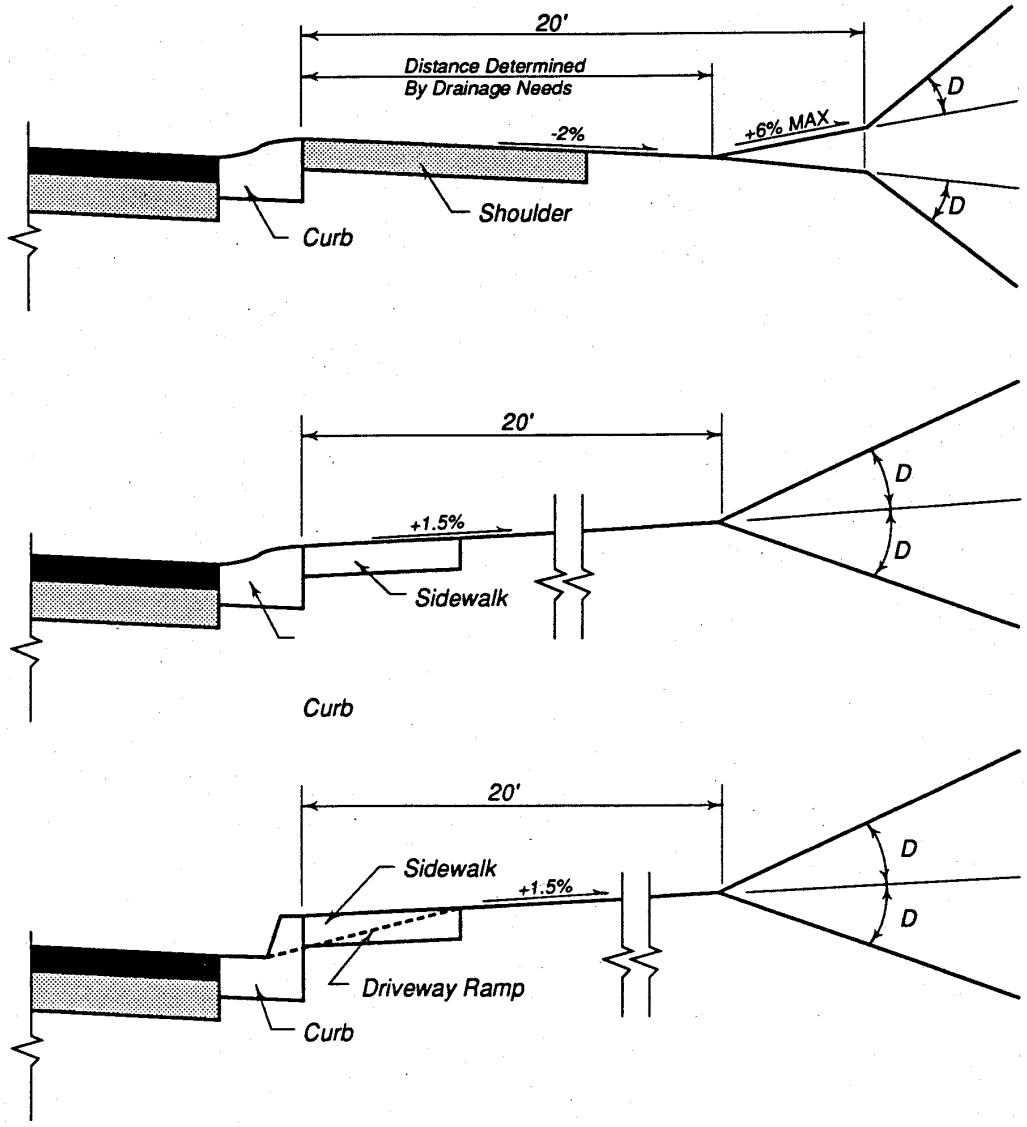
One Way Egress
CI-2



Two Lanes, One Way Egress
CI-3

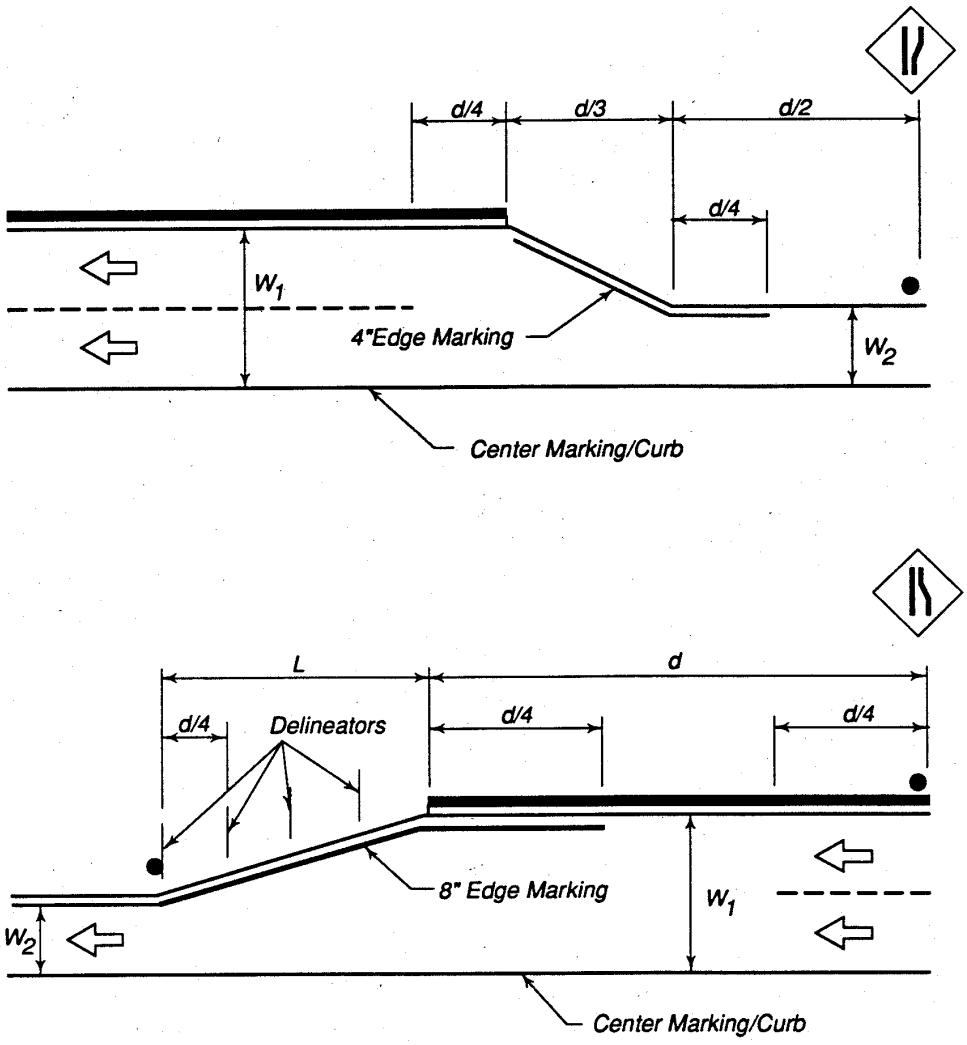
FIGURE 3.1-20

Commercial/Industrial Driveways Type CI



A.D.T. For Driveway		Grade Difference, D	
		Desirable	Maximum
Low Volume	1-500	6%	10%
Medium Volume	500-1500	3%	10%
High Volume	1500 or More	0%	10%

FIGURE 3.1-21
Driveway Grade Standards



S= *Design Speed or 85 Percentile Speed, Whichever is Higher*

L= WS

$W=W_1 - W_2$

d=15S

FIGURE 3.1-22

Pavement Width Transitions

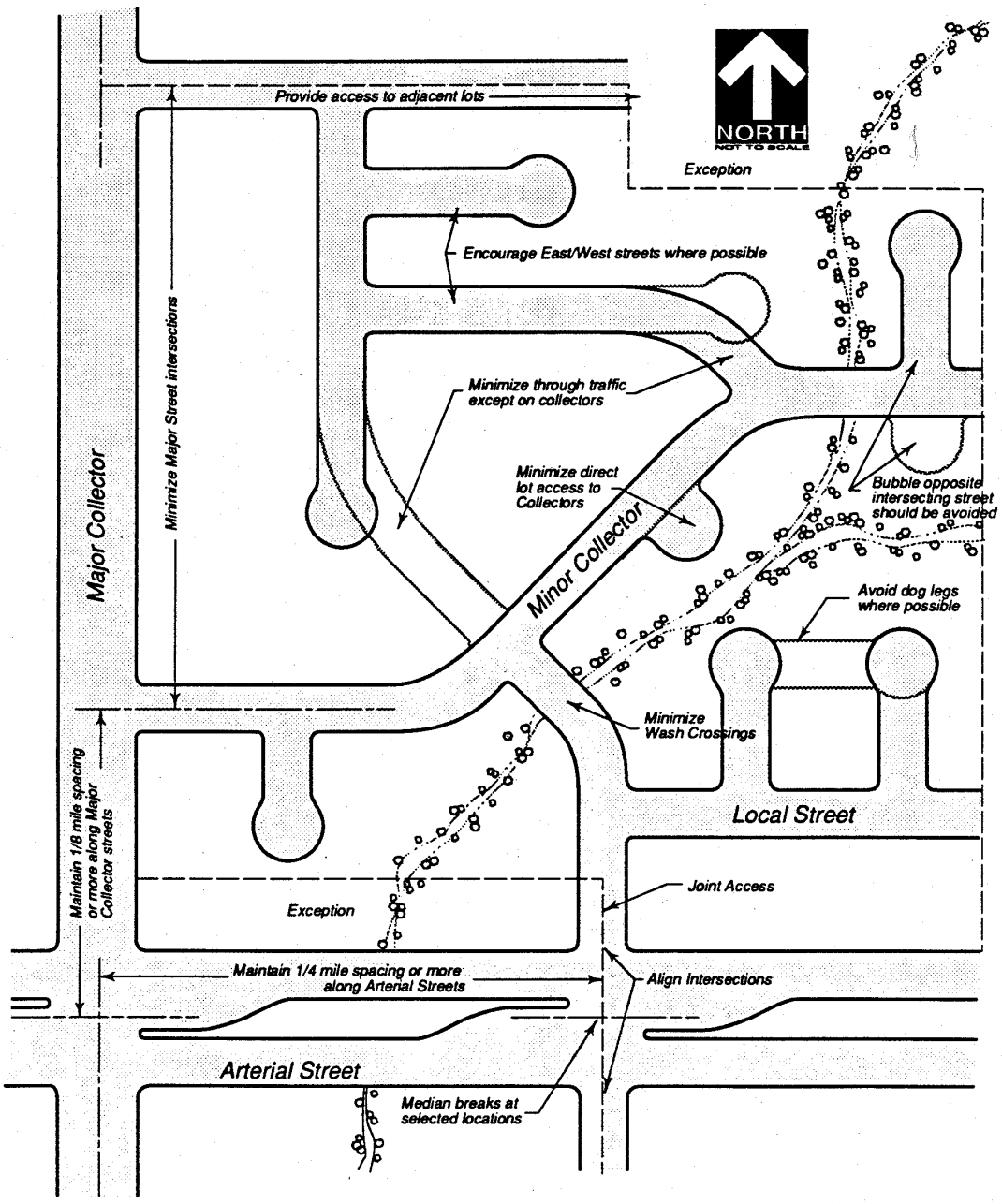
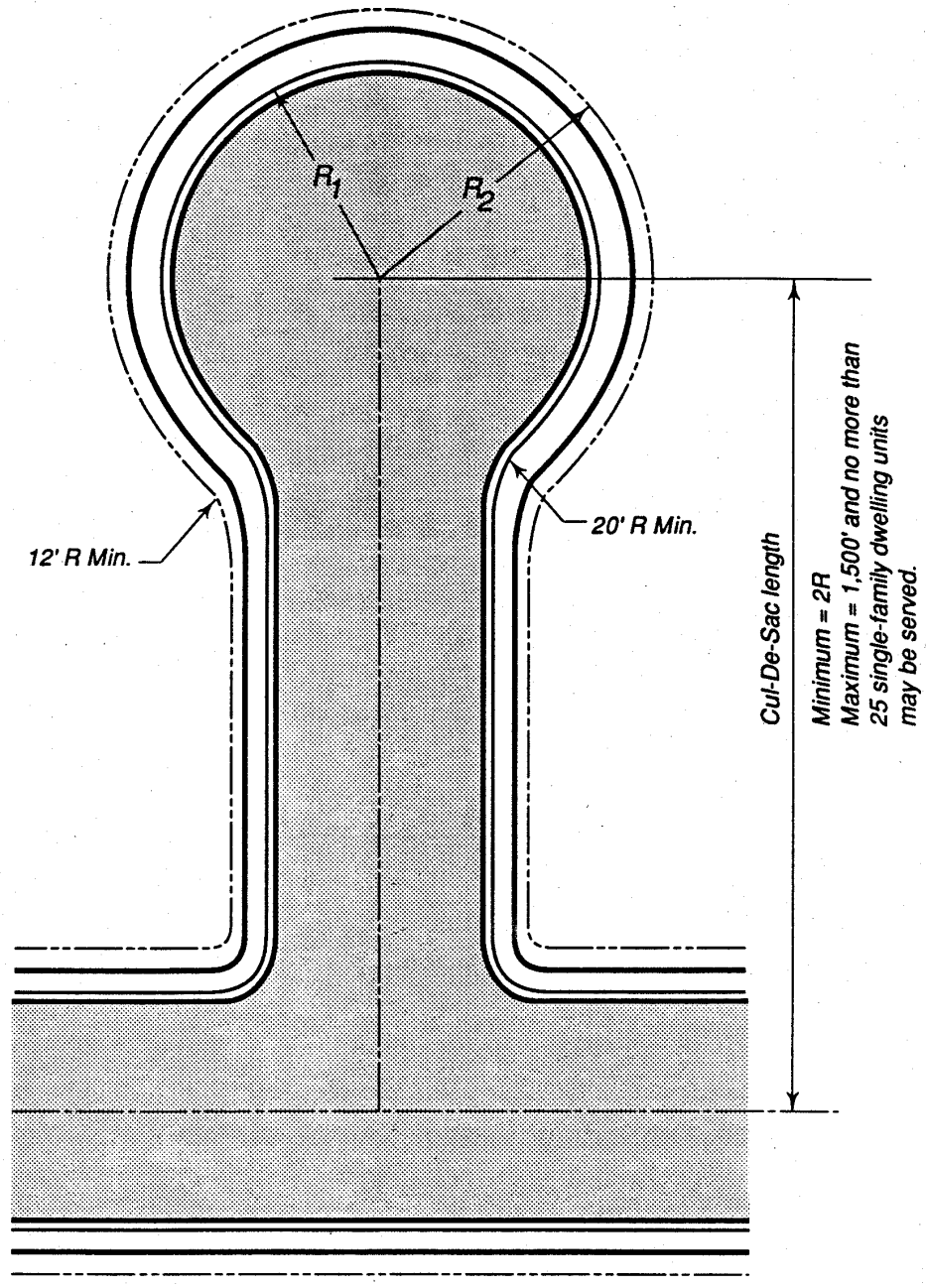


FIGURE 3.1-23
Subdivision Street Planning

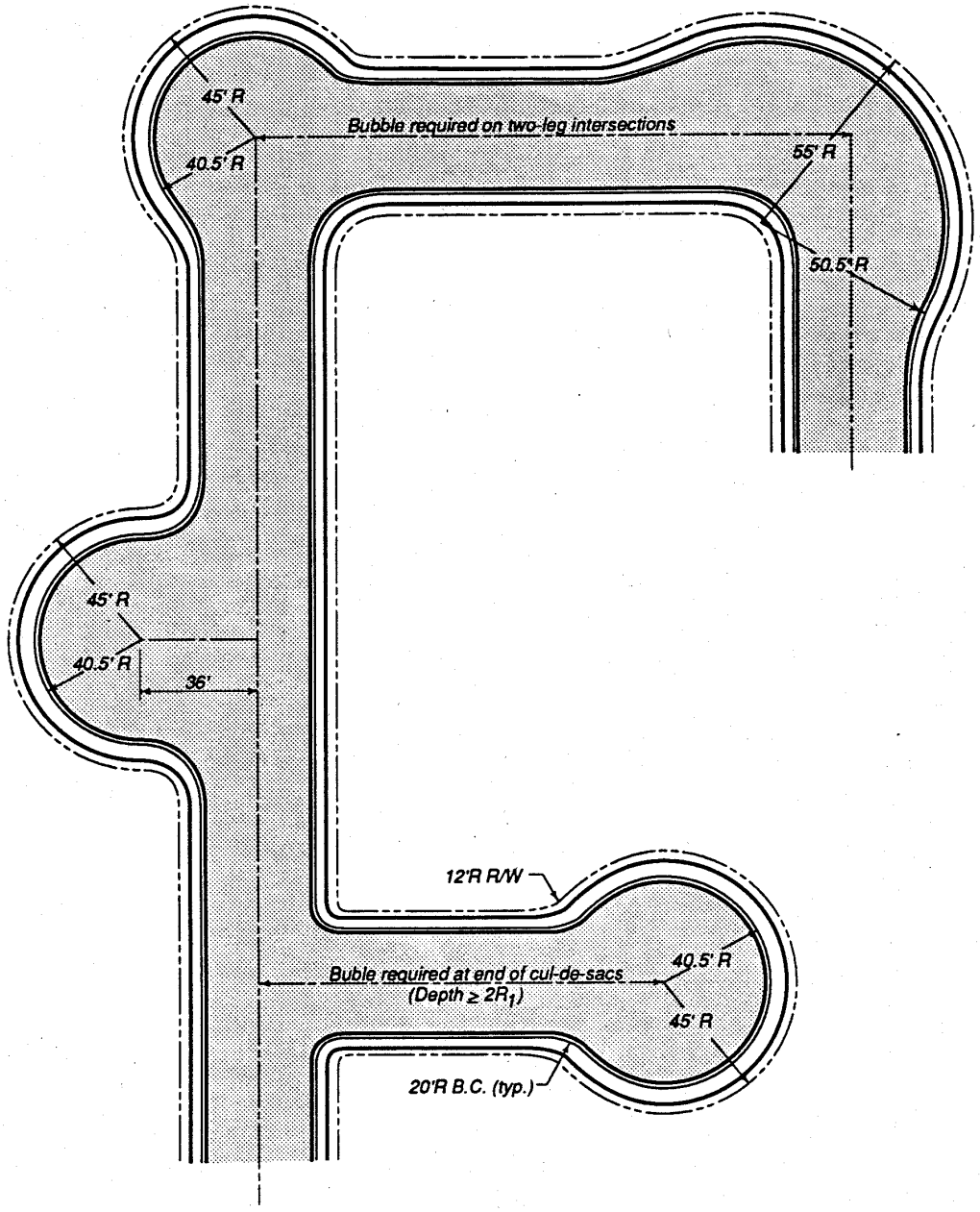


Classification of Cul-De-Sac	Bubble Radii, feet R_1(B.C.)	R_2(P.L.)
Local Res., Non-Hillside	40.5	45
Local Commercial *	60.5	70
Local Industrial	60.5	70

*This also applies to multi-family residential development.

FIGURE 3.1-24

Cul-De-Sac Street Length



The bubble radii shown on this figure are for local residential streets. Radii for cul-de-sac bubbles for other street classifications are shown on Figure 3.1-24. The use of bubbles (except for a cul-de-sac) on other than local residential streets must be approved by the Transportation Department. Radii appropriate for these bubbles will be established as part of that approval.

FIGURE 3.1-25
Bubbles For Streets

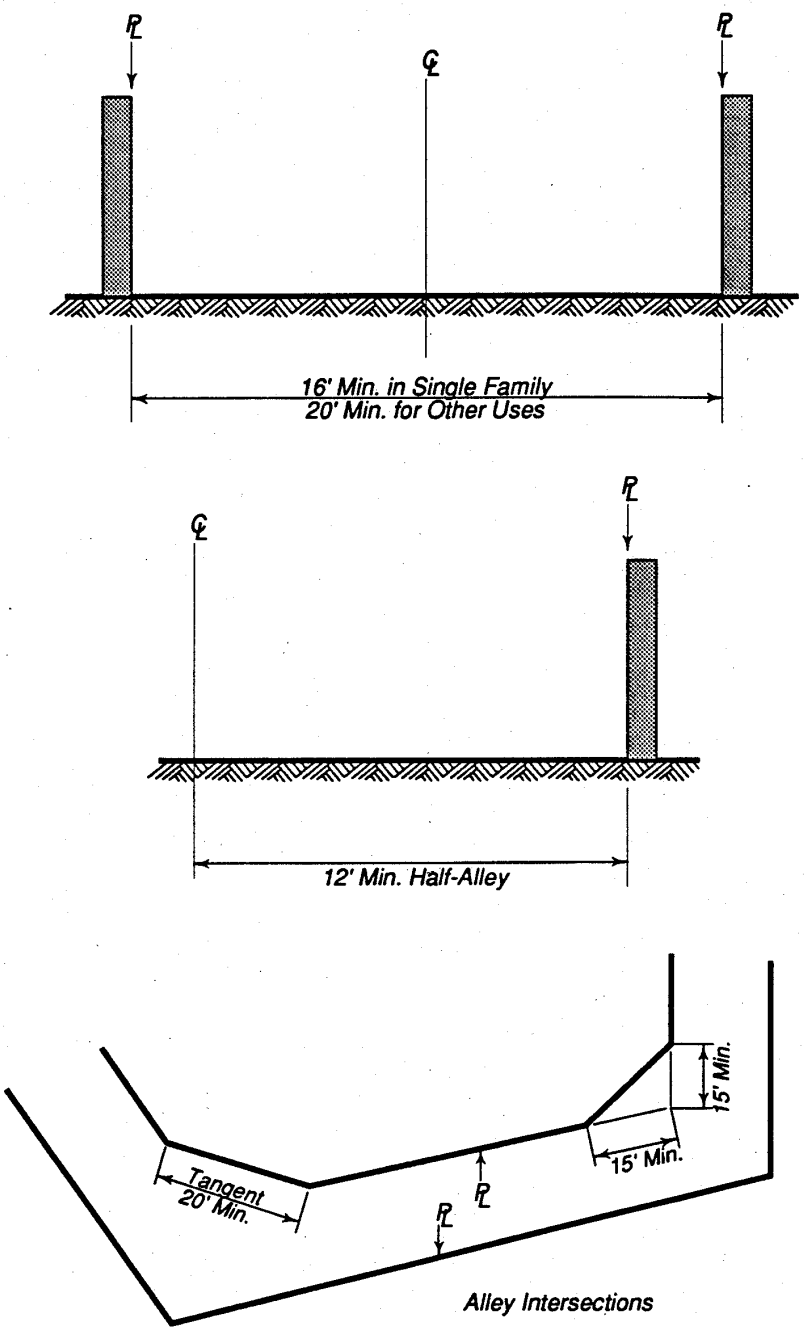


FIGURE 3.1-26

Alley Widths and Intersections

Section 3.2

TRAFFIC SIGNAL DESIGN

Design Standards and Policies
Revised December 1999

Chapter 3
Transportation

SECTION 3.2
TRAFFIC SIGNAL DESIGN

CONTENTS

SECTION	PARAGRAPH TITLE	PAGE
3-201	Introduction	1
3-202	City of Scottsdale Traffic Signal Policies	1
3-203	Traffic Signal Design Criteria	2
3-204	Pre-Design Conference With STSDOD	4
3-205	Traffic Signal Design Guidelines	4
3-206	Construction Plan Submittals	10
3-207	Traffic Signal Plan Content	10
3-208	Figures	14
3-209	Requirements/Specifications	20
3-210	Type 170 Traffic Signal Controller	21
3-211	Traffic Signal Structures	28
3-212	Traffic Counter Components	29
3-213	Emergency Vehicle Priority System	32
Appendix A	COS QPL	41
Appendix B	Caltrans QPL	44

SECTION 3.2
TRAFFIC SIGNAL DESIGN

3-201 INTRODUCTION

This document presents criteria and procedures to be used when preparing traffic signal plans for the City of Scottsdale. **Issues not addressed in this document should be directed to the City of Scottsdale, Transportation Systems Department, Operations Division, (STSDOD), at (480) 312-7623.**

3-202 CITY OF SCOTTSDALE TRAFFIC SIGNAL POLICIES

The following policies have been adopted by the City of Scottsdale City Council. Requests to deviate from these policies must be submitted in writing to the Transportation Systems Department for consideration.

- Install warranted traffic signals to maintain one-half mile signal spacing on expressways, parkways, and major and minor arterials. Spacing must be consistent with the City's traffic control system plan.

- Install warranted traffic signals to maintain one-quarter mile spacing on major collectors. Spacing must be consistent with the City's traffic control system plan.

- Install warranted left-turn arrows based upon established City of Scottsdale criteria.

- Require a traffic signal plan when a new traffic signal is to be constructed or when an existing signal, or any part of an existing signal, is to be modified in any way.

- Require any traffic signal construction, private or public, to be supervised by a certified I.M.S.A. Level II Signal Technician.

3-203 TRAFFIC SIGNAL DESIGN CRITERIA

A. Abbreviations
Abbreviations are defined as follows:

AASHTO	- American Association of State Highway and Transportation Officials
ADOT	- State of Arizona Department of Transportation
AHD	- Arizona Department of Transportation Highways Division
APS	- Arizona Public Service Company
ASTM	- American Society for Testing and Materials
COS	- City of Scottsdale
FHWA	- Federal Highway Administration
IMSA	- International Municipal Signal Association
ITE	- Institute of Transportation Engineers
MAG	- Maricopa Association of Governments
MUTCD	- Manual on Uniform Traffic Control Devices
NEMA	- National Electrical Manufacturers Association
SRP	- Salt River Project
SSPC	- Surface Structure Painting Council
STSDOD	- Scottsdale Transportation Systems Department, Operations Division
CAL-TRANS	- State of California Department of Transportation
USDOT	- United States Department of Transportation
QPL	- City of Scottsdale "Qualified Products List"
QPL-CAL	- CAL-TRANS "Qualified Products List"
TSCA	- Traffic Signal Control Assembly
RCU	- Remote Control Unit

B. Design Criteria/Reference Documents

The current revision of the following publications is to be used in conjunction with the design criteria in this document.

- MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS - USDOT, FHWA
- STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION and GENERAL SPECIFICATIONS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING - Construction Specifications, ADOT
- TRAFFIC SIGNALS AND LIGHTING and SIGNING AND MARKING - Standard Drawings, ADOT
- TRAFFIC CONTROL MANUAL FOR HIGHWAY CONSTRUCTION AND MAINTENANCE - ADOT
- MANUAL OF SIGNS APPROVED FOR USE ON STATE HIGHWAY SYSTEM - ADOT
- POLICIES, GUIDE AND PROCEDURE MANUAL - ADOT
- INFORMATIONAL GUIDE FOR ROADWAY LIGHTING - AASHTO
- GUIDE TO STANDARDIZED HIGHWAY LIGHTING POLE HARDWARE - AASHTO
- UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION - MAG
- UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION – MAG
- SCOTTSDALE SUPPLEMENT TO MAG UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION - COS
- SCOTTSDALE SUPPLEMENT TO MAG UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION - COS
- CITY OF SCOTTSDALE DESIGN STANDARDS AND POLICIES MANUAL

3-204 PRE-DESIGN CONFERENCE WITH STSDOD

Prior to beginning traffic signal design, a pre-design conference may be requested by either STSDOD or the design consultant.

3-205 TRAFFIC SIGNAL DESIGN GUIDELINES

All equipment and materials specified must be listed on the COS QPL or include the required documentation to comply with the COS QPL.

A. Specifcations/Provisions

1. The COS "Boiler Plate" construction specifications shall be used. The need for project-specific construction special provisions will be determined by the STSDOD. (Specifications for controllers, controller cabinets, lighting, and other equipment details is included in this document.)

B. Signal Structures

1. Poles shall be per TRAFFIC SIGNALS AND LIGHTING – Standard Drawings, ADOT, and must meet the STSDOD QPL.

2. The preferred configuration of poles is one pole per corner, located at the center of the curb return, at the back edge of the sidewalk. A sufficient landing which meets ADA requirements must be provided. Situations requiring multiple poles per corner, or poles (traffic signal or pedestrian) within medians should be discussed with the STSDOD.

3. Traffic signal installations along the east and west couplet require "trombone style" poles and mast arms.

4. Combination poles, bracket arms, mast arms, bases and foundation entrance conduit shall be included on the traffic signal plan.

C. Signals

1. All design elements must comply with MUTCD standards, unless directed otherwise by the STSDOD.

2. Twelve-inch signal faces shall be used for all overhead indications and for all left-turn indications. Eight-inch signal faces may be used within signal heads at other locations. Exceptions, such as 12-inch indications for side-mount heads where increased visibility is desired, may be recommended by the consultant and/or may be required by the MUTCD or STSDOD.

3. Typically, a minimum of three heads is required for control of a through movement (one overhead mount and two far-side, side-mounts – left and right). Typically, a minimum of two heads is required for control of other movements.

4. Typically, a minimum of two heads is required to control a left-turn movement. One head shall be overhead-mount, on the mast arm containing the heads which control the corresponding through movement, and the other head shall be side-mounted or pole- mounted on the far-side left corner, facing the corresponding through movement.

5. One mast arm-mounted signal head is required for expressway off-ramp terminals.

6. Red ball, green ball, red arrow, and green arrow indications shall be "LED" type lamps. All pedestrian indications shall also be "LED" type lamps. LEDS shall be model 430-

1315 or approved equivalent. Wattage is as follows: 8” red ball = 15 watts; 12” red ball = 15 watts; 12” red arrow = 9 watts; 8” green ball = 8 watts; 12” green ball = 11 watts; 12” green arrow = 11 watts; 16” pedestrian “man/hand” signal module = 11 watts. All amber indications shall be “Dura-Test” lamps or approved equivalent. Wattage is as follows: 8” ball = 90 watts; 12” ball or arrow = 135 watts. Questions regarding indication type should be directed to the COS, Field Services Division, (480) 312-5634.

7. Fiber optic indications shall not be used unless directed otherwise by the STSDOD.

8. Only polycarbonate signal heads and glass lenses may be used.

9. Heads and mounting brackets shall be black.

10. Back plates and tunnel visors shall be installed on all signal faces and shall be black.

11. Base-mount mounting height of 4 and 5 section heads should be adjusted to avoid conflict with mast arm. The aiming of the head can not conflict with the mast arm or mast arm connection. (These side-mount heads should be mounted on the backside of the pole, at a 45 degree angle, at a height of 115 inches.)

12. A maximum of three heads shall be installed on a mast arm that is 40 feet in length or less. A maximum of four heads shall be installed on a mast arm that is 45 feet in length or longer. (A mast arm that is 40 feet in length or less shall include a minimum of two tenons. A mast arm that is 45 feet in length or greater shall include a minimum of three tenons.)

13. The use and placement of right-turn arrow heads shall be approved by the STSDOD.

14. ADOT type eleven (XI) mounting hardware will not be used in Scottsdale signal designs.

D. Pedestrian Signals

1. Pedestrian signals should be installed at ALL crossings, unless directed otherwise by the STSDOD.

2. Pedestrian push-buttons should be installed at ALL crossings, unless directed otherwise by the STSDOD.

3. Pedestrian push-buttons shall meet ADA requirements. (All traffic signal poles with pedestrian push-button assemblies shall be wheel chair accessible. A four (4) foot wide concrete access ramp and landing per ADA requirements shall be provided to poles which are not placed immediately adjacent to sidewalks. Pedestrian push-button assemblies shall be mounted no higher than 42 inches above the adjacent sidewalk or ramp elevation.)

4. The ADOT pedestrian push-button post shall be used when necessary in accordance with MUTCD.

5. Pedestrian signals shall be 16” LED “Man/Hand” indication and have bottom hinges.

6. The required "Pedestrian-Push-Button-Placard" design may be viewed at www.ci.scottsdale.az.us/streets/signs&mrk.asp, or contact COS, Field Services Division, at (480) 312-5635.

E. Controller
   1. The Controller shall be a 170E or higher system unless otherwise directed by the STSDOD.

F. Controller Cabinet
   1. The controller cabinet shall be model 330 unless otherwise directed by the STSDOD.

   2. Typically, the cabinet should be located on the same corner as the power cabinet. (The power cabinet is typically located on the corner closest to the power source, which is typically specified by the power provider.) To the extent possible, the cabinet should be shielded and protected from the threat of errant vehicles. The cabinet should be positioned so as to allow a technician working within the cabinet, a clear view of the intersection under control.

   3. The cabinet foundation shall project 12 to 18 inches above the adjacent (ultimate) ground elevation. The cabinet foundation shall extend 32 to 36 inches below the adjacent (ultimate) ground elevation.

G. Electric Service Cabinet
   1. The electric service cabinet shall be "MEYERS model MUEGL-W/TB" unless otherwise directed by the STSDOD. The electric service cabinet shall include the following: lightning arrest (ground rod); photocell receptacle rated for 20 amps or more; sub-breakers; and test/auto switch. A permanently affixed metal address tag shall be mounted on the front side underneath the meter window.

   2. Typically, the electric service cabinet is located on the corner closest to the power source, which is typically specified by the power provider. To the extent possible, the cabinet should be shielded and protected from the threat of errant vehicles. The cabinet should be positioned so as to allow a technician working within the cabinet, a clear view of the intersection under control.

   3. A #7 pull box shall be installed adjacent to the electric service cabinet. A power run shall be installed from the pull box to the cabinet.

   4. When the power source is an overhead power drop, 2-inch galvanized conduit shall be used above ground and through the first underground sweep.

   5. The cabinet foundation shall project 12 to 18 inches above the adjacent (ultimate) ground elevation. The cabinet foundation shall extend 32 to 36 inches below the adjacent (ultimate) ground elevation.

   6. The service address shall be permanently attached to the electric service cabinet.

H. Loop Detectors
   1. All loop detectors shall be wire-in-duct type wire. (Detect-a-Duct or approved equivalent, #14 stranded inside a ¼ inch PVC tubing.)

   2. All loop detectors shall be centered in the middle of the applicable traffic lane. Loops shall be sufficiently dimensioned on the plans. Loop detectors should extend five feet into the crosswalk unless directed otherwise by the STSDOD.

   3. A rectangular loop with 3 turns (6 feet x 40 feet) shall be used for all through lanes.

4. A quadrapole loop with 2 outside turns and 4 inside turns (6 feet x 40 feet) shall be used in all exclusive left-turn lanes. (Wire in middle cut shall run the same direction.)

5. Loop detectors shall not be installed in exclusive right turn lanes.

6. The location of permanent count detector loops shall be specified by the STSDOD. Count detector loops shall consist of a minimum of 4 turns (6 feet x 6 feet).

7. Pre-formed loop detectors conforming to the latest ADOT specification shall be used under decorative pavement, “pavers,” concrete, or other “special” roadway surfaces, or as directed by the STSDOD.

8. Lead-in cable between loop wire and controller shall meet IMSA 50-2 specification or approved equivalent.

9. Loop lead-in and splices in pull box shall be twisted and soldered. Griggs Loop Detector Sealant, 3-M Loop Sealant, or approved equivalent shall be used

10. Loops shall be installed prior to the installation of the final pavement lift (if part of a paving project).

11. Loops shall be inspected and tested prior to acceptance by the City.

I. Conductors

1. #12 solid THHN/THWN wire shall be used for all signal conductors. #12 stranded THHN/THWN wire shall be used for all pedestrian push-button conductors.

2. Signal pole and conduit grounding wire shall be #8, solid bare copper wire.

3. Belden 9883 or approved equivalent shall be used between telephone drop point and the controller. IMSA 50-2 or approved equivalent shall be used between detector-loop pull box and the controller.

4. Opticom model 138 detector cable shall be used for emergency vehicle pre-emption. 138 detector wire may not be spliced between pole connection and cabinet termination.

5. Lead-in cable between loop wire and controller shall be IMSA 50-2 specification or approved equivalent.

6. Any existing conduit run which is disturbed shall be re-pulled completely with new wire and the old wire shall be removed. The use of wire pulling lubricant is required in all conduits. Pull wires shall be installed in every conduit run.

7. No wire splicing shall be permitted, except in pull boxes, terminal compartments, control cabinet, and electric service cabinet. Wire splices must be twisted prior to wire nuts being installed. All splices shall be dipped in 3M Scotch Kote or approved equivalent a minimum of two times to eliminate any air bubbles. Wire nut shall be 100% filled with sealer. All pull box loop detector connections shall be soldered. Loop wire to first pull box shall be twisted a minimum of six wraps per foot prior to soldering to lead-in cable.

J. Conduits

1. 2-inch conduit shall be used for pole runs and telephone drop. 2 1/2-inch conduit shall be used for all other runs.

2. Two (2) 2 1/2-inch conduits are required for every street crossing.

3. Galvanized conduit shall be used for exposed, above-ground runs through the first sweep below grade.

4. Red warning tape shall be placed in all trenches, 12 inches below final grade.

5. Expansion joints shall be used every 50 feet.

6. Schedule 40 PVC shall be used, except for service runs above ground.

7. Avoid installing conduit in the medians, unless otherwise directed by the STSDOD.

K. Pull Boxes

1. No pull boxes shall be placed in traveled roadways. Conduit must be extended where necessary to relocate pull box to a non-traveled area.

2. Concrete pull boxes with steel covers shall be used in dirt areas and in sidewalks.

3. When possible, pull boxes shall be located adjacent to sidewalks rather than in the sidewalk.

4. All traffic signal pull boxes shall be marked "Traffic Signal" on the lid.

5. Pull boxes shall be used at all corners and in island noses.

6. #7 pull boxes shall be used in all locations except on end runs and unless otherwise directed by STSDOD.

L. Lighting

1. Luminaires shall be provided on all signal poles unless there is a utility conflict or unless directed otherwise by the STSDOD. Luminaire wire connections shall only be made in pull boxes and not brought into the signal controller cabinet.

M. Emergency Vehicle Pre-Emption

1. Emergency vehicle pre-emption shall be used for al directions, at all locations, unless otherwise directed by the STSDOD. Additional sensors may be necessary if approaches are offset or vision is obstructed.

2. Opticom model 138 detector cable shall be used for emergency vehicle pre-emption. 138 detector wire may not be spliced between pole connection and cabinet termination.

3. Opticom detector cables must be taped and color-coded.

N. Phasing Standard

1. Intersection phasing shall be determined by the STSDOD. Left-turn phasing will operate as lag-left unless otherwise directed by the STSDOD.

2. Corresponding permitted/protected left-turn phasing shall be wired together and operate simultaneously to avoid the left-turn trap.

3. The signal controller shall be wired by an IMSA Level 2 certified signal electrician.

O. Electrical Power
1. Contact the applicable power provider to determine source for traffic signal power and to coordinate applicable requirements.

2. The electrical service address shall be shown on the signal plan. The address may be obtained from the COS, Records Department.

3. The contractor must obtain an electrical service permit from the COS, One-Stop-Shop.

P. Traffic Signal System (Communications)
1. All traffic signals shall be interconnected to the COS Traffic Signal System by means of a telephone land-line, unless directed otherwise by the STSDOD. Contact STSDOD at (480) 312-7935 for circuit number and other applicable information.

2. Contact the applicable communications provider to determine location for telephone drop and to coordinate applicable requirements.

3. A separate 2 inch conduit shall be installed from the point of phone service (phone drop) to the nearest pull box. Belden 9883, or approved equivalent, shall be used for the telephone run.

4. The telephone service address shall be shown on the signal plan. The address may be obtained from the communications provider.

Q. Signing
1. All regulatory, warning and route marker signs shall be provided with the traffic signal installation and shall be in accordance with the Manual on Uniform Traffic Control Devices. "Metro" street name signs shall be installed on signal poles per COS criteria. See Traffic Signs and Markings, Section 3.6, for details.

R. Striping
1. All necessary striping shall be provided with the traffic signal installation and shall be in accordance with the Manual on Uniform Traffic Control Devices. See Traffic Signs and Markings, Section 3.6, for details.

S. Removal and Salvage
1. All existing traffic signal equipment and street lights shall remain in operation until new installations are operational.

2. Foundations shall be removed to at least 12 inches below grade, or as directed by the COS inspector.

3-206 CONSTRUCTION PLAN SUBMITTALS

Traffic signal plans shall be submitted to Project Review through the normal One-Stop-Shop process and must comply with all requirements of the COS Design Standards and Policies Manual. **Two** (2) sets of mylar signal plans are required to receive final project approval. One set will be approved and returned to the submitter; one set will be forwarded to the STSDOD.

3-207 TRAFFIC SIGNAL PLAN CONTENT

A. Plan Content

Traffic signal plans shall be developed in accordance with the requirements of the COS Design Standards and Policies Manual, Section 1, and conform with ADOT standard practices. As a general guide, the traffic signal plan layout shall be drawn at 1" = 20' scale, and shall include the following items:

1. Locate and identify ALL existing and/or proposed improvements, above and below ground, within 200' of the intersection. INCLUDE ALL UTILITIES.

2. Locate and identify ALL existing and/or proposed pavement marking and signing, include "turn-arrows" for exclusive turn lanes.

3. Locate existing vegetation (trees, etc.) which could be in conflict with any proposed equipment locations or impact required signal visibility distances.

4. Provide a "profile layout" when vertical roadway alignment may impact traffic signal visibility requirements. (1" = 40' scale for profile is acceptable.)

5. Provide bearings for each leg of the intersection when deflection is greater than 2 degrees. Provide roadway curve data if applicable.

6. Locate all traffic signal equipment (poles, controller cabinet, electric service cabinet, telephone drop, etc.) by station and offset dimension.

7. All traffic signal poles, conduits and equipment must be located within public right-of-way or easement.

8. Controller and cabinet must be type 170 system with type 330 cabinet.

9. Electric service cabinet must be MYERS, MEUGL-100TB(dual) or COS/APS/SRP approved equivalent.

10. Locate and specify source of electric service.

11. Provide address for electric service cabinet, available through COS Records Department.

12. Locate telephone drop and run conduit with communication cable back to signal controller.

13. Provide emergency vehicle signal pre-emption, using 3M Opticom optical detectors and model 138 detector cable, or approved equivalent.

14. Provide phasing diagram for initial signal operation and ultimate 8-phase operation, unless directed otherwise by the STSDOD.

15. Provide conductor schedule indicating conduit run number, conduit size, wire type/size, phase, and any other pertinent information.

16. Details of any items not covered by standards.

B. General Notes

Include the following General Notes on all COS Traffic Signal Construction Plans. Also see the COS DS&PM, Section 1, for additional notes that may also be required.

1. All traffic signal equipment and all construction in public right-of-way or in easements granted for public use shall conform to the Arizona Department of Transportation (ADOT) standard drawings and specifications, to the Maricopa Association of Governments (MAG) Uniform Standard Specifications and Details for Public Works Construction, to the City of Scottsdale (COS) Supplement to MAG Standard Specifications and Details for Public Works Construction, and to the COS Design Standards and Policies Manual.

2. Traffic control shall conform to the City of Phoenix "Traffic Barricade Manual" and/or as directed by the City Public Works Inspector.

3. Utility locations shown are based upon the best available information. The Contractor shall contact Blue Stake at 602-263-1100 before construction and verify actual utility locations.

4. Traffic signal poles, mast arms, and service cabinets shall be painted with 2 coats white enamel paint meeting ADOT Specification Section #1002.

5. All pull boxes shall be ADOT #7 unless noted otherwise.

6. A ground rod shall be installed within the customer side of the electrical service panel and a #4 bare bond conductor attached.

7. Pavement replacement shall conform to COS Standard Detail 2200 and 2001. Sidewalk replacement shall conform to MAG Standard Detail 230.

8. “Metro Street Name Signs” shall be installed on traffic signal mast arms per COS Supplement to MAG Specifications, Section 402.3.4.

9. Applicable signal and pedestrian indications shall be “LED” type lamps pursuant to the COS Design Standards and Policies Manual.

10. Emergency Vehicle Pre-Emption shall be field-adjusted to optimize reception.

11. All existing traffic control devices (including stop signs) and street lights shall remain in operation until new installations are energized and operational. Any removed COS equipment shall be salvaged and returned to the COS Traffic Signal Shop at 9191 E. San Salvador (Scottsdale).

12. Questions concerning traffic signal design should be directed to the “Signal Designer, Address, Phone Number.”

13. The electrical service address is: XXXXXXXXXX.

14. The Telephone drop address is: XXXXXXXXXX.

15. At START of construction the contractor shall contact the COS Signal Supervisor at 480-312-5635 to coordinate power authorization, cabinet set-up and inspection requirements.

16. At START of construction the contractor shall contact the electric power provider to confirm power location and to schedule inspection.

17. At START of construction the contractor shall contact the telephone service provider to confirm telephone drop location and to schedule inspection.

C. Standard Traffic Signal Circuitry

CONDUCTORS (#)	AWG	PHASING/CIRCUIT
Signal (3)	12	01 – 08 / Controller to heads
Ped Signal (2)	12	02, 04, 06 08 Ped / Controller to ped heads
Ped Buttons (1)	12	02, 04, 06, 08 Ped / Controller to ped buttons
Signal Common (1)	12	Pole (w/ped or signal head) to controller
Ped Common (1)	12	Controller to all buttons
Spares (Minimum 3)	12 (Brown)	Any conduit crossing under roadway
Power Hot (2)	8	Electric service to controller
Street Light Common (1)	12	Electric service to all fixtures
Street Light Hot (1)	8	Electric service to fixtures
Equipment Ground Bare Bond (1)	8	In all conduit with voltages present
Electric Service Bare Bond (1)	4	From electric service to ground
Telephone interconnect (1)	Belden 9883	Controller to phone drop
Detector Loops (N)	IMSA 50-2	Controller to detector loop pull box

D. Phase Color Coding

The following table lists color coding for signal and detector wiring. Each signal phase wire shall be coded with colored tape in the pull box.

- SIGNAL 8 PHASE
  - NBLT - red & white
  - SB - yellow
  - EBLT - green & white
  - WB - blue
  - SBLT - yellow & white
  - NB - red
  - WBLT - blue & white
  - EB - green

- PEDs:
  - N / S - East side - red
  - N / S - West side - yellow
  - E / W - North side - blue
  - E / W - South side - green

- PED PUSH-BUTTONS
  Same as peds

- 2 PHASE SIGNAL:
  - N / S - red
  - E / W - green

- 2 PHASE PEDS:
  - N / S - red
  - E / W - green

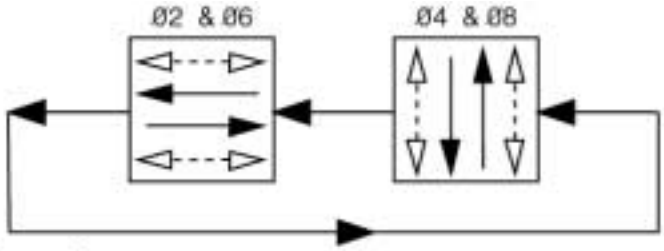
- DETECTORS
  same as signals

- PRE-EMPTION DETECTORS
  same as signals

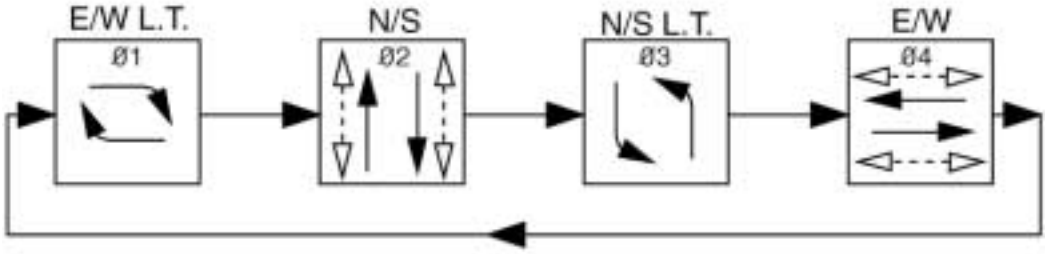
3-208 FIGURES

The following figures are included for informational purposes.

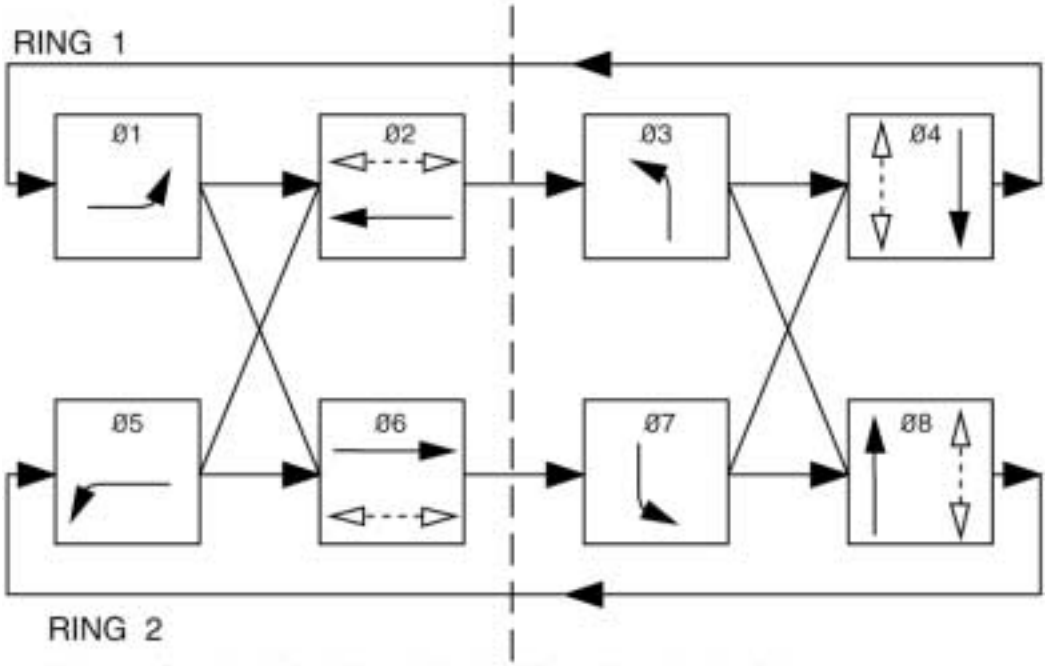
Figure 3.2-1	Phase Diagram
Figure 3.2-2	Traffic Signal Reference Chart
Figure 3.2-3	Title and Signature Block
Figure 3.2-4	Loop Detail
Figure 3.2-5	Sample Standard Traffic Signal Plan



2 Phase Operation



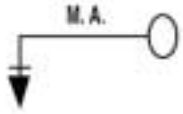
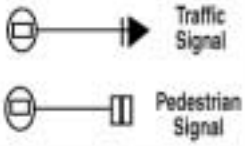
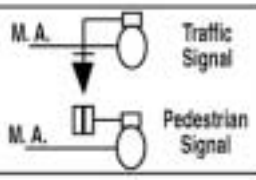
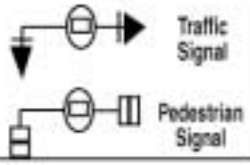
4 Phase Lag - Left Operation

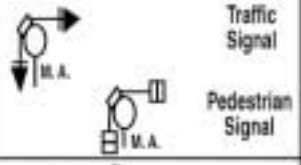
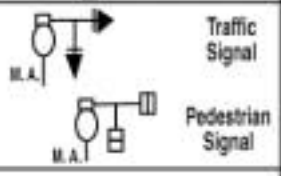
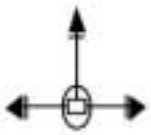
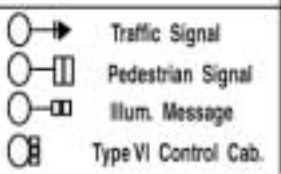


8 Phase Quad Left - Turn Dual Ring (Lead - Left)

FIGURE 3.2-1

Phase Diagram

TYPE	PLAN SYMBOL	REFERENCE
I II		ADOT T.S. 9-1
III		ADOT T.S. 9-2
IV		ADOT T.S. 9-2
V		ADOT T.S. 9-3
VI		ADOT T.S. 9-4

TYPE	PLAN SYMBOL	REFERENCE
VII		ADOT T.S. 9-5
VIII		ADOT T.S. 9-6
IX		ADOT T.S. 9-7
X		ADOT T.S. 9-8
XI		ADOT T.S. 9-9

Standard Signal Faces
Reference ADOT T.S. 8-1

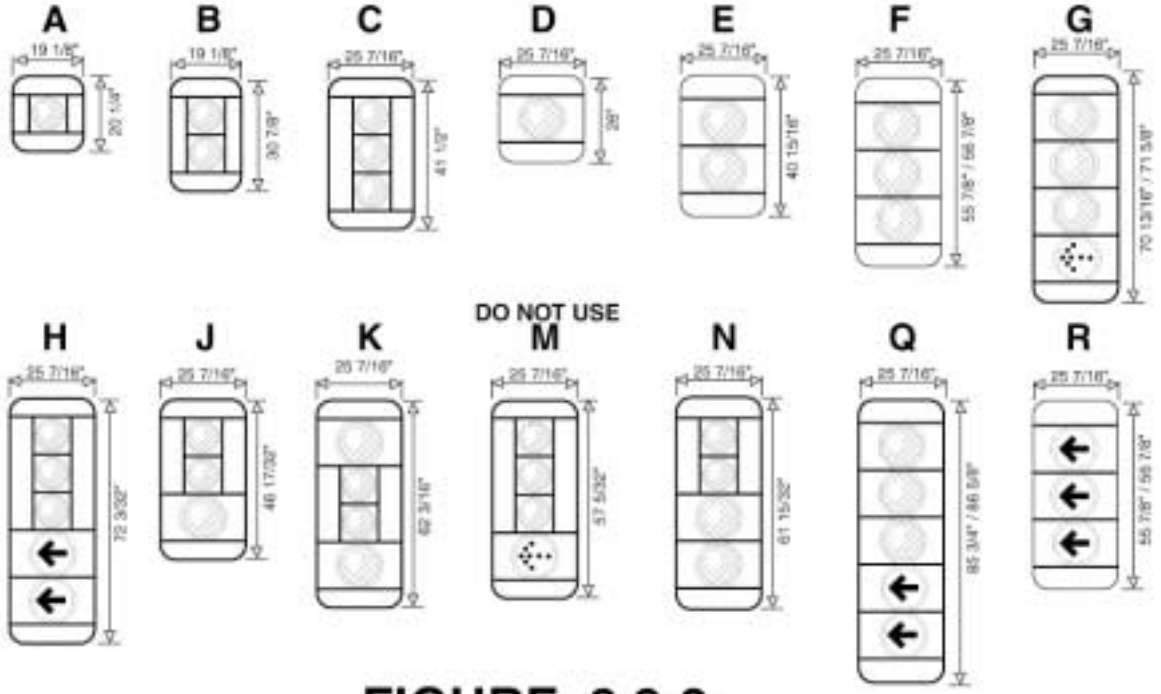


FIGURE 3.2-2

Traffic Signal Reference Chart

DATE	REVISION	BY

PROJECT TITLE

ENGINEERING FIRM	DESIGNED BY	DRAWN BY

DATE	AS-BUILT DATE	BID NO.	SCALE	Sht. ___ of ____

ENGINEER STAMP

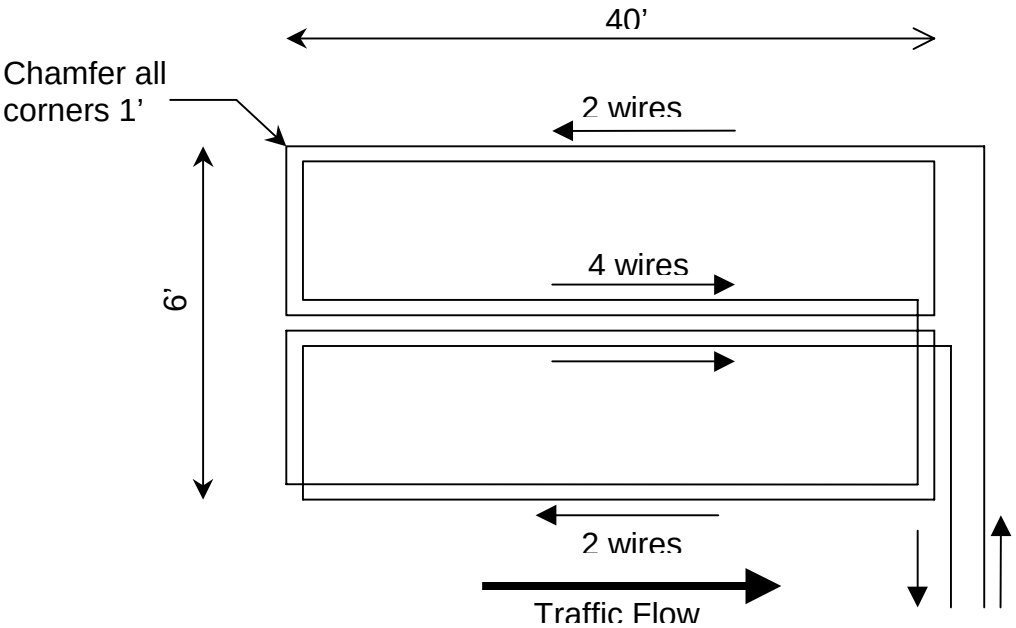
TRANSPORTATION DEPARTMENT

TRAFFIC ENGINEERING
7447 E INDIAN SCHOOL
SCOTTSDALE, ARIZONA 85251

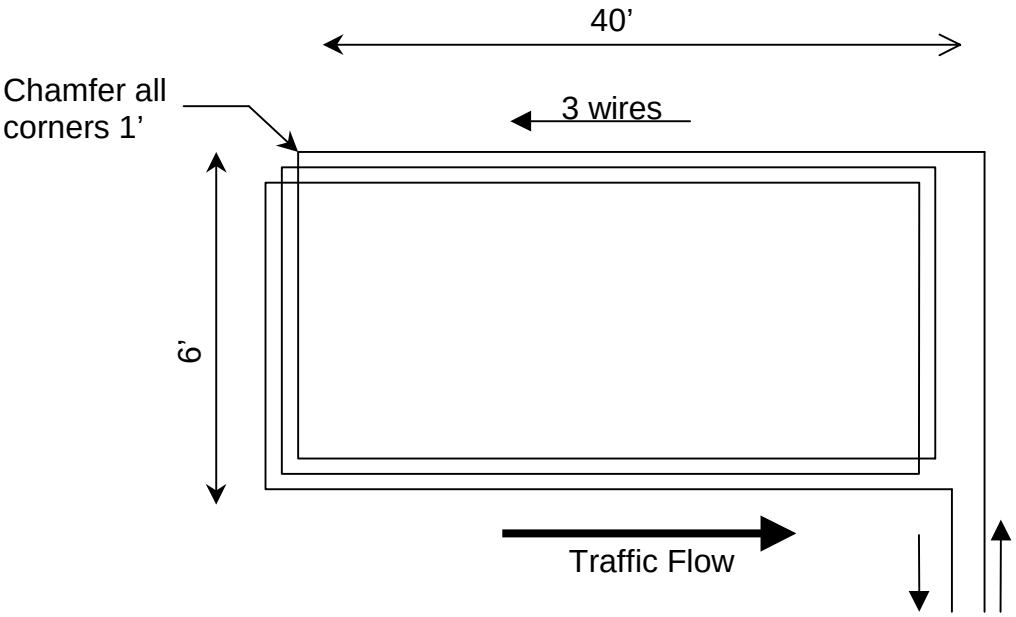
REVIEW AND SIGNATURE/DATE BLOCK

_____	_____
Engineering Coordination Manager (or designee)	Engineering Review

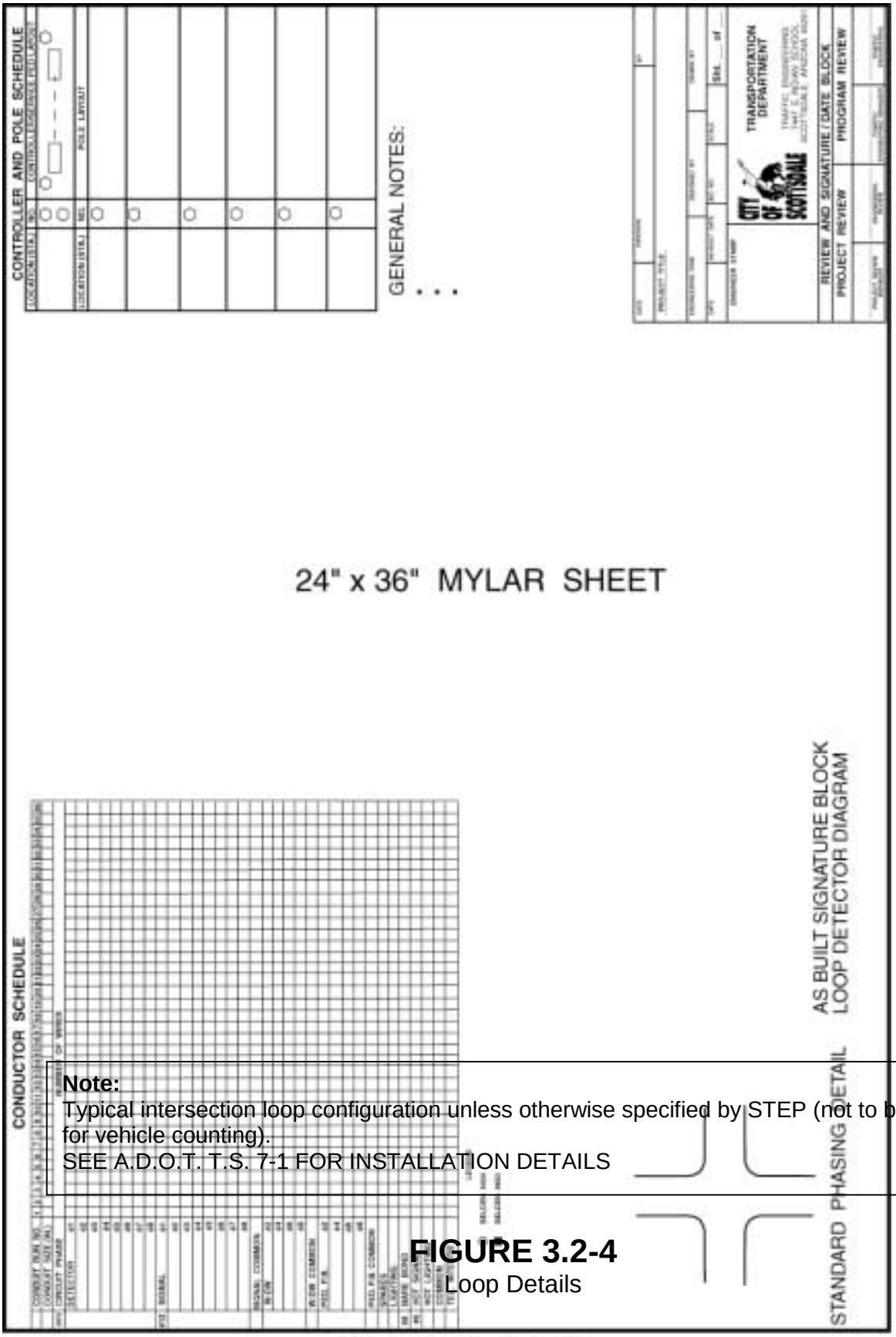
FIGURE 3.2-3
Title & Signature Block



QUADRUPOLE LOOP DETECTOR
For Left Turn Lanes Only



STANDARD LOOP DETECTOR



Note:
Typical intersection loop configuration unless otherwise specified by STEP (not to be used for vehicle counting).
SEE A.D.O.T. T.S. 7-1 FOR INSTALLATION DETAILS

FIGURE 3.2-4
Loop Details

FIGURE 3.2-5
Standard Traffic Signal Plan

3-209 GENERAL REQUIREMENTS/SPECIFICATIONS

A. All traffic signals and lighting equipment, in addition to meeting the requirements of this specification, shall conform to the current version of the following documents.

- Arizona Department of Transportation, Standard Specifications for Road and Bridge Construction
- Arizona Department of Transportation, Traffic Signals and Lighting, Standard Drawings
- California Department of Transportation, Traffic Signal Control Equipment Specifications
- International Municipal Signal Association, Wire and Cable Specifications
- National Electrical Manufacturers Association, Traffic Control Systems, Standards Publications
- U.S.D.O.T./F.H.W.A., Manual on Uniform Traffic Control Devices
- American Association of State Highway and Transportation Officials, Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals
- U.S.D.O.T./F.H.W.A., Type 170 Traffic Signal Controller System - Hardware Specification

B. Lighting Specifications
Intersection lighting shall be, 120 volt, 250 watt, two door, 90-degree cutoff with filter. GE model M 250 or ITT model 25-5232DJ, or approved equivalent, per specifications. Luminaires shall include one solid state photocell for each luminare. All wire to the installation shall be THHN/THWN or approved equal.

C. Electric Service Cabinet
Use approved alternate with lighting arrest installed. Photocell receptacle should be rated for 20 amps. Install "Grounding Rod" within the customer side of the electric service cabinet.

3-210 TYPE 170 TRAFFIC SIGNAL CONTROLLER ASSEMBLY

A. General

1. Definition: The Type 170 traffic signal controller assembly is defined as a complete electrical mechanism mounted in a cabinet for the purpose of controlling the operation of a traffic control signal.

2. General Requirements
   Qualified Products List (QPL):
   A City qualified Products List has been established for the following traffic signal controller assembly components:

   Type 170 system cabinets
   Type 170 controller units
   Remote control units
   Type 170 controller unit software

   Model 200 load switch
   Model 204 flasher
   Model 210 conflict monitor
   Model 222 two-channel loop detector
   Model 224 four-channel loop detector
   Model 242 two-channel DC isolators
   Model 252 two-channel AC isolators
   Model 430 relays
   Model 412 program module
   Model C424 and C422 count loop detectors
   See Appendix A

   City qualified vendors are not required to submit equipment for testing; however such vendors are required to submit product data including manufacturer, description, and photos.

   All vendors wishing to submit bids for traffic signal controller assembly components that are not on the City's qualified Product List, but are already on California's Qualified Product List must provide their equipment and supporting documentation for city review. If the product satisfies review process, it will be placed on the city QPL.

   Bids submitted without equipment and supporting documentation will be deemed non-responsive and WILL NOT BE OPENED. Review process will consist of 30 days for equipment testing plus 15 days for data review. Vendor is responsible for product during review process.

3. Product Training
   The contractor shall provide complete instructions in the operation of the type 170 traffic signal controller assembly component if requested by the city. This training may be in person or on videotape.

4. Proprietary Parts
   When proprietary electrical parts are used, an additional ten (10) percent inventory of the proprietary parts are to be supplied as spare parts. In addition, the contractor shall supply ordering information for the proprietary parts.

5. Product Documentation
   All data submittals required by Caltrans (i.e. warranties, diagrams, and manuals) shall be supplied to the City.

6. Equipment Warranty
   Each item furnished shall be warranted by the supplier against all defects in design, materials, and workmanship for a period of 18 months following the acceptance by the City. This guarantee period shall be extended by the amount of time between the city's notice to the contractor of a defect in the equipment and the contractor's replacement or repair of said equipment and return of said equipment to the City.

7. Hardware
   If a malfunction in any one or more of the Type 170 traffic signal controller assembly components occurs during the warranty period, the supplier shall, within 72 hours after verbal notification (excluding Saturday, Sunday and Holidays) furnish a like component for city use while the warranted unit is being repaired. The isolation of any malfunction and repair and/or replacement of any devices within the warranty period shall be the responsibility of the supplier. After the supplier has repaired and returned the operational equipment, the city will return the spare component. All costs incurred in warranty work, with the exception of city labor, is the responsibility of the contractor.

8. Software
   If a malfunction in the software occurs during the warranty period, the supplier shall within seven calendar days after verbal notification correct the problem to the city's satisfaction.

9. Note: Failure to comply with warranty requirements shall be sufficient ground to prohibit the contractor from bidding on future City contracts.

10. Software Update
    The supplier shall furnish, free of charge, all software updates to the City for a period of two years following the date of acceptance. After this time, the City requests that the contractor notify the City of all updates.

B. Type 170 TSCA Base Specifications
   The base specification for the Type 170 traffic signal controller assembly is the State of California, Department of Transportation's Traffic Signal Control Equipment Specifications, Current, including all addendums as of 30 days prior to the bid opening. Using the Caltrans specification as a foundation, the city has accepted some modified specifications. Please examine the various component descriptions for possible deviations from the "base" Caltrans specification.

C. Type 170 TSCA, Component specification - System Cabinets

1. The type 170 system cabinet is defined in accordance with Caltrans Specification as including the following:

   - housing
   - mounting cage
   - power distribution assembly (exception to Caltrans specification: field output Signal Bus Circuit Breakers must be 20 amps)
   - input files
   - power supply assembly

- output files
- C1 harness (shall be of adequate length so that controller may be removed to top of cabinet without disconnection)
- service panel
- input panel

2. Emphasized and additional minimum requirements for each Type 170 system cabinet are:

   (1) Model 210 "modified" conflict monitor
   (1) Internal, rear, florescent lamp for model 336 "stretch"
   (4) Model 430 flash transfer relays for model 330 and 336 "stretch" cabinets
   (2) Model 204 "modified" flasher unit for model 330 and 336 "stretch" cabinets
   (1) Set of cabinet anchor bolts

   The housing shall be painted white inside and outside per ADOT specifications.

3. Note:
   All Type 170 system cabinet models shall include C2 cable interface wiring, plus PC 642C-008 telephone surge arrestor and cable to accept Model 400 modems, or approved equal. C2 cable shall be a minimum of 6 feet long. Cabinet must also include loop detector surge suppression device SR1-6LCB or approved equal (5 per cabinet).

4. Acceptable Type 170 system cabinet models are as follows:

   Model 330: New York State Department of Transportation, Traffic Signal Equipment Microcomputer Specifications current. In addition, must have flash sense wired to PDA 1/A/W latest drawing number.

   Additional requirements for each type cabinet include phone jack installed in police panel with 5 feet twisted pair wire connected in accordance with latest drawing number.

D. Type 170 TSCA, Component specification Model 170 Controller Unit

NOTE: 170 controller units must be able to accept dual port ACIA, and modem (C2 & C20) shall be complete and functional.

E. Type 170 TSCA, Component Specification Model 412 Program module "modified."

Additional requirements for the Model 412 "modified" program module are:

- Each program shall be capable of running the traffic signal control program currently used by the city. (WAPITI MICRO SYSTEMS CORP., W4IKS, current revision).

- The contractor shall supply a fully programmed configuration PROM. The city will program the 27256 EPROM with the current revision of W4IKS. The contractor shall supply two 6264 RAMS and two 2816 EEPRMS or 32K or higher non-volatile storage RAM as required.

F. Type 170 TSCA, Component Specification Model 200 Load Switch Module "modified."

Additional requirements for the Model 200 "modified load switch module are:

- Each load switch module shall be rated at 15 amps or 20 amps.

F1: In addition, each load switch shall contain 3 replaceable "cube type" solid state modules.

G. Type 170 TSCA, Component Specification Model 204 Flasher Unit Module "modified."

Additional requirements for the Model 204 "modified" flasher unit module are:

- Each flasher unit module shall be rated at 15 amps or 20 amps.

G1: In addition, each flasher unit shall contain 2 replaceable "cube type" solid state modules.

H. Type 170 TSCA, Component Specification Model 210 Conflict Monitor "modified."

Additional requirements for the Model 210 "modified" conflict monitor are:

- Each conflict monitor shall have the ability to detect the following error conditions:
  - Simultaneous sensing of active yellow and green inputs on a channel.
  - Simultaneous sensing of active red and green inputs on a channel.
  - Simultaneous sensing of active yellow and red inputs on a channel.
  - Absence of a signal on a channel.
  - Simultaneous sensing of 2 or more active inputs for less than 750ms shall not cause the monitor to activate.
  - Simultaneous sensing of 2 or more active inputs for more than 1000ms shall cause the monitor to activate.

I. Type 170 TSCA, Component specification Model 222 "modified" - Category 1.

Additional requirements for the Model 222 "modified" vehicle detector are:

- Each detector unit shall sequentially energize its loop inputs to eliminate cross talk.

- Each channel shall retune and detect properly, immediately following reconnection of the broken (open) circuit. Previous "open" loop/lead-in connections shall be held in memory for recall and verification via a front panel "open loop test" switch.

- Each detector unit shall use the ΔL thresholding technique.

I1: Type 170 TSCA, Component specification Model 222 "modified" - Category 2:

All requirements apply except detector unit may or many not have a front panel "open loop test" switch for recall verification of previous "open" loop conditions.

J. Type 170 TSCA, Component Specification Model 224 Four Channel Vehicle Detector Unit "modified."

Additional requirements for the Model 224 "modified" vehicle detector are:

- Each detector unit shall sequentially energize its loop inputs to eliminate cross talk.

- Each channel shall retune and detect properly, immediately following reconnection of the broken (open) circuit. Previous "open" loop/lead-in connections shall be held in memory for recall and verification via a front panel "open loop test" switch.

- Each detector unit shall use the ΔL thresholding technique.

J1: Type 170 TSCA, component specification Model 222 "modified" - Category 2: All requirements apply except: detector unit may or may not have a front panel "open loop test" switch for recall and verification of previous "open" loop conditions.

K. Type 170 TSCA, component specification Model C422 or C424 - category 1 or 2: These detector units will be supplied when count loop detectors are called for on the Traffic Signal Construction Plans. The vehicle detector shall have communication capabilities via direct connection to a laptop computer or modem interface from the front panel of the detector to allow for the following functions:

- Read and send data from the communication device to the detector;

- View and change detector parameters via the communication device or switches on the detector board;

- View a currently active loop detector via communication device without disruption of operation to the controller;

- Use software utilities to test front panel indications, reset loop detectors, set communication parameters.

When more than 2 lane count detectors are called for on the signal print(s), contractor shall supply a four-channel loop detector for each direction. Two channel detectors shall be supplied for 2 loops or less per direction.

L. Type 170 TSCA, Component Specification Model 242 Two-Channel DC Isolator.

M. Type 170 TSCA, Component Specification Telemetry Unit.

1. Description:

The telemetry unit module 400 modem must have input/output connections as follows:

EDGE CONNECTOR

NAME	ORIGIN	PIN NO.	FUNCTION
DR (data receiver)	TELCO	2	Modulated data input to modem (4-wire only)
DRR (data receiver return)	TELCO	3	Return circuit for received data (4-wire only)
DX	TELCO/ MODEM	X	Modulated data input and output (2-wire) or modulated data output (4-wire)

DXR (data transmitted return)	TELCO/ MODEM	Y	Reference for DX
BA (received data)	MODEM	M	Demodulated digital data output to terminal
BB (received data)	MODEM	P	Demodulated digital data output to terminal
CA (request to send)	TERM	L	Signals the modem that the terminal wants to transmit
CB (clear to send)	MODEM	N	Flags the terminal that the modem is ready to transmit
CF (carrier detected)	MODEM	K	Flags the terminal that the modem is ready to transmit.
CF (carrier detected override)	USER	H or J	Allows the user to squelch
		Jumper Opt.	CF flag (regardless of the state of the CA signal) for 7.5=/-1 milliseconds
+12VDC	USER	C & D	Modem positive power source
-12VDC	USER	E & F	Modem negative power source
Ground, AA, BB	USER	A & B	Modem power and signal circuit common

2. Performance Specification:

Data Rate:
0-1200 baud. 1200 to 1800 baud requires user supplied conditioned lines.

Modulation:
Phase coherent FSK (frequency shift keying)

Data Format:
Asynchronous, serial.

Line interface:
Common carrier, 4 or 2-wire leased unconditioned line. For 1800-baud application use C-2 conditioned line, no distance restrictions. For unterminated dry “private wire” the maximum distance 10-20 miles depending on the line characteristics.

Line impedance:
600 ohms resistive. Others available as a factory option.

Receiver dynamic range:
+3 to –45 dBm minimum.

Carrier threshold:
-47 + / - 2 dBm at 25 degrees centigrade; maximum hysteresis is 3 dBm.

Receive frequencies:
Mark 1200 Hz, Space 220 Hz.

Receive frequency accuracy:
+ / -25 Hx for –40 dBm minimum.

Receiver performance:
Less than 15% peak jitter and 10% peak distortion at 1200-baud operation.

Transmit frequencies:
Mark 1200 Hz + / -1%, space 2200 Hz + / -1%

Transmit level:
0 dBm to –8 dBm minimum range, adjustable by potentiometer.

Data interface:
Meets EIA RS-232-C and CCITT V.24/.28 standards.

Indicators (LEDs):
Transmitted data, received data, carrier detect, request to send, clear to send.

Operating temperature:
-40 to +75 degrees centigrade.

Timing specifications:
CTS Timing: 12 + / -2mS, Rec. line signal director: 8 + / -2mS on/off, Carrier turnoff: 10 ms nominal.
Power requirements:
+12 VDC, 75mA maximum; -12 VDC, 75mA maximum; maximum noise ripple, 500 mV.

Mode selection:
(via PC board switches)
2-wire Half Duplex; 4-wire Full Duplex.

Connector:
Printed circuit board edge connector; two rows of 22 bifurcated contacts on 0.156 inch center (44 pins). Polarity keyed between pins C & D and pins H & J.

3. General Requirements:
   Qualified products list (QPL):

   a. A City of Scottsdale QPL has been established for traffic signal structures. See Appendix A. Qualified product contractors are not required to submit documentation for review by the city. All contractors wishing to submit bids for traffic structures that are not on the QPL must provide documentation for City review in advance of their bid submittal. Bids submitted without product documentation will be deemed non-responsive and WILL NOT BE OPENED.

      All contractors bidding traffic signal structures not on the City QPL are required to submit the following documentation for the city's review:

      - Traffic signal structure drawings.
      - Traffic signal structure specifications.

- Traffic signal structure load calculations signed and stamped (based on the maximum city loading).
- Documentation of all deviations from ADOT specifications.
- A letter signed and stamped by a registered professional engineer stating that the signal structure will safely support the maximum loading as described by the City.
- Recommended foundation designs and specifications for all traffic signal structures except the ADOT/Scottsdale traffic signal structures.

b. Traffic Signal Structures ADOT/Scottsdale
The base specification and warranty requirements for the ADOT/Scottsdale traffic signal structure shall be:

Arizona Department of Transportation, Standard Specification for Road and Bridge Construction: Current.

Arizona Department of Transportation, Traffic Signals and Lighting, Standard Drawings: Current.

3-211 TRAFFIC SIGNAL STRUCTURES

A. General

1. Definitions: A traffic signal structure is defined as a complete pole and mast arm assembly attached to a concrete foundation for the purpose of supporting traffic signals, street lights, and signs.

   The traffic signal structure shall as a minimum consist of the following parts:
   - pole shaft
   - signal mast arm
   - luminary mast arm (if required)
   - foundation anchor bolts plus hardware
   - mast arm pole connecting hardware
   - top cap hardware
   - pole hardware
   - concrete foundation and steel reinforcing (if required)
   - protective coating

2. General Requirements
   Qualified Products List (QPL):

   A City of Scottsdale Qualified Products List has been established for traffic signal structures. See Appendix A. Qualified product contractors are not required to submit documentation for review by the city. All contractors wishing to submit bids for traffic structures that are not on the Qualified Products List, must provide documentation for City review in advance of their bid submittal. Bids submitted without product documentation will be deemed non-responsive and WILL NOT BE OPENED.

   All contractors bidding traffic signal structures not on the City QPL are required to submit the following documentation for the City's review:
   - Traffic signal structure drawings
   - Traffic signal structure specifications
   - Traffic signal structure load calculations (based on the maximum city loading) signed and stamped

- Documentation of all deviations from ADOT specifications
- A letter signed and stamped by a registered professional engineer, stating that the signal structure will safely support the maximum loading as described by the city
- Recommended foundation designs and specifications for all traffic signal structures, except the ADOT/Scottsdale traffic signal structures

B. Traffic Signal Structures ADOT/Scottsdale
The base specification and warranty requirements for the ADOT/Scottsdale traffic signal structure shall be:

Arizona Department of Transportation, Standard Specification for Road and Bridge Construction: Current.

Arizona Department of Transportation, Traffic Signals and Lighting, Standard Drawings: Current.

3-212 TRAFFIC COUNTER COMPONENTS

A. General
1. Definition:
A traffic counter is defined as a complete, portable, microprocessor based system, to be used for the primary purpose of counting motor vehicles. There are two types of traffic counters--a Type 1 System and a Type II System. Each system is comprised of three major components:

- A field unit
- A set-up, monitor and data collection system
- Count data management software

2. General Requirements
Qualified Products List (QPL):
A City of Scottsdale Qualified Products List has been established for traffic counters (see Appendix A). Qualified product contractors are not required to provide equipment for testing.

3. Product Documentation:
The contractor shall include three sets of complete technical information, shop drawings, circuit diagrams, instruction manuals, and all other necessary documents to fully describe the field unit and the set-up, monitor and data collection system.

4. Product Training
The contractor shall provide complete instruction in the operation of the field units, the set-up, monitor and data collection system, and the count data management software. This training may be in person or on videotape.

5. Proprietary Parts:
When proprietary electrical parts are used, an additional ten (10) percent inventory of the proprietary parts are to be supplied as spare parts. In addition, the contractor shall supply ordering information for the proprietary parts.

6. Equipment Warranty:
   Each item furnished shall be warranted by the supplier against all defects in design, material, and workmanship for a period of 18 months following the acceptance by the City. This guarantee period shall be extended by the amount of time between the City's notice to the contractor of a defect in the equipment and the contractor's replacement or repair of said equipment and return of said equipment to the city.

7. Hardware:
   If a malfunction in any one or more of the field units, or the set-up, monitor and collection system, occurs during the warranty period, the supplier shall, within 72 hours after verbal notification (excluding Saturday, Sunday and Holidays) furnish a like component for city use while the warranted unit is being repaired. The isolation of any malfunction and repair and/or replacement of any device within the warranty period shall be the responsibility of the supplier. After the supplier has repaired and returned the operational equipment, the City will return the spare component. All costs incurred in warranty work, with the exception of city labor, is the responsibility of the contractor.

8. Software:
   If a malfunction in the software occurs, the supplier shall within seven calendar days after verbal notification correct the problem to the City's satisfaction.

   Note: Failure to comply with warranty requirements shall be sufficient ground to prohibit the contractor from bidding on future city contracts.

9. Software Updates:
   The supplier shall furnish, free of charge, all software updates to the city for a period of two years following the date of acceptance. After this time, the city requests that the contractor notify the city of updates.

10. Completeness:
    Each Type 1 and Type 2 traffic counter system field unit shall be complete and fully operational, with the exception of the in-road loops and tubes. All components needed for full operation shall be provided by the contractor. This is to include but not be limited to:

    - Memory packs, data modules, or other types of data storage cartridges
    - Batteries
    - Electrical cables and connectors

    Each Type 1 and Type 2 traffic counter system, set-up, monitor and data collection system shall be complete and fully operational. All hardware and software necessary to accurately and efficiently perform the specified operations shall be included.

B. Traffic Counter Type 1 System Field Unit Functional Specification:
   The purpose of the Type 1 system field unit is to count and classify motor vehicles by speed, length, type and gap using tube or loop type vehicle detectors. As a minimum, the Type 1 system field unit shall have the following:

   Vehicle detection: 2 air switches, 8 internal, inductive loop detectors

   Programmable recording intervals: 5 minute, 15 minute, 30 minute, 1 hr, 12 hrs, 24 hours

Maximum count rate: 10 counts per second, 100 vehicles per minute
9,999 vehicles per count period

Clock: 24 hour, real time, accurate to within 5 minutes per month

Calendar: Full year - month - day

Data transfer: Electronic

Housing: Aluminum or steel and weather resistant

Power: Battery(s)

C. Traffic Counter Type 2 Field Unit Functional Specification
The purpose of the Type 2 system field unit is to count motor vehicles using tube type vehicle detectors only. As a minimum, the Type 2 system field unit counter shall have the following:

Vehicle detection: 2 air switches

Programmable recording intervals: 5 minute, 15 minute, 30 minute, 1 hr, 12 hrs, 24 hours.

Maximum count rate: 10 counts per second, 100 vehicles per minute
9,999 vehicles per count period

Clock: 24 hour, real time, accurate to within 5 minutes per month.

Calendar: Full year - month - day.

Data transfer: Electronic

Housing: Aluminum or steel and weather resistant.

Power: Battery(s)

D. Traffic Counter Type 1 and Type 2 Systems Set-Up

1. Functional Specification

Minimum requirements:
The purpose of the setup, monitor and data collection system shall be to perform the following tasks:

a. Initialize and program into the field unit the count data collection parameters.

b. Verify that the field unit is operating properly.

c. Extract traffic counts from the field unit and transfer the data to a city printer or a city IBM PC/XT/AT compatible computer.

The set-up and monitor system may use any one of, or a combination of the following methods to accomplish the described tasks a and b:

1. The field unit's RS232 communications port and a (*) portable computer.

2. The field unit's keyboard and display or a programmer.

3. A data shortage module inserted into the field unit along with the field unit's keyboard and display.

The data collection system may use any one of, or a combination of the following methods to accomplish the described task c:

1. In the field, up-load the count data via the field unit's RS232 communications port to a (*) portable computer. In the office, data is transferred from the portable computer to a city printer or city computer.

2. In the field, up-load the count data from the field unit to a data storage module. In the office, the data is transferred from the data storage module via a field unit to a city computer.

3. In the field, up-load the count data from the field unit to a data storage module. In the office, the data is transferred from the data module via a communications interface device to a City computer.

*Note: If the contractor can only manipulate data in the field by method number 1, then the contractor shall supply a small rugged portable computer as part of the set-up, monitor and a data collection systems. The portable computer shall be constructed to withstand the potential of high impact and vibration associated with field use.

E. Traffic Counter Type 1 and Type 2 Systems Count Data Management Software

Minimum requirements:
The count data management software shall be designed to operate in conjunction with an IBM PC/XT/AT compatible computer system. The purpose of the program is to arrange the volume, speed, type, length, and gap data into meaningful formats, produce understandable reports, and store data files.

3-213 OPTICALLY ACTIVATED TRAFFIC SIGNAL PHASE SELECTION SYSTEM SPECIFICATIONS FOR AN EMERGENCY VEHICLE PRIORITY SYSTEM

A. System Description
The system employs optical communication to identify the presence of designated priority vehicles and cause the traffic signal controller to advance to and/or hold a desired traffic signal display selected from phases normally available. The matched set of components, which make up the system, will cause the existing traffic controller to be manipulated upon recognition of the signal from the vehicle. This communication is effective to the optical detectors at or near the intersection over a line-of-sight path of a minimum of 1,800 feet. The system shall require no action of the vehicle operator other than the operation of the "Emitter On" switch located in the vehicle. The switch is to remain "ON" until the end of the emergency run. The system shall operate on a first-come first-served basis or on selected priority basis. The system shall be designed to yield to other priority demands such as railroad, drawbridge, etc. The system shall interface with existing traffic signal controllers without compromising normal operation or existing safety provisions. The Priority control System shall consist of an optical emitter, optical detectors, optical detector cable, and phase selectors.

B. Matched System Components

To assure desired performance, the system, shall provide the synergy of four principle components, matched and proven through integrated testing and extensive functional experience. The matched component system shall offer compatibility with all types of traffic signal controllers, i.e., electro-mechanical, solid-state. Matched components provide future system compatibility of all priority control elements.

1. Optical Emitter (not part of signal design)
   Shall be a lightweight, weatherproof, light-emitting device with internal, regulated, power supply designed to produce high intensity optical energy, from a single source, precisely timed by a crystal controlled circuit.

2. Optical Detector
   Shall be a lightweight, weatherproof, adjustable, bi-directional optical detector assembly. Internal circuitry shall transform optical energy from the optical emitter assembly into electrical signals for delivery (up to 1,800 feet) via optical detector cable to the phase selection equipment.

3. Optical Detector Cable
   Shall be a durable, shielded, 3-conductor cable with a drain wire and the necessary electrical characteristics to carry power to the optical detector from the phase selector and to carry the optical detector signal to the phase selector.

4. Phase Selector
   This equipment shall interface between the optical detectors and the controller unit and provide the following functions while not compromising the existing fail-safe provisions.

   a. Sufficient power to all optical detectors required for the intersection.

   b. Suitable sensitivity to the optical detector signal via adjustable range potentiometers.

   c. Differentiation of signals by optical detectors from one or more emitters on a first-come, first-served basis.

   d. Outputs to signal the controller to cause selection of the desired phase green display for the approaching vehicle.

   e. Smooth transition to non-priority operation upon passage of the vehicle through the intersection.

   f. Various phase selector models that take advantage of the phase delivery capability of the variety of traffic controller types.

C. System Operation

1. Phase selection shall be activated by an optically transmitted signal of 14.035 or 9.639HZ from a single light source, or upon the actuation of a test switch or remote call signal to the phase selector.

2. The system shall cause the traffic controller to select from normally available green phases by activation of a combination of its inputs such as STOP TIME, MANUAL,

FORCE OFF, MANUAL CONTROL ENABLE, INTERVAL ADVANCE, PHASE OMIT, and VEHICLE DETECTOR;
or
by activating one of several discrete inputs that will cause the controller to execute one of its internal programmable priority phase selection plans.

3. The system shall not require modification or replacement of the existing traffic controller unit beyond adding the necessary system hardware.

4. The system shall provide adjustable timing capability to ensure adequate minimum traffic signal displays when priority control is active. The traffic engineer shall be able to establish the following within the limitations of the traffic controller unit and the timings stated in section IV.D of this specification:

   a. Minimum green times on non-designed greens.

   b. Minimum display times of pedestrian WALK and DON'T WALK.

5. The system shall provide for up to 3 optical detectors to be connected to each channel to accomplish the following:

   a. To provide adequate optical emitter detection range to allow sufficient time to deliver the desired traffic signal display in accordance with the minimum times required to terminate non-desired traffic signal displays.

   b. To provide continuous line-of-sight contact between the optical emitter and the optical detector units.

6. Abnormal sequence of traffic signal displays will not occur.

7. Transitions from green to red without an appropriate yellow change interval will not occur.

   The system shall cause the controller to deliver the desired traffic signal display even if the optical energy signals are interrupted before the desired display is obtained. This "commit to green" feature may be provided by the priority system or the traffic controller's software.

8. The system shall allow the traffic signal controller to resume normal timing operation after the desired signal display is obtained and optical signals have ceased for an appropriate period.

9. The system shall not attempt controller manipulation nor retain priority vehicle calls during periods of "Intersection Flash" operation.

D. System Component Specifications

1. Optical Emitter (not for signal design)

   a. The optical emitter shall include an optical energy emitting unit and emitter control.

   b. The optical emitter shall operate over an ambient temperature range of -30OF (-30OC) to up to +140OF (+60OC).

c. The optical energy emitting unit shall contain an internal, regulated power supply to convert 12VDC (positive or negative ground) vehicle battery power to high voltage required for the flashtube and meet the following electrical requirements:

- Operate at 10 to 15 volts DC.
- Have internal protection for sustained input voltage up to 25 volts DC.
- Deliver sufficient optical energy to activate the optical detector up to 1,800 feet (549m).
- Power consumption of less than 40 watts.
- The optical emitter shall weigh not more than 4.5 lbs. (9.9kg).
- The optical emitter shall produce precisely timed pulses of high intensity light from a single light source.
- The optical emitter shall be controlled by a single ON/OFF switch, which requires no warm-up, setting, or adjustments by the vehicle operator.
- The emitter shall produce crystal controlled optical energy pulses at a rate of 14.035+/-255HZ or 9.639+/-.199Hz.

2. Optical Detector

a. The optical detector shall be a lightweight, weatherproof device capable of sensing and transforming pulsed optical energy into electrical signals usable by the phase selection equipment.

b. The unit shall be high-impact polycarbonate construction with non-corrosive hardware.

c. The unit shall be designed for simple mounting at or near an intersection on mast arm, pedestal, pipe, or span wire.

d. The unit shall accept optical signals from two directions and provide a single electrical output signal.

e. The unit shall include a design feature to allow aiming of the two optical sensing inputs for skewed approaches or slight curves.

f. The unit shall have a built-in terminal strip to simplify wiring connections.

g. The unit shall receive power from the phase selector and be operational from 16 to 40 unregulated DC volts.

h. The unit shall be responsive to the optical emitter at a distance of 1,800 feet (549m).

i. The unit shall be capable of providing the necessary electrical signal to the phase selector through up to 1,000 feet (305m) of optical detector cable.

j. The unit shall employ a replaceable circuit board assembly and photocells to facilitate repair.

3. Optical Detector Cable

a. Optical system cable shall be tested and certified by the manufacturer of the priority system components that the cable meets or exceeds matched component system performance.

b. The cable must guarantee delivery of the necessary quality signal from the optical detector to the phase selector over a non-specified distance of 1,000 feet (305m).

c. The cable must guarantee sufficient power to the optical detector over a non-specified distance of 1,000 feet.

d. The cable must be of durable construction to satisfy the following installation methods:

- Direct burial
- conduit and mast arm pull
- Exposed overhead (supported by messenger wire)

e. The weight must not exceed .04 lbs./ft. (65.5 grams/meter).

f. The outside diameter shall not exceed 0.3 inches (7.62 mm).

g. The insulation rating must be 600 volts minimum.

h. The temperature rating must be 80° C minimum.

i. The cable shall have 3 conductors of AWG20 (7 x 28) stranded, individually tinned, copper color coded as follows:

- Orange for delivery of optical detector power (+)
- Blue for optical detector power return (-)
- Yellow for optical detector signal

j. The conductors will be shielded with aluminized polyester and have an AWG20 (7 x 28) stranded and individually tinned drain wire to provide signal integrity and transient protection.

k. The shield wrapping shall have a 20% overlap to ensure shield integrity following conduit and mast arm pulls.

4. Phase Selection Equipment

a. The priority control system manufacturer shall offer devices to assure interface electro mechanical controllers, solid-state controllers with or without internal priority control capability, and Type 170 controllers with internal priority control software.

b. Phase selector for use with Type 170 traffic controllers:

1) Shall be a plug-in, two channel, dual priority device intended to be installed directly into the input file of Type 170 controllers equipped with priority phase selection software.

2) Shall be powered from AC mains and contain an internal, regulated power supply to power optical detectors.

3) Shall be capable of recognizing the following pulse rates as delivered by the optical detectors:

   - 9.639+/-.119Hz as Frequency I
   - 14.035+/-.255Hz as Frequency II

4) Primary optical detector inputs and power outputs shall be on the card edge. Two additional detector inputs, per channel, shall be provided via a front panel connector.

5) An opto-isolated output shall provide the following signals to the card edge:

   - 6.25+/-.02Hz pulse in response to a low frequency signal
   - A "Steady-On" in response to a high frequency signal

6) Shall utilize crystal controlled timing and optical pulse rate recognition circuitry to assure:

   - Accurate optical signal recognition (dual frequencies)
   - Synchronous logic
   - Precise output pulse
   - Accurate call drop-out time

7) Shall have six recessed range control per channel, three per frequency, to independently adjust optical sensitivity.

8) Shall have a solid-state "Power-On" indicator.

9) Shall have a "Frequency I" and "Frequency II" solid-state indicator for each channel which performs as follows:

- Flashing during call validation
- Be steady-on when processing a valid call and during test switch operation

10) Shall have a test switch for each channel to deliver Frequency I or Frequency II signal pulse rate to verify proper function at both optical emitter flash rates, first-come, first-served operation, and Frequency II override capability.

11) Shall have a selectable call dropout time of 5 seconds (10 seconds optional) -0 to +2.5%.

12) Shall properly identify a Frequency II demand with any combination of up to 10 high and low priority emitter signals being received simultaneously and asynchronously on either channel.

13) Shall not exceed the following dimensions:

- Length (including handle) 7.91 inches (200.7mm)
- Width 1.11 inches (29.18mm
- Height 4.50 inches (114.3mm)

E. Reliability

1. All equipment supplied as part of the optical priority remote traffic control system intended for use in the controller cabinet shall meet the electrical and environmental specifications spelled out in the NEMA Standards Publication TSI - 1983, Part 2:

   a. Line voltage variations per NEMA TS1 - 2.1.2

   b. Power source frequency per NEMA TS1 -2.1.3

   c. Primary power interruptions per NEMA TS1 - 2.1.04.A.1

   d. Power source noise transients per NEMA TS1 - 2.1.6.1

   e. Power source high energy transients per NEMA TS1 - 2.1.6.2

   f. Non-destruct transient immunity per NEMA TS1 - 2.1.8

   g. Input-Output immunity per NEMA TS1 - 2.1.7

   h. Temperature range per NEMA TS1 - 2.1.5.1

   i. Humidity per NEMA TS1 - 2.1.5.2

   j. Shock test per NEMA TS1 - 2.1.13

   k. Vibration per NEMA TS1 - 2.1.12

2. All equipment supplied as part of the priority control system intended for use in or on emergency vehicles shall operate properly under any combination of the following environmental Conditions.

   a. Temperature range: -30° F (-34° C) to + 140° F (+60° C)

   b. Relative Humidity: 0 to 95%

   c. Vehicle battery voltage: 10 to 15 volts

F. Manufacturer's Responsibilities

1. The manufacturer and/or the manufacturer's representative shall provide quality service before, during, and after installation of the priority control system. The manufacturer and/or the manufacturer's representative as consultants to the installer must provide certified trained technicians having traffic systems industry experience and operational knowledge of priority control systems.

2. Prior to bid/quote activity, the manufacturer or its authorized representative shall be required to conduct field surveys of intersection control equipment or review design

documentation to determine the most appropriate phase selection device for each location and to recommend locations for installing optical detectors.

3. After an award, the manufacturer or its authorized representative shall be responsible for system documentation including the following:

   a. Acquire all relevant controller information.

   b. Determine the number of vehicle phases (greens).

   c. Determine the desired greens for priority approaches.

   d. Determine ring configuration of each controller.

   e. Establish pedestrian phase timing requirements.

   f. Establish minimum green times for non-priority phases.

   g. Establish the manipulation method of each controller type.

   h. Supply interface information to installer.

   i. Assist in system checkout prior to purchaser's acceptance by:

      - Verifying proper installation per recommended interfaces
      - Verifying that optical ranges are properly set
      - Verifying that phase selector timings or controller software timings are properly set

      System checkout requirements when using the plug-in version of phase selector must include verification that when two plug-in units are used, the controller must recognize high frequency over low frequency and first-come, first served. All possible conditions of priority control must be considered. This may require software and/or hardware changes in the traffic controller. Software and programming of these controllers is the responsibility of the purchasing/using agency.

   j. Instruct emergency vehicle operators or their representatives in the operation of the system. Instruction shall include introductory training, periodic training updates, and a leave-behind audio visual self-instruction course for on-going training.

   k. Instruct maintenance personnel in routine maintenance of the system.

G. Warranty and Certificate of Insurance

1. Manufacturer shall warrant that, provided the priority control system has been properly installed, operated and maintained, component parts of a matched component system that prove to be defective in workmanship and/or material during the first ten (10) years from date of shipment from manufacturer, shall be covered in a documented system protection plan.

   Guaranteed warranty substantiates the manufacturer's financial ability to process warranty claims. This guarantee shall be determined in reference to the

manufacturer's business assets and financial experience over the preceding five (5) business years.

2. In addition, upon request, the manufacturer shall provide documentation proving ability to financially support the ten (10) year provisions of the warranty. Documentation shall include appropriate financial reports for the previous five (5) business years.

3. The protection plan shall warrant that component parts, of a matched component system, that prove to be defective in workmanship and/or material during the first five (5) years from date of shipment from manufacturer will be repaired at no charge and that extended coverage with a fixed repair deductible will be available for an additional five (5) years.

4. In total, the warranty coverage must assure ten year operational reliability and interface compatibility with future components designed for the system.

5. A copy of the manufacturer’s warranty outlining the conditions stated above shall be supplied with bid.

6. Certificate of Insurance
   The manufacturer shall provide a certificate of insurance protection for $5,000,000. This certificate assures the priority control user that the manufacturer is insured against civil damages if proven to be at fault for an accident due to equipment failure within the system of matched priority control components. This certificate, however, need not, and is not meant to, provide liability insurance protection to the priority control system user.

7. The manufacturer of the priority control system shall certify that all component products are designed, manufactured, and tested as a system of matched components and will meet or exceed the requirements of this specification.

APPENDIX A
Scottsdale Transportation Systems Department, Operations Division (STSDOD)
November 1999

QUALIFIED PRODUCTS LIST:

Type 170 System Cabinet:
Model 330 Cabinet
Safetran Traffic Systems, Inc.
McCain Traffic Supply

Model 412 Program Module:
Safetran Model 412B
Dynatrol Model 412B
Safetran Model 412B2

Type 170 Controller Units:

Safetran Traffic systems, Inc.	170SV
Dynatrol	170E
Topping	170E
McCain	170E

Telemetry Units:
General Devices, Inc. (G.D.I.), Model 400 modem, Rev. E

Type 170 Controller Unit Software:

Wapiti Micro Systems Corp.	W4IKS, current Rev.
Wapiti Micro Systems Corp.	Traffic View, current Rev.

Model 200 Load Switch – Category 1:
PDC – SSS-87
Solid State Device 200K

Model 200 Load Switch – Category 2:
PDC – SSS-88
Solid State Device 200D

Model 204 Flashers – Category 1:
PDC – SSF-87
Solid State Devices 204K

Model 204 Flashers – Category 2:
PDC – SSF-88-X
Solid State Devices 204D

Model 210 Conflict Monitor:
Solid State Devices Model 210P
Solid State Devices Model 210PC
Eberle Design, Inc., Model 210E

APPENDIX A (Continued)
Scottsdale Transportation Systems Department, Operations Division (STSDOD)
November 1999

Model 222 Detectors – Category 1:
3M Canoga Model P422T
Detector Systems Model 222D
3M Canoga Model C422 or C424

Model 222 Detectors – Category 2:
Detector Systems Model 222B
Indicator Control Corp., Part #3DLD827B
3M Canoga Model C422 or C424

Model 242 Two Channel DC Isolators:
General Devices & Instruments Model 242
PDC Model 242
Detector Systems

Model 252 Two-Channel AC Isolators:
PDC Model ACI-88
Detector Systems

Model 430 Relays:
Magnecraft Model W21 ACPX-2
Midtex 136-62T3A1
Traconex Model W21 ACPX-2

Model 721 Optical Detector:
Indicator Controls Corporation
3-M Safety and Security System Division

Model 752 Phase Selector:
Indicator Controls Corporation
3-M Safety and Security System Division

Model 196 High Priority Emitter Assembly:
Model 292 H Indicator Controls Corporation
3-M Safety and Security System Division

Model 195 Low Priority Emitter Assembly:
Model 292 L Indicator controls Corp.
3-M Safety and Security System Division

Model 138 Optical Detector Cable:
Indicator Controls Corporation
3M Safety and Security System Division

LED Signal Indications
Dialight model 430-1315-001 or approved equivalent with temperature compensation and power correction

APPENDIX A (Continued)
Scottsdale Transportation Systems Department, Operations Division (STSDOD)
November 1999

The effective period this QPL is indeterminate. Manufacturers are required to notify the 170 Program Coordinator of any proposed changes affecting design or performance in the product that has been approved. This includes all components listed in manuals and all engineering changes.

Manufacturers not on the list who want their assemblies or units tested so as to be added to the QPL for future bids should submit a written request to the 170 Program Coordinator*.

Failure to perform satisfactorily on purchase orders by failing to meet delivery schedules or maintain a high rate of acceptance will result in being removed from the QPL.

*170 Program Coordinator:
Dan Edwards
(602) 391-5673 (5637)
email: dedwards@ci.scottsdale.az.us

City of Scottsdale
Municipal Services Department
9191 E. San Salvador
Scottsdale, AZ 85258

Traffic Signal Structures:
ADOT/Scottsdale

Valmont Industries, Inc.	Drawing #DB00181, no Rev.
Valmont Industries, Inc.	Drawing #DB00182, no Rev.

Couplet "Trombone" Type Pole

Valmount Industries, Inc.	Drawing #DB00243,

(Or Ameron Pipe - #505, Revision B – verify)

APPENDIX B
CAL-TRANS
April 1996

QUALIFIED PRODUCTS LIST:

Controller Assemblies for the Model 170 Traffic controller

The assemblies listed below have been tested by the California Transportation Laboratory and found to be compliant to the "Traffic signal Control Equipment Specifications" (TSCES), dated April 1978, and applicable addendum.

When these assemblies are to be purchased, only those listed below will be considered.

QUALIFIER TO QUALIFIED PRODUCTS LIST (QPL):

A manufacturer's listing on the QPL does not waive any of the requirements of the specifications or relieve the manufacturer/contractor of any obligation thereunder. Defective work, materials, and equipment will be rejected.

In short, all equipment submitted must comply to current specifications.

MODEL 232 DUAL MAGNETIC DETECTOR SENSOR UNIT
- Safetran

MODEL 242 TWO-CHANNEL DC ISOLATORS
- Detector Systems
- General Devices, Inc. (GDI) – DIM 242
- PDC – DCI-82
- Traffic Sensor (TSC)

MODEL 252 TWO-CHANNEL AC ISOLATORS
- General Devices, Inc. (GDI) – 252CA
- PDC – ACI-88
- Traffic Sensor (TSC)

Model 332A CABINETS
- McCain Traffic Supply
- Peek Traffic/Signal Control Company
- Safetran Traffic Systems, Inc.
- Traffic Sensor (TSC)

MODEL 334C CABINETS
- McCain Traffic Supply
- Peek Traffic/Signal Control Company
- Safetran Traffic Systems, Inc.
- Intersection Development Corporation

MODEL 400 MODEMS
- General Devices, Inc. (GDI), Rev. E
- General Devices, Inc. (GDI), Rev. F
- PDC
- Sonex

APPENDIX B (Continued)
CAL-TRANS
April 1996

MODEL 412 PROGRAM MODULE
- Automatic/Eagle Signal – 412C
- Dynamic Traffic Systems (Dynatrol) – 412C
- McCain Traffic supply – 412C
- Peek Traffic/Signal Control Company – 412C
- Safetran Traffic Systems, Inc. – 412C
- Topping Electronics, Inc. – 412C

PDA2 (POWER DISTRIBUTION ASSEMBLY)
- McCain Traffic Supply
- Peek Traffic/Signal Control Company
- Safetran Traffic Systems, Inc.
- Traffic Sensor (TSC)
- Intersection Development Corporation

PDA3 (POWER DISTRIBUTION ASSEMBLY)
- McCain Traffic Supply
- Peek Traffic/Signal Control Company
- Safetran Traffic Systems, Inc.

The effective period of this QPL is indeterminate. Manufacturers are required to notify the 170 Program Coordinator of any proposed changes affecting design or performance in the product that has been approved. THIS INCLUDES ALL COMPONENTS LISTED IN MANUALS AND ALL ENGINEERING CHANGES.

Manufacturers, not on the list, who want their assemblies or units tested so as to be added to the QPL for future bids should submit a written request to the 170 Program Coordinator.

Failure to perform satisfactorily on purchase orders by failing to meet delivery schedules or maintain a high rate of acceptance will result in removal from the QPL.

ROBERT MCMILLAN
170 Controller Program Coordinator
(916) 654-4385
Calnet 646-4385
FAX: (916) 653-3053
Calnet FAX: 800-453-3053

DEPARTMENT OF TRANSPORTATION
Division of Traffic Operations
1120 N. Street
Sacramento, CA 95814

Section 3.3

Transit

Design Standards and Policies Manual
Revised December 1999

Chapter 3
Transportation

SECTION 3.3
TRANSIT

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
3-301	Introduction A. Purpose B. Applicability C. Goals	1
3-302	Criteria For Bus Stop Locations A. Bus Stop Specifications B. Accessibility	2
3-303	Transit Amenities A. Benches B. Shelters C. Other	3
3-304	Bus Bays (Pullouts)	4
3-305	Park and Ride Lots	4
3-306	Major Transit Centers	4
3-307	Landscaping	5
3-308	Signage	5
3-309	Bus Stop Maintenance	6
3-310	Submittal Requirements and Review Procedures	7

SECTION 3.3
TRANSIT

3-301 INTRODUCTION

A. PURPOSE

This section documents transit facility guidelines for Scottsdale's public works projects and for developers working on projects that will impact the transit system. This includes projects that create high-activity centers such as shopping malls or high-density living areas.

Criteria are documented for locating bus stops and transit amenities such as bus benches and transit shelters. It includes street geometrics for bus bays, standard signage and review and submittal requirements. There is also a brief discussion on landscaping as it relates to transit amenities.

The guidelines consider the needs of the transit user, the bus operator, neighbors adjacent to bus stops and the general public.

B. APPLICABILITY

The information presented in this document is intended for use by engineers, developers, and City staff.

These guidelines are generalizations applicable to most situations. They are not intended as detailed engineering solutions; each site will have its own unique set of needs. Rather, transit-related design solutions may need to be adjusted to fit specific sites and applicable codes.

Developers are responsible for obtaining all city approval and permits necessary to complete the transit improvements.

C. GOALS

The goal of these guidelines is to provide a clean, safe, comfortable and convenient environment for users of Scottsdale's transit system, and to provide developers a framework in which transit amenities are stipulated for new projects.

All transit improvements will be designed to meet the regulations set forth by the Americans with Disabilities Act (ADA).

3-302 CRITERIA FOR BUS STOP LOCATIONS

A. BUS STOP SPECIFICATIONS (See Section 3-304 for Bus Bay Descriptions.)
Frequency of bus stops is dictated by the degree to which bus patrons are willing to walk to board a bus. The minimum standard for bus stop locations in Scottsdale is at quarter mile intervals for residential areas and one-eighth mile intervals for major activity centers.

In order to provide the greatest convenience and safety for passengers, bus stops are generally located as close to intersections as possible. This minimizes walking distance for transferring passengers and encourages the use of crosswalks. Far side stops, those located immediately past an intersection, are optimal for the following reasons:

- Minimal interference with traffic flow
- Minimal interference with intersection sight distance
- Less likelihood of passengers crossing in front of a bus
- Less conflict for automobile right turns
- Less obstruction for vehicles entering the intersection from a side street
- More effective re-entry for bus into the traffic stream

Near-side bus stops (those stops located immediately before an intersection) are considered when placement of far-side stops is not feasible or when that stop will be located near buildings with high volumes of transit riders. These types of stops may also be located where a high-volume bus transfer location would otherwise require a pedestrian crossing at a busy street.

On occasion a mid-block bus stop may be utilized to provide access to a major generator, but it is generally discouraged due to the likelihood that pedestrians would cross streets mid-block rather than at an intersection.

The location of a transit stop is generally 85 feet, plus or minus 25 feet from the curb of an unsignalized intersection and 120 feet plus or minus 25 feet from a signalized intersection. The paved loading area should be clear of any obstructions. (Figure 3.3-1 - 3.3-3)

Where a development or subdivision is walled-off from the street, steps should be taken to allow easy pedestrian access. This could include a pedestrian access path linking various sections of the development to the bus stop or a system of offset walls around developments, which allow pedestrian passage.

All transit stop furniture must be placed outside the standard five-foot sidewalk. A minimum three foot clearance is required between transit components and fire hydrants, switch boxes, mail boxes, etc.

B. ACCESSIBILITY
All transit facilities must comply with the applicable provisions of the Americans with Disabilities Act. In general, a 36” clearance is to be maintained between bus stop components to allow for maneuvering by wheelchairs. A minimum clear length of 96 inches (measured from the curb or roadway edge) and a minimum clear width of 60 inches (measured parallel to the roadway) shall be provided at all transit locations where a sidewalk is available. (Figures 3.3-4)

(See Figures 3.3-5 thru 3.3-8, MAG Standard Details 230 & 231, and City of Scottsdale Standard Details 2232 for related issues.)

3-303 TRANSIT AMENITIES

Comfortable and secure passenger waiting areas should be provided at as many bus stops as feasible. The waiting areas may include a varying range of improvements depending upon ridership and specific site needs. Below are typical transit amenities and conditions under which they should be employed.

Advertising and placards are not allowed by city ordinance.

A. BENCHES

Benches should be located at all bus stops.

Several styles of benches have been approved for placement in Scottsdale. Specialty benches are used in downtown Scottsdale. (See City of Scottsdale Standard Detail 2268 for slab requirements.) A plastic-coated blue bench with matching trash receptacle is used in all other areas except for those bus stops affected by the Environmentally Sensitive Land Ordinance (ESLO). Transit amenities located within ESLO boundaries (Figure 3.3-9) must conform to its guidelines. Additional styles may be acceptable and need city staff approval.

B. SHELTERS

Shelters should be located at all bus stops. In a development, any requirement for bus shelters may be waived if adequate exterior shading and architectural shelter is provided by the developer.

Shelters should be arranged with considerations to the sun's angles. Coverage should allow for maximum shade during the peak use hours of the summer morning and afternoon. The shelter should be oriented, however, to allow the bus driver clear visibility of the passenger and to allow passengers a view of oncoming traffic.

Scottsdale has a standard shelter design; developers and other interested parties should contact the Transportation Planning Division of the City of Scottsdale Transportation Department for copies of these plans. (See also Figure 3.3-10 for general layout and City of Scottsdale Standard Detail 2268-2269 for related issues.) Other shelter designs may be used provided it is approved by the City and the Development Review Board. Shelter designs must meet the following criteria:

- Minimum canopy of 65 square feet with a minimum width of 5.5 feet
- Minimum 7 feet clearance between underside of roof and sidewalk surface
- Shelter canopy will be waterproof with provisions for drainage away from transit users
- Seating areas will be shaded
- Provide security for transit passengers
- Have a minimum 6 inches vertical clearance from the sidewalk to avoid collection of trash and debris
- Fixed components to prevent unauthorized removal
- Materials will allow for air circulation and avoid containment of hot air
- Materials must be finished to prevent overheating
- Canopy materials that collect and radiate head will be insulated.
- Materials, coatings and surfaces will be graffiti resistant
- Components of the shelter will be readily replaceable
- Colors respond to the architectural character of the development and the transit system (Per review and approval of Development Review Board)
- Minimum two foot clearance between roof canopy and face of curb

C. OTHER

- Trash receptacle with a minimum capacity of 30 gallons
- Minimum of 6 linear feet of seating located under the shelter canopy
- Transit information holder will be placed in a well-lit portion of the shelter
- Bus stop graphics per City requirements
- Minimum two bike loops (Refer to Section 3.4 Bikeways and City of Scottsdale Standard Detail 2285)

3-304 BUS BAYS (PULLOUTS)

Bus bays enable buses to pull completely out of the traffic lane while loading and unloading passengers. Bus bays are recommended under the following conditions:

- At or near transfer points
- Along arterial streets
- At locations recommended by the City's Traffic Engineering staff
- At layovers at the end or along bus routes
- When average peak period boardings exceed 5 people per bus or
- When average peak period dwell time exceeds 30 seconds per bus or
- When there have been 5 accidents involving buses within the past year
- At locations where wheelchair boardings are likely

Two types of bus bays are allowed: open-ended and closed. Generally, open-ended bays are used on far-side stops where space is limited. Closed bus bays are the preferred option. (See Figure 3.3-11 for generalized dimensions and City of Scottsdale Standard Details 2266-1, 2266-2, and 2267 for specific dimensions.)

3-305 PARK AND RIDE LOTS

Park-and-ride lots provide free automobile parking and allow patrons convenient access to public transit. These facilities may be combined with transit centers or major transfer centers. They are also found at shopping malls and near large employment centers.

The purpose of park-and-ride lots is to intercept automobile trips close to their origin and to transfer patrons to buses for the remaining portion of the trip.

Park-and-ride lots should be located in conformance with the Circulation Element of Scottsdale's General Plan. Additionally, these lots should be located at express bus route stops at major activity centers.

3-306 MAJOR TRANSIT CENTERS

Two types of major transit centers are described below.

The first type is a Transfer Center where several bus routes converge. These facilities provide a convenient location for bus passengers to transfer between routes. They also typically provide direct pedestrian access to major activity centers.

Transfer centers include permanent facilities with a high level of transit amenities such as shelters, bike lockers, drinking fountains and information kiosks. They may be constructed off-street to include a bus turn-around loop, or on-street where major transfer activity occurs between intersecting or converging bus routes.

Criteria for locating major transfer centers are:

- Where regional and local bus routes intersect or
- At transfer points between two or more regional bus routes
- Near crossings of major arterial streets
- Adjacent to or in major activity centers

Transfer centers may also be combined with Park and Ride lots. The size of transfer center will vary depending on the anticipated needs, but are typically a minimum of 1.5 acres and accommodate at least 45 parking spaces if combined with a Park and Ride lot.

Another type of transit center is a telecommute center. Telecommute centers provide office space for commuters who can and wish to work closer to their homes. Typically office, meeting, and kitchen space is provided in addition to showers, parking, bike lockers, etc. Telecommute centers may be combined with other types of transit centers.

The Scottsdale Transit Plan has proposed several locations for both transit centers and park-and-ride lots (Figure 3.3-12).

3-307 LANDSCAPING

Landscaping may replace (with City staff approval) a requirement for a passenger waiting shelter. Shade trees and other protective landscaping should be provided wherever possible. This landscaping could be considered part of the development's frontage landscape and could count towards any landscaping requirements, which may apply. Considerations for selection and location of landscaping include:

- Trees should be mature and have an adequate canopy to shade the seating area
- Low-water consumption trees and shrubs should be used
- Tree location should consider the solar orientation of the transit stop. Priority should be given to shading afternoon summer sun
- Transit landscaping should be compatible with other frontage landscaping

All landscaping shall be carefully located so as not to obstruct the visibility of either the transit user or the bus operator. The developer/property owner shall be responsible for the maintenance of landscaping at bus stops. City staff has available landscape shelter specifications that are not included in this document. Copies are available.

3-308 SIGNAGE

A. BUS STOP SIGNS

The placement of bus stop signs is an important passenger convenience, operations and marketing tool for transit systems. Bus stop signs are positioned to notify passengers that the bus will stop at that specific location. They serve as a reference for bus operators and as a point of identity for the transit system.

The bus stop sign is generally not a traffic sign (except as noted below) since it is not displayed to regulate or warn motorists.

A regional bus stop sign is currently in use throughout the Valley (Figure 3.3-13). The sign is 18" wide by 24" high, reflectorized for night time visibility and is double-faced so that it can be seen from both directions. The upstream side of the sign contains "No Parking" information for motorists approaching the bus stop.

The standard regional sign identifies a location as a bus stop and includes the name and number of the bus route(s) being served and the transit information telephone number.

B. SIGN PLACEMENT

Bus stop signs must be placed at the location where people board at the front door of the bus. In cases where the bus stop sign is incorporated into the design of a transit shelter, the need for a separate sign may be eliminated.

Ideally, bus stop signs should be placed independently of all other signs to maintain the importance of the bus stop identity. It should be installed with its own sign post although non-wood light poles may be used if it is at the proper stop location and if the sign face is visible from both sides. Signs are not to be placed on wood poles as it poses a hazard to linemen who climb the poles.

Bus stop signs should be installed on sign posts or metal poles so that the sign is "flagged". In other words, the sign should be attached to the post by its edge. This allows both sides of the sign to be viewed without obstruction. The bottom of the sign should be seven feet above ground level, at least two feet from the curb face and away from obstructions such as landscaping or other signs. The standard regional sign has been designed so that it may be mounted by its edge to a two-inch post without obscuring the backside message. Where metal street light poles are at the proper location but too close to the curb, the signs may be flagged away from the street. (Figure 3.3-14)

Usually, the City will be responsible for the installation of bus stop signs.

3-309 BUS STOP MAINTENANCE

Well-maintained bus stops are crucial to the image of the transit system. Damaged furniture and trash build-up should be tended immediately to create a positive impression for transit patrons and the general public.

Regular maintenance should include:

- Full wash down of shelter and accessories
- Removal of all dirt, graffiti, and pasted material
- Squeegee wipe down of glass surfaces
- Removal and replacement of trash bag
- Litter pick up around stop or shelter/accessories to a distance of ten feet
- Manual or chemical removal of weeds
- Pruning of obstructing tree growth
- Touch up of paint scratches

Repair of items that pose a safety problem should be performed within twenty-four hours. Repairs that do not pose safety problems should be completed within three days.

3-310 SUBMITTAL REQUIREMENTS AND REVIEW PROCEDURES

The following facilities must be delineated on all site plans or the preliminary plat submitted to the City:

- Major transfer centers
- Bus stops
- Park-and-ride lots
- Bus bays
- Shelters
- Bus benches

The design and location of the above mentioned facilities must be approved by Transit staff during the project review process.

Developers may deposit funds in lieu of construction and installation of stipulated transit amenities. The amounts of funds to be deposited are determined during the project review process and are in force upon City Council approval of the project. Fees are to be paid at the One-Stop Shop, 7447 East Indian School Road, in Bus Shelter Deposit Account #2151-24130-12151 when other permit fees are paid.

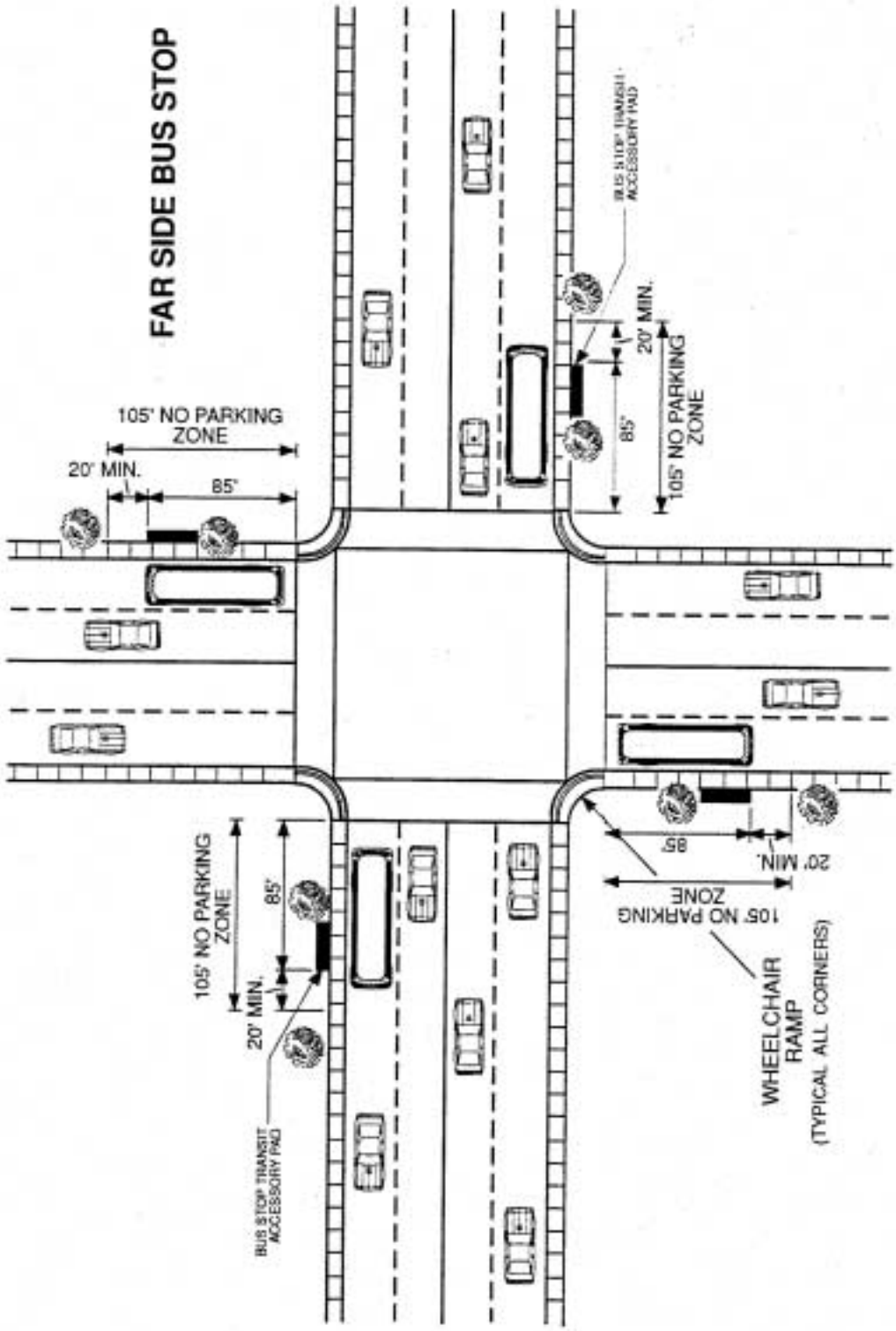


FIGURE 3.3-1

Standard Bus Stop Location

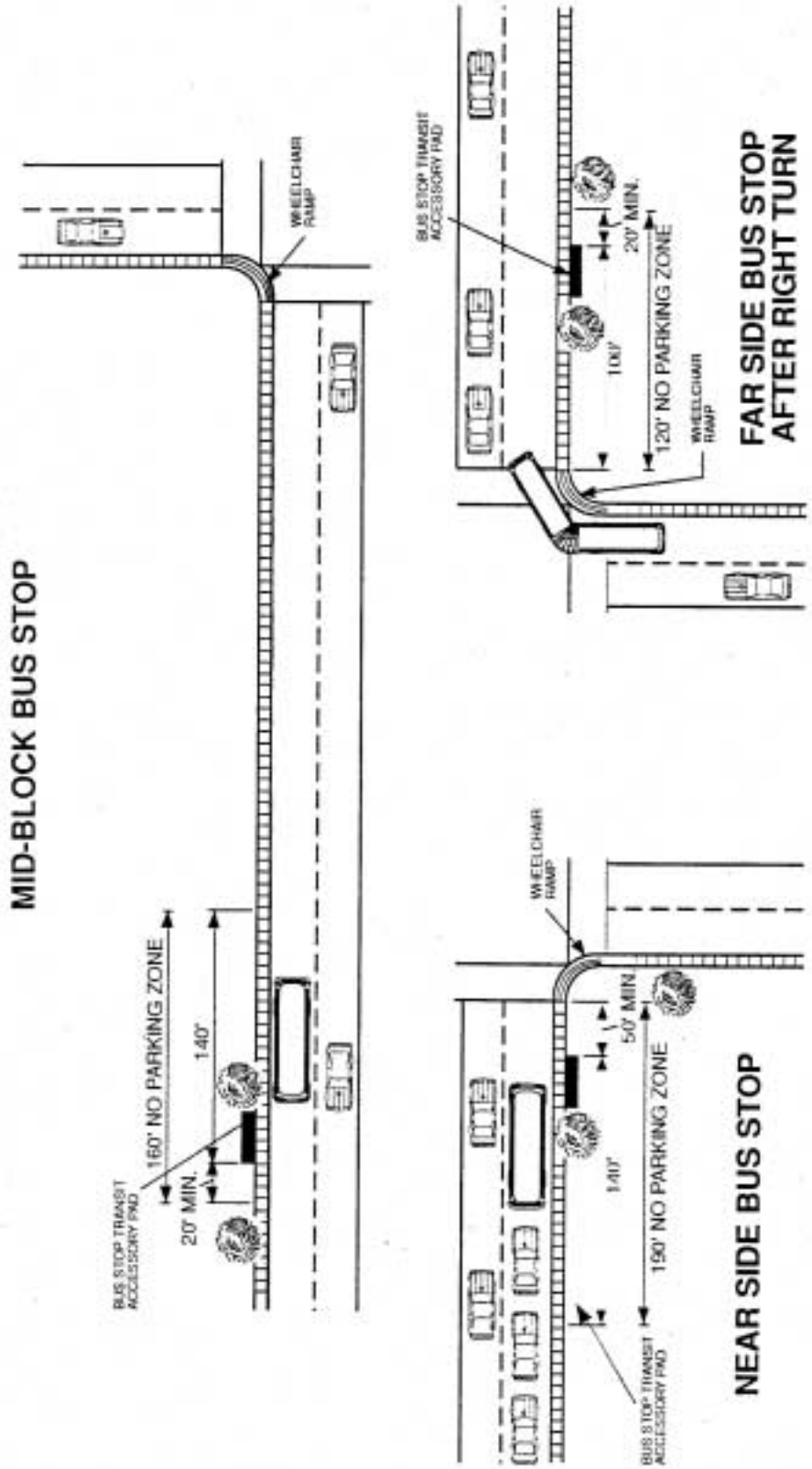


FIGURE 3.3-2

Special Condition Bus Stop Locations

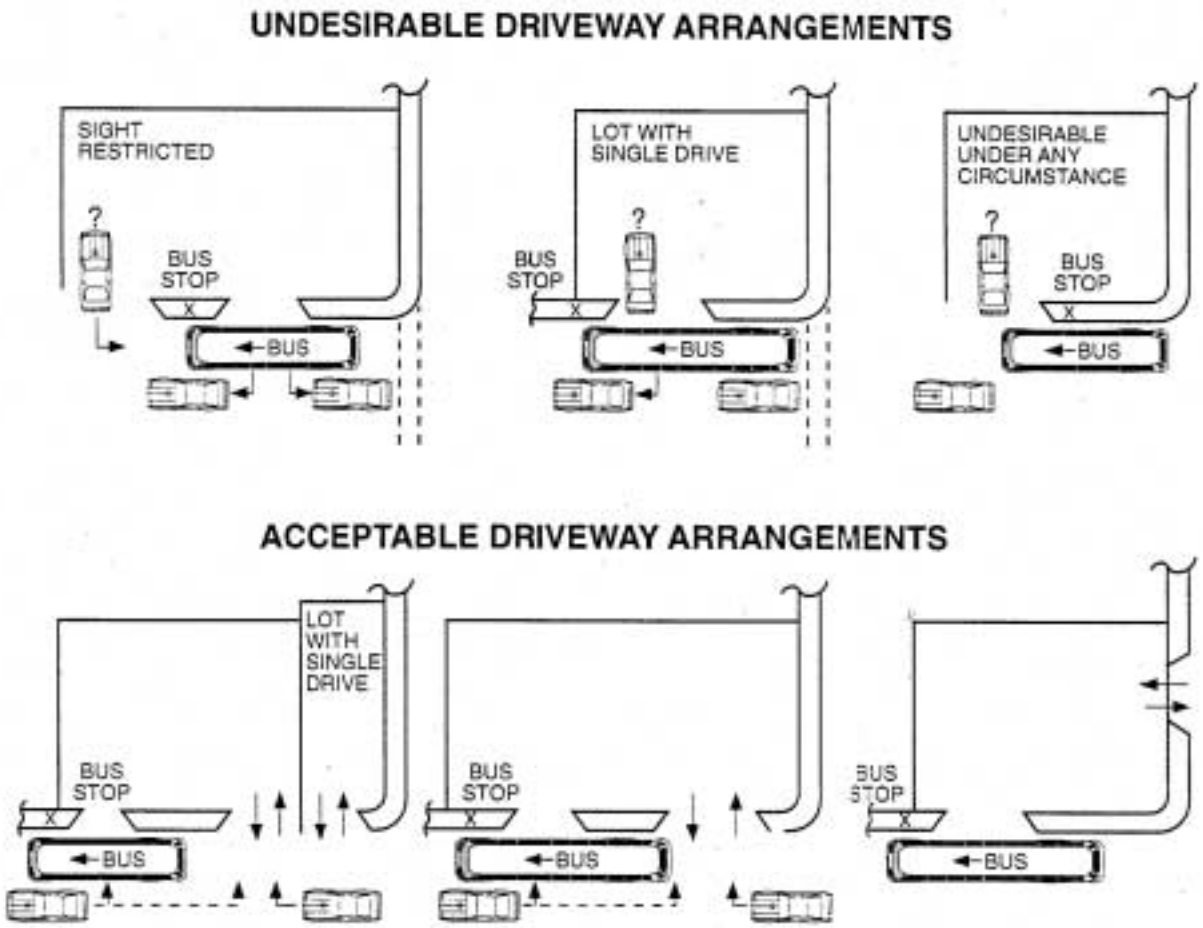


FIGURE 3.3-3

Driveway Locations near Bus Stop

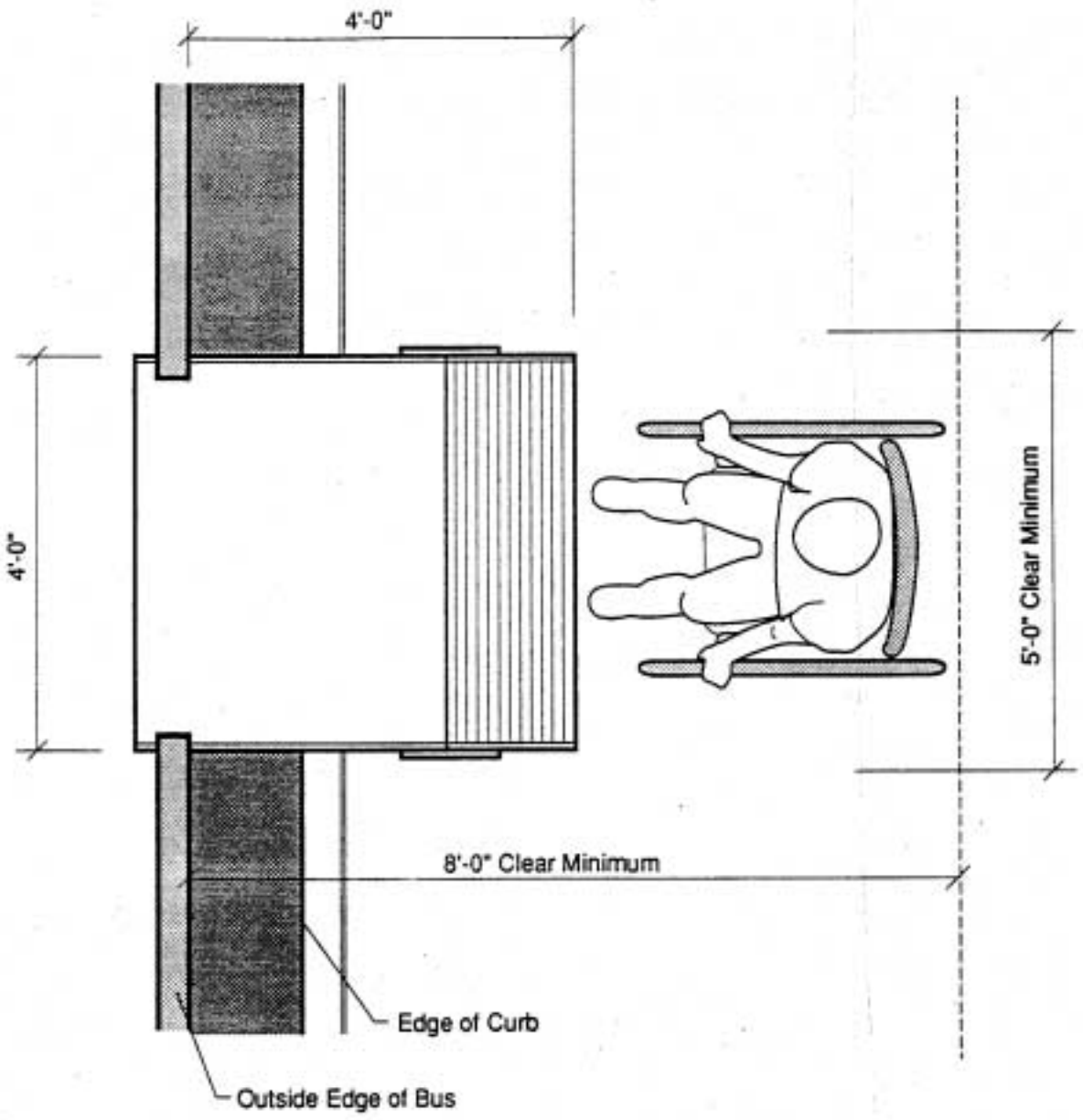


FIGURE 3.3-4

Wheelchair Lift Dimensions

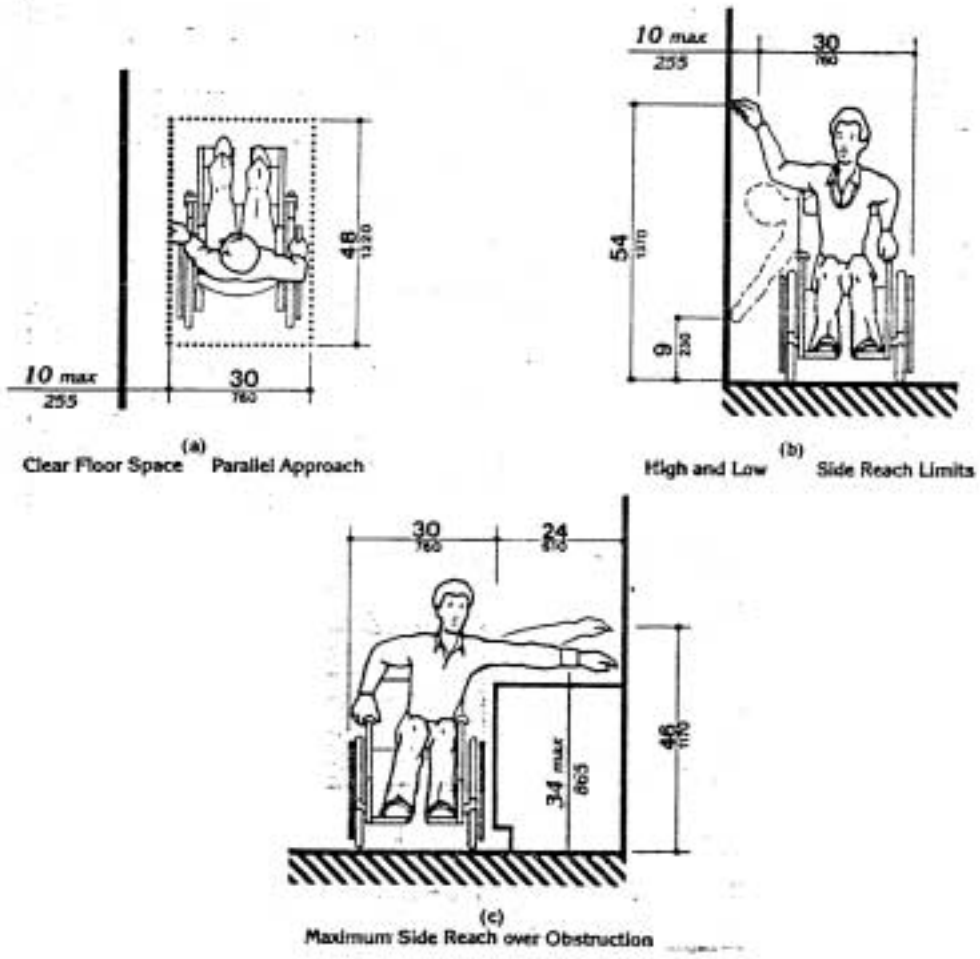


FIGURE 3.3-5

Wheelchair Accessible Routes Dimensions
(Page 1 of 2)

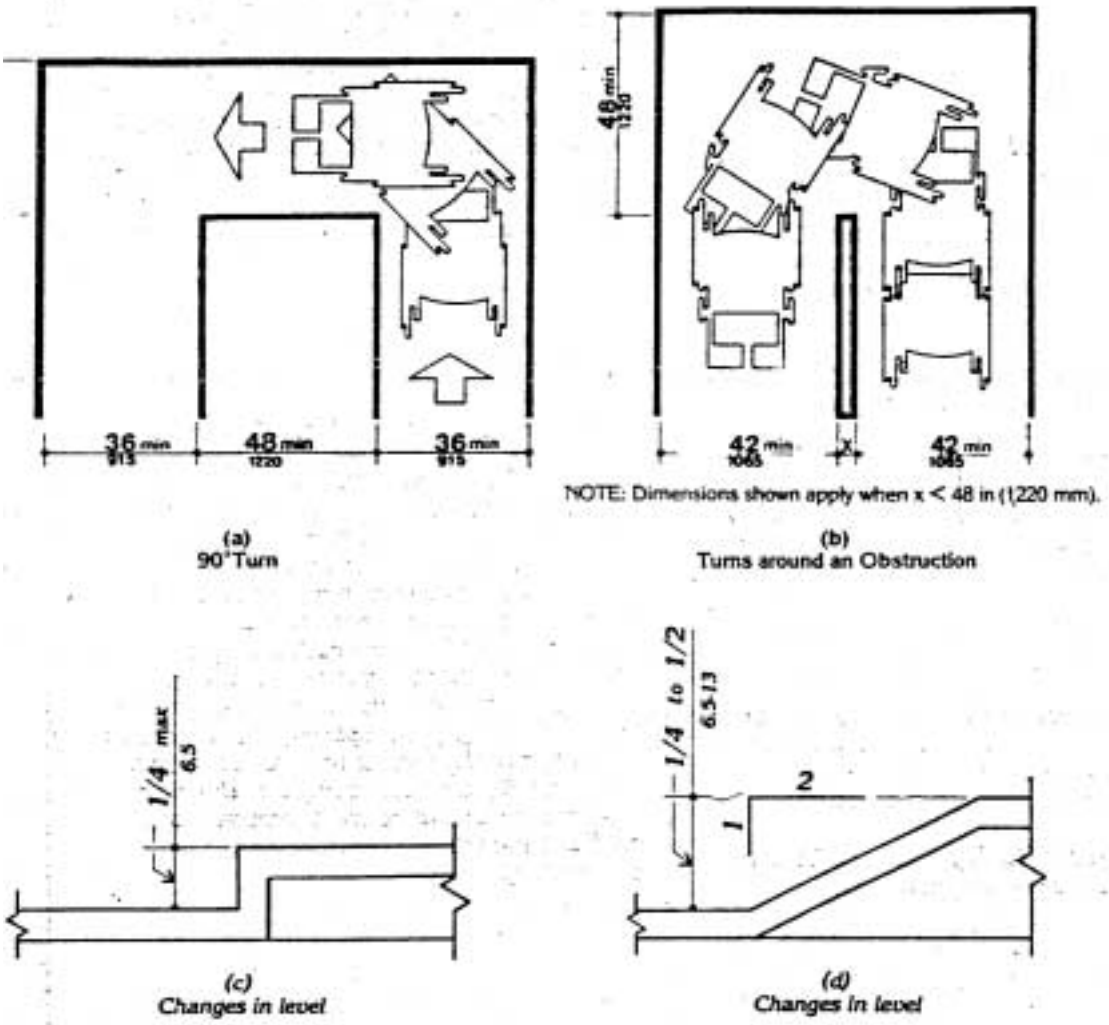
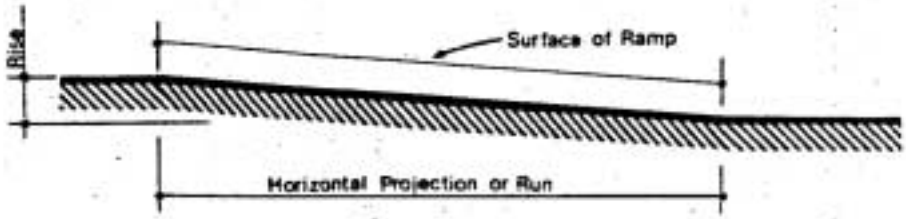


FIGURE 3.3-6

Wheelchair Accessible Routes Dimensions
(Page 2 of 2)



	Maximum Rise		Maximum Horizontal Projection	
Slope	in	mm	ft	m
1:12 to < 1:16	30	760	30	9
1:16 to < 1:20	30	760	40	12

FIGURE 3.3-7

Components of a Single Ramp Run and Sample Ramp Dimensions

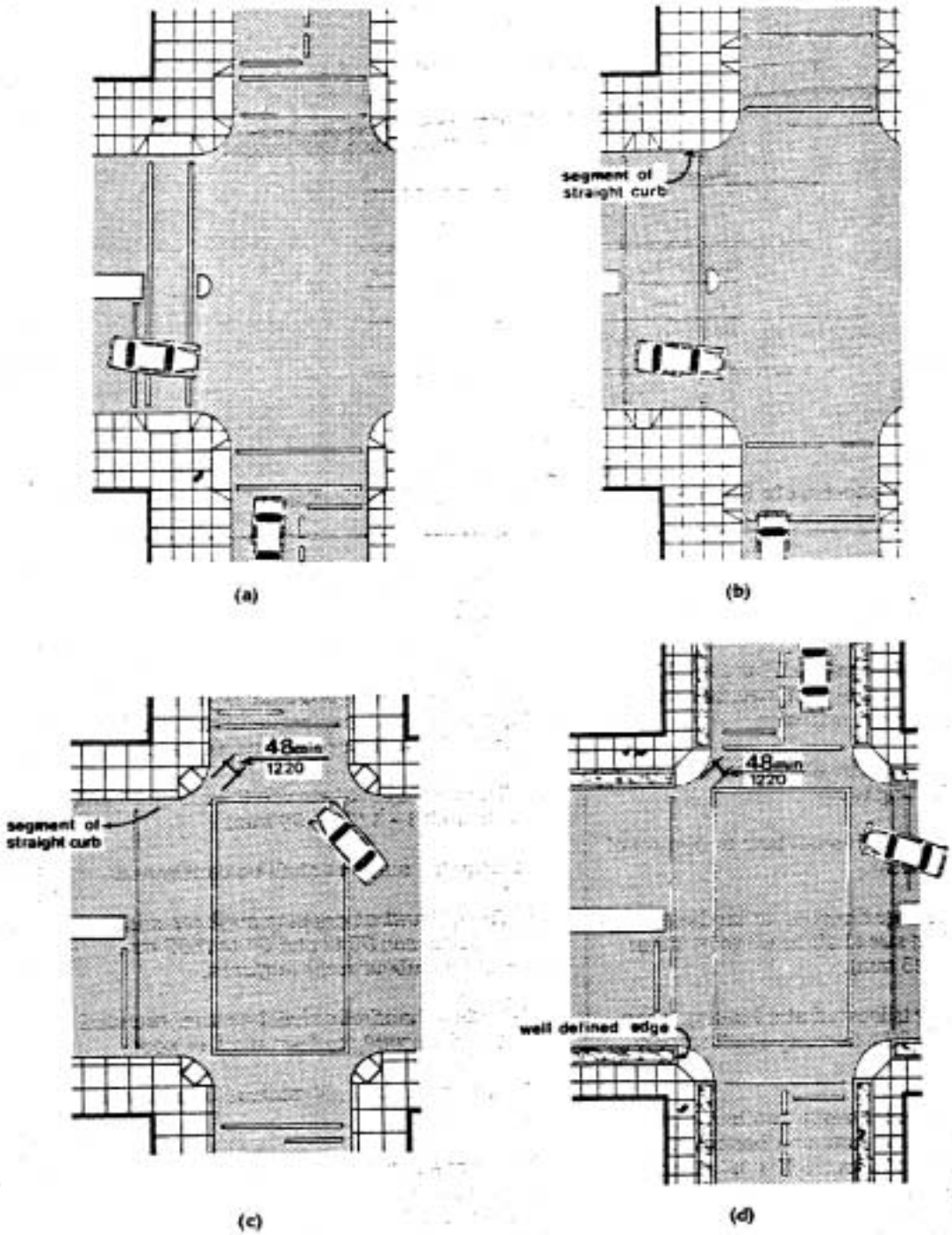


FIGURE 3.3-8

Curb Ramps at Marked Crossings

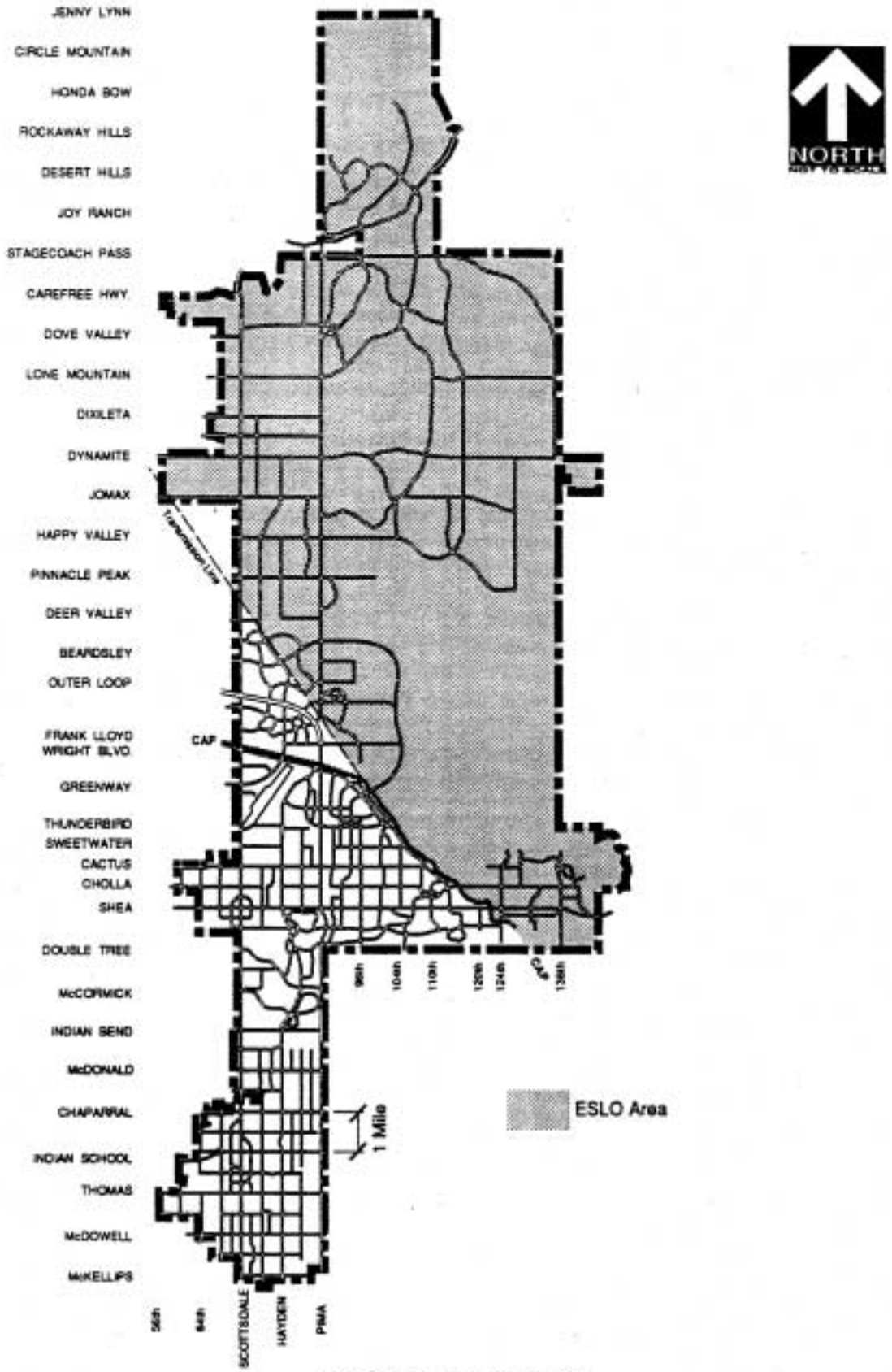
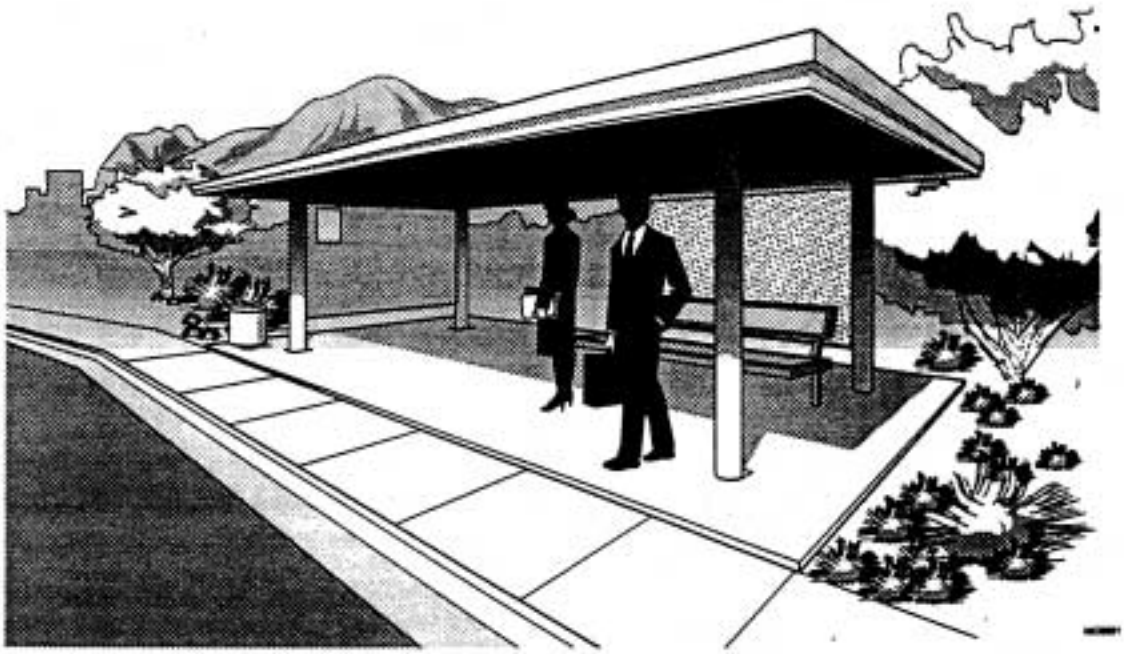


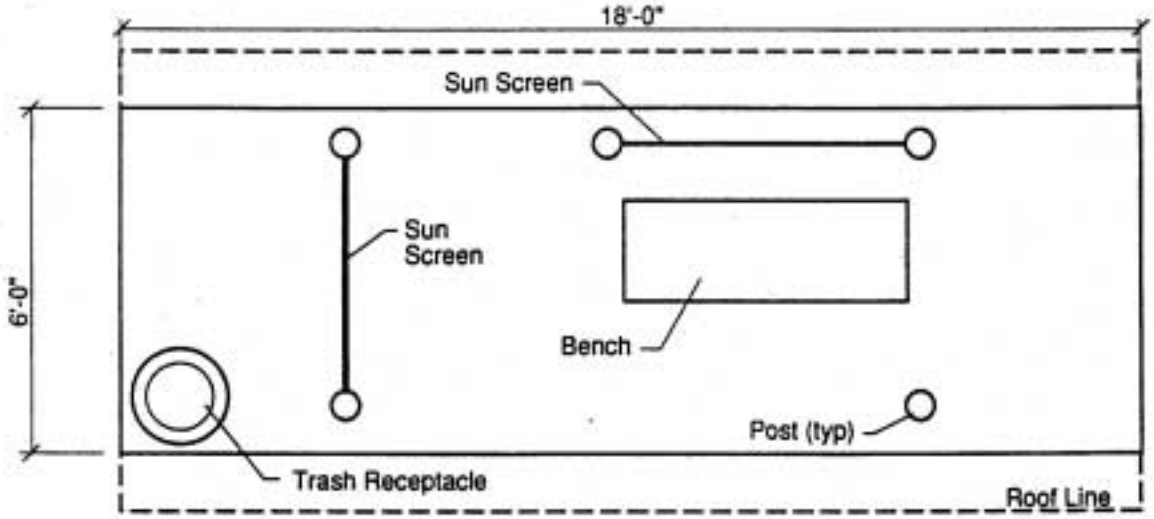
FIGURE 3.3-9

ESLO Boundary



Transit Shelter Perspective

Note: This figure in not intended as a construction document. Figures are not to scale.

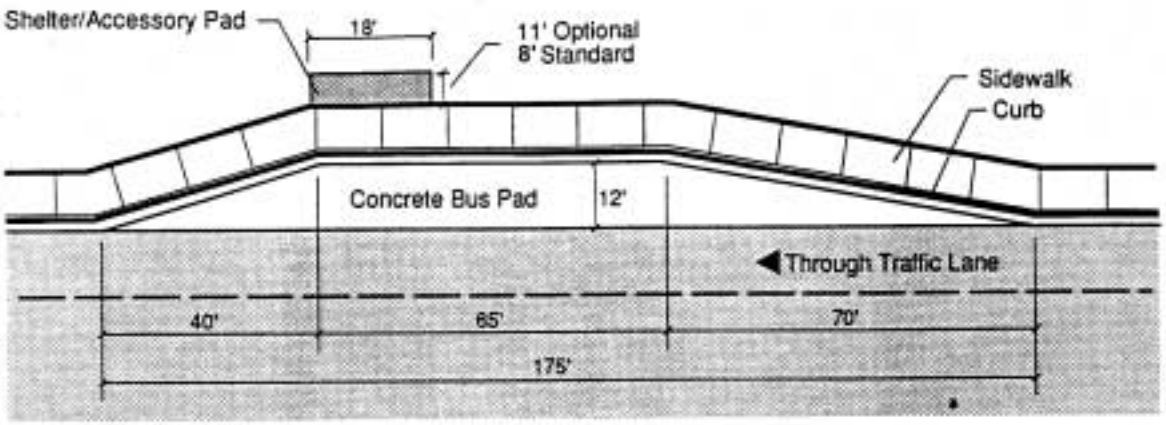


Transit Shelter Plan

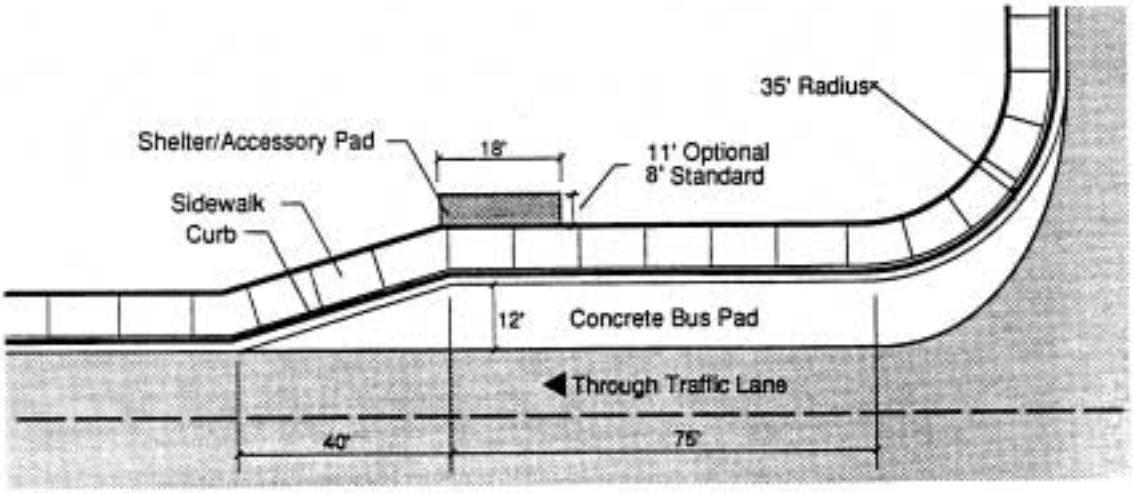
Note: This figure in not intended as a construction document. Figure is not to scale.

FIGURE 3.3-10

Standard Transit Shelter



Closed Bus Bay



Open-ended Bus Bay

Note: Driveways should be avoided within all bus bays. Under no circumstance should a driveway be placed within the shelter/accessory pad area.

FIGURE 3.3-11

Bus Bay Generalized Dimensions

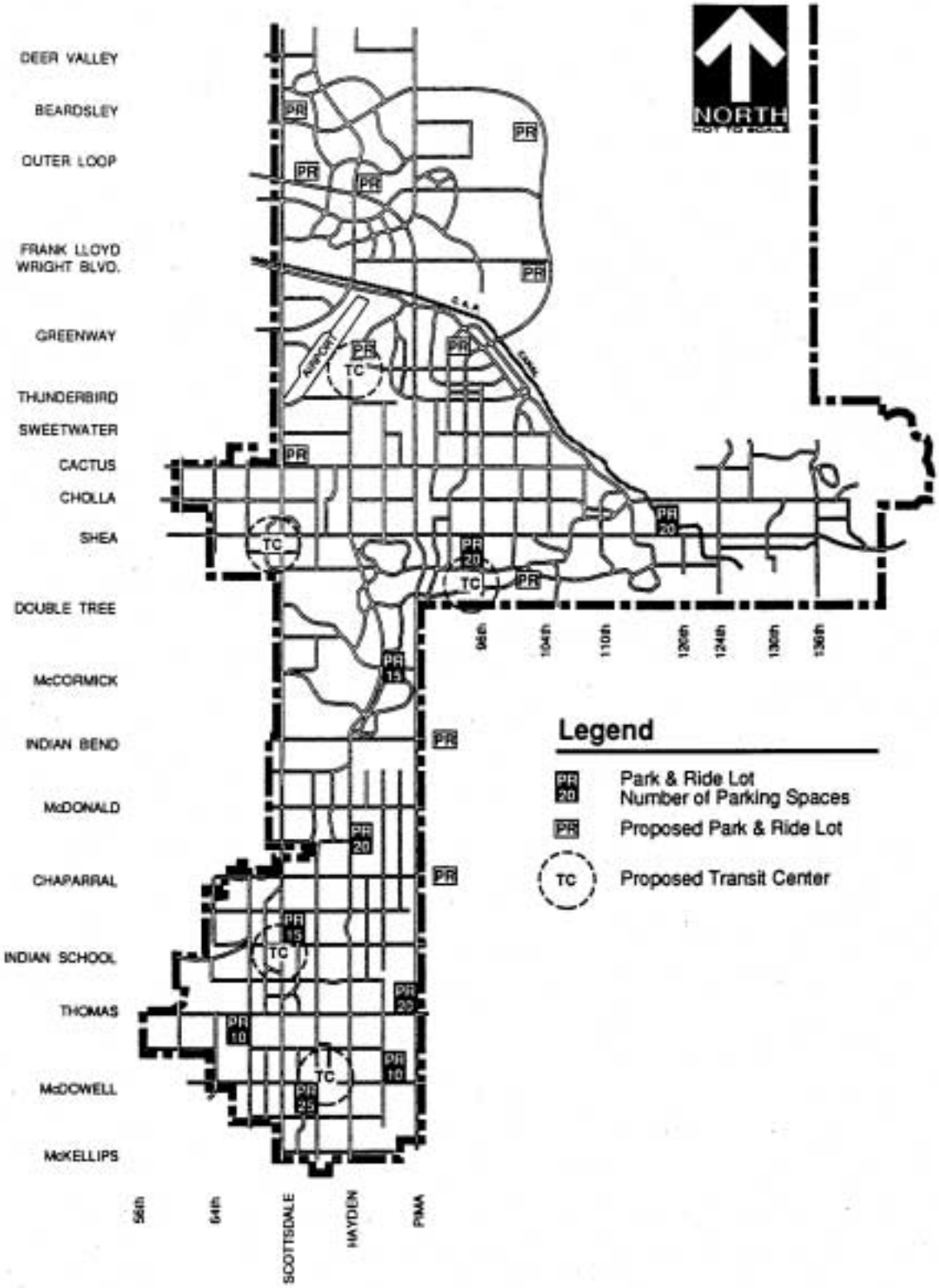
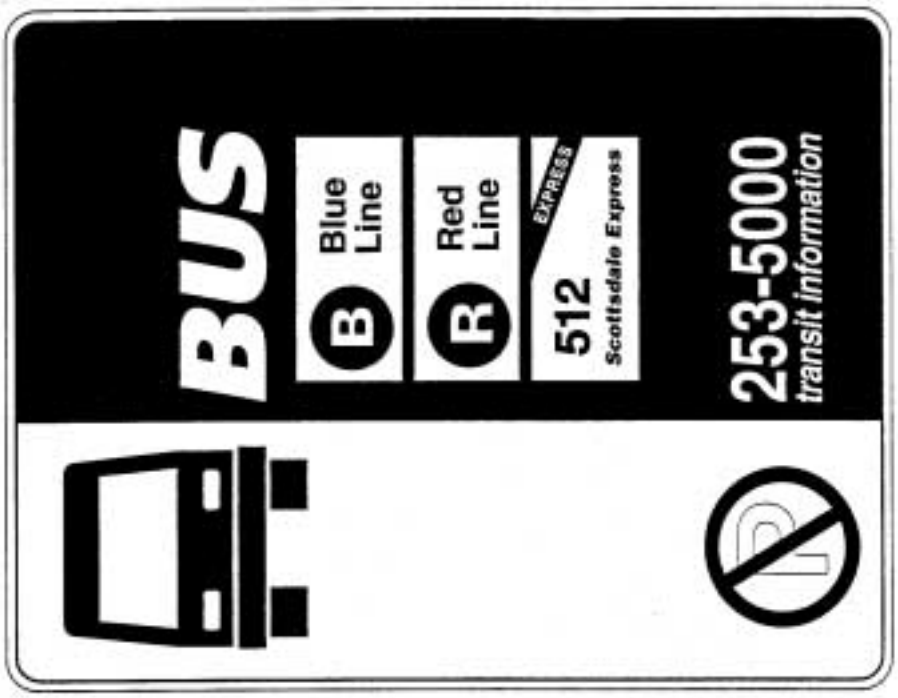
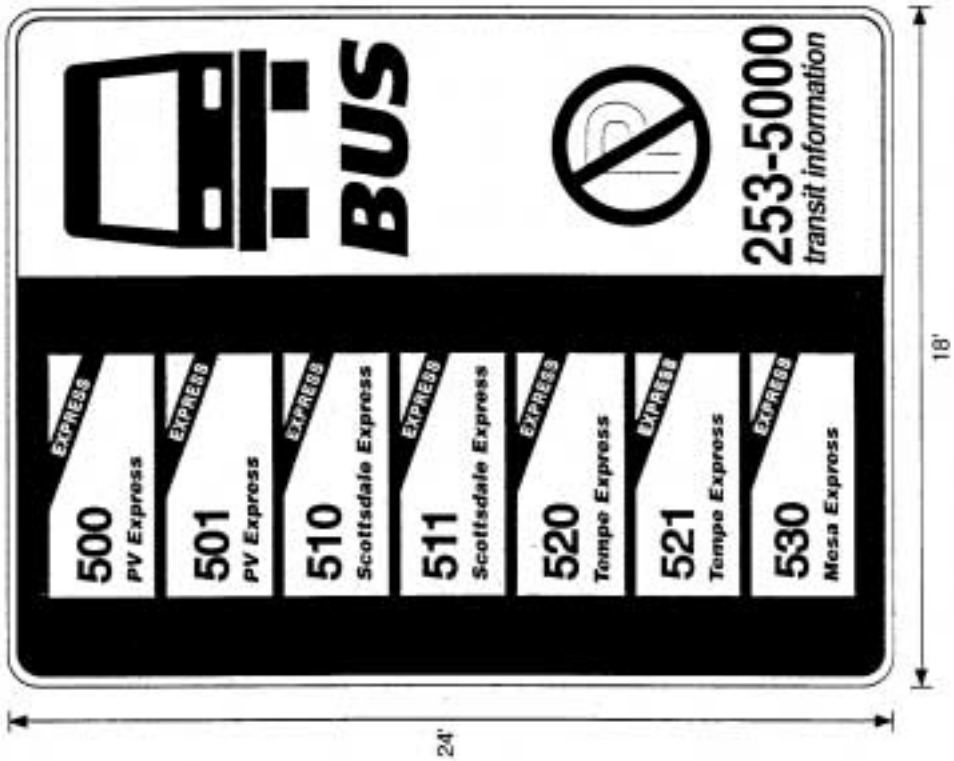


FIGURE 3.3-12

Park and Ride Lots and Transit Centers



STANDARD SIGN



CUSTOM SIGN

FIGURE 3.3-13

Bus Stop Sign

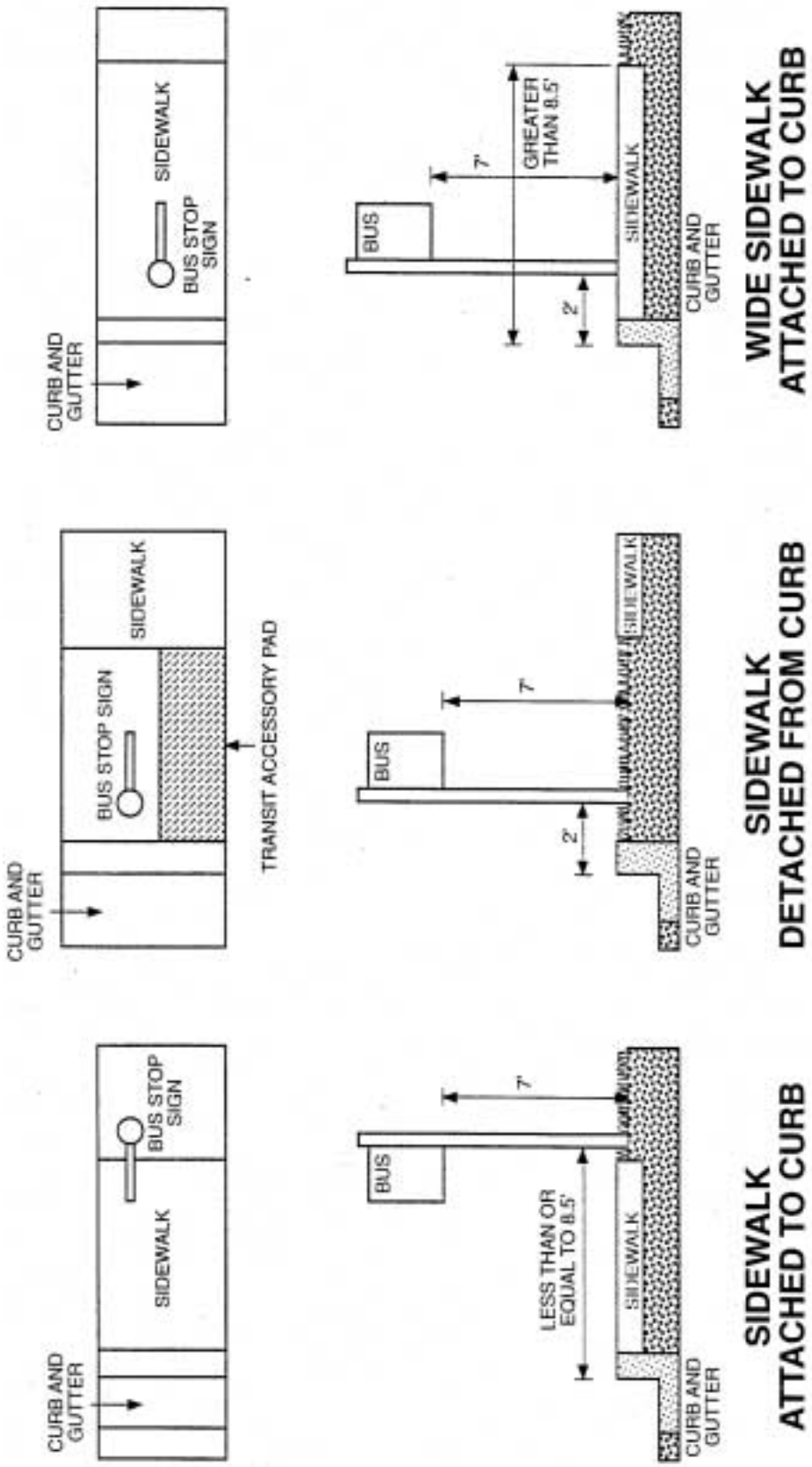


FIGURE 3.3-14

Bus Stop Sign Clearances

Section 3.4

BIKEWAYS

DESIGN STANDARDS AND POLICIES
REVISED DECEMBER 1999

CHAPTER 3
TRANSPORTATION

SECTION 3.4
BIKEWAYS

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
3-401	Introduction	
	A. Philosophy - Planning & Design	1
	B. Bikeway Components	1
	C. Documents & References	2
3-402	Planning	
	A. Location	3
	B. Facility Selection: On-Street	3
	C. Facility Selection: Off-Street	3
	D. Easements & Dedications	4
3-403	Facility Design	
	A. Shared Streets & Bike Routes	4
	B. Bike Lanes	5
	C. Multiuse Paths	5
	D. Riding Surfaces	7
3-404	Traffic Controls	
	A. Signs & Markings	7
	B. Detours & Construction	8
3-405	Parking	8
3-406	Maintenance	9

Figures

3.4-1 COS Detail #2281 Multiuse Path Crossing Sign
3.4-2 COS Detail #2282 Multiuse Path Striping & Signing
3.4-3 COS Detail #2283 Multiuse Path Details
3.4-4 COS Detail #2284 Multiuse Path Wet Crossing Sign
3.4-5 COS Detail #2285 Double Bicycle Rack
3.4-6 Bike Lane Cross Sections
3.4-7 Bike Lane Markings
3.4-8 Bike Lane Ramp Crossings
3.4-9 Multiuse Path Perspectives
3.4-10 Multiuse Path Intersections and Clearances
3.4-11 Multiuse Paths Bridges and Tunnels
3.4-12 Ramps for Multiuse Paths
3.4-13 Intersections of Paths and Streets
3.4-14 Safety Rails & Side Slopes for Paths
3.4-15 Options for Intersections of Paths and Ramps
3.4-16 Other options for Grade-separated Crossings

SECTION 3.4
BIKEWAYS

3-401 INTRODUCTION

A. Philosophy of Bikeway Planning and Design

The City of Scottsdale is committed to providing an extensive, connected, and functional bikeway system. The primary purpose of the bikeway system is to provide an alternate means of personal mobility and access to varied destinations.

Bicycle transportation can be used for professional/commuting, social/recreational, or fitness/health purposes. Facilitating this alternative to the SOV by providing a bicycle-friendly city can:

- Replace the use of cars for many short trips
- Help reduce traffic congestion, air pollution, & demand for parking
- Benefit those who cannot drive or cannot afford a car
- Provide healthy recreation for families & all ages
- Help maintain Scottsdale as a livable city with an outdoor lifestyle

Planning for bicycle transportation should be approached as any conventional transportation planning where the same factors of access, convenience, safety, cost, efficiency, travel demand, connections, and engineering considerations all apply. In addition, unlike motor vehicle drivers, plans must accommodate cyclists ranging from children to elders, and individual cyclists present a broad cross-section of needs and skill levels. Different types of facilities need to be designed and provided to accommodate this wide user demographic and their various purposes for making trips.

B. Components of Bikeway System

<u>Bike Lanes</u> are an integral section of a roadway which is marked for exclusive bicycle use. Bike Lanes are always one-way.

<u>Bike Routes</u> may include shared streets, bike lanes, or multiuse paths, in any combination. Routes may be designated by signing or by placement on a map.

<u>Bikeways</u> can be any combination of shared-streets, bike lanes, bike routes, or multiuse paths, and can be designated by signing, mapping, or consistent public use.

Grade-Separated Crossings are underpasses or overpasses, which serve to isolate motorized and non-motorized traffic from each other at points of intersections.

Multiuse Paths are paved pathways set aside for the exclusive use of human-powered travel. They are clearly separate from the road infrastructure. Paths are shared with skaters and pedestrians. In general, multiuse paths are intended for two-way traffic.

Multiuse Trails are unpaved and designed primarily for equestrians. However, trails are also open to bicycle and pedestrian travel. See Section 7-3 for trail information.

Shared Streets may not have a designated bicycle travel facility, but are open to bicycles. This includes all public streets, unless specifically posted to prohibit cyclists. While the suitability of particular streets will vary -often according to the skills and preferences of the individual cyclist- the basic street grid will always provide the major foundation for bicycle travel.

C. Documents and References

The following publications or their current revisions are to be used in conjunction with the design criteria in this book when designing bicycle or multiuse paths for the City of Scottsdale:

American Association of State Highway & Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities. (New edition in 1999)

Arizona Department of Transportation (ADOT) Arizona Bicycle Facilities Planning and Design Guidelines.

City of Scottsdale Bicycle/Pedestrian Transportation Plan, Adopted 1995.

City of Scottsdale Circulation Element of the General Plan, 1991.

City of Scottsdale Design Standards and Policies Manual, Section 3.4, Bikeways, 2000.

City of Scottsdale Supplement to MAG Uniform Standard Specifications for Public Works Construction.

City of Scottsdale Zoning Ordinance, Section 9.100.

Manual of Uniform Traffic Control Devices (MUTCD) Section IX, Traffic Controls for Bicycle Facilities. (Revised manual to be issued in 2000.)

Maricopa Association of Governments Regional Bicycle Plan, 1999.

Maricopa Association of Governments Uniform Standard Specifications for Public Works Construction.

3-402 PLANNING

A. Location

It is a goal of the Scottsdale Bikeway System to provide facilities on a minimum of a:

- Half-mile grid south of Shea Blvd.
- One-mile grid between Shea Blvd. & the CAP Canal
- Two-mile grid north of the CAP Canal

Providing equal grids for both on- and off-street types of bikeways is to be encouraged, as that will accommodate the widest possible range of users, purposes, and trip destinations. The Circulation Element of the 2000 General Plan contains maps of the planned on-street and off-street bikeway systems.

B. Facility Selection: On-Street

Bike Lanes are the most desirable facility for any street with a classification of minor collector or higher. For these streets with higher volumes of traffic, the classification of a street will determine its cross-section. Parkways, major arterials, minor arterials, major collectors, minor collectors, and certain special neighborhood and rural streets have standard cross-sections that include bicycle lanes. Bike lanes would, therefore, be included on these streets whenever they are built or reconstructed. These cross-sections are given in Section 3.1.

For streets that are needed to provide a connection for local or regional bikeway systems, but where a full cross-section with bicycle lanes cannot be accommodated, the following measures should be considered: (Listed starting with the most desirable.)

- Edge line stripe with route signs
- Edge line stripe with no signs
- Route signs with no edge strip

C. Facility Selection: Off-Street

In planning for off-street multiuse paths, the following hierarchy should apply, starting with the most desirable:

- ten or twelve foot multiuse path, well separated from streets, & in a natural setting
- ten or twelve foot pathway, set off from the street by at least ten feet of landscaping
- ten or twelve foot multiuse path protected from the street with a traffic barrier & railing.

Connections between different types of facilities can be very important to insure an efficient and functional system. In places, multiuse paths may be used to connect sections of roadways that would otherwise dead-end. However, it is critical not to attempt to substitute a path or a sidewalk where bike lanes are warranted. Bike lanes allow direct, higher-speed travel for cyclists, unimpeded by pedestrians. Bike lanes are also one-way, going with the adjacent traffic. Paths are typically two-way; so designing a path to connect properly with bike lanes would require very careful study and design. The major problem is that people may end up going the wrong way (against traffic) in one of the bike lanes.

Opportunities to provide bicycle access may occur in conjunction with public or private development, greenbelts, canal banks, flood control projects, vista corridors, or anyplace with available open space or right-of-way. It is the intention of Scottsdale's bicycle planning efforts to remain flexible and open to new opportunities.

D. Easements, Dedications & Abandonments

In the case of on-street facilities, the bike lane or route is typically located within the street right-of-way (ROW). Sometimes on-street facilities may need to be connected with short sections of paved path. An example of this would be cul-de-sacs that have only one direct access to the public street system. Sometimes the cul-de-sac street can be connected to allow bicycle and foot access to reach adjacent streets, paths, trails, or property.

If a private, gated community will cut off functional access for cyclists, means should be explored to maintain a public use easement on the streets and through the gates for pedestrians and cyclists.

For off-street paths, ROW may need to be obtained from development stipulations, or purchased. Any easements or dedications for paths should include a clear statement of maintenance responsibilities: for the actual concrete path, any adjacent landscaping or lighting, and for maintaining proper grades and drainage along the path. Dedication of right-of-way or of public use easements for paths must be noted in the stipulations and on the site plan. This should occur in the Project Review process for new developments.

If the classification of an existing or planned street is proposed to be changed, or a street easement or ROW proposed for abandonment, present and potential pedestrian and cyclist connections should be reviewed. The proposed change shall be evaluated against the needs of the bicycle program. If needed, some means of bicycle and/or foot access, such as a public use easement, should be obtained.

3-403 FACILITY DESIGN

GENERAL COMMENT

While every effort has been made to ensure the accuracy and completeness of these guidelines, the City of Scottsdale shall not be held responsible for any errors or omissions. It shall be the sole responsibility of the design engineer to ensure a proper design and the accuracy and completeness of construction documents containing his or her signature.

A. Shared Streets and Bike Routes

It should be assumed that cyclists will ride on all streets, unless such use is expressly prohibited and posted. Many neighborhood streets function quite well as bikeways with no additional signing or marking. If these streets are needed to complete some part of the bikeway system, or to provide a connection for cyclists, the street may be designated by edge stripes, signs, or on a map.

Since cyclists will tend to use the right side of the outside lane, this area should always be built and maintained to accommodate that use. Drainage grates should be designed and installed in a manner that will not trap wheels. Longitudinal cracks, potholes, rough paving, etc. should be eliminated.

B. Bike Lanes

Streets such as parkways, major arterials, minor arterials, major collectors, minor collectors, and certain neighborhood and rural streets have cross-sections that include bicycle lanes. These cross-sections are in Section 3.1.

COS lanes shall be a minimum of four feet of asphalt from the center of the lane stripe to the edge of the concrete gutter pan. A solid six-inch white stripe is used to mark off the bike lane. An alternative method is to combine the lane and gutter pan as one concrete strip. In these cases it is desirable to exceed the four-foot minimum, as measured to the face of the vertical curb. Figures 3.4-6 and 3.4-7.

Bridges, tunnels, or any grade separation structure, should allow the full width of the physical improvements including standard bike lanes. Also note that most surface streets, even without designated bike lanes or shoulders, usually allow for some “shy distance” or permit an emergency move off the road. Bridges and tunnels with solid barriers alongside often become dangerous constriction points for bicycle travel. Therefore consideration should be given to maintaining extra width on bridges and in tunnels even if the street does not have bike lanes.

In rural areas, a paved shoulder can serve the function of a bike lane, in which case it should have a minimum of five feet of paving. A bicycle lane can also be delineated with striping between an area for parallel parking and a traffic lane. In this case the bicycle lane should be at least five feet. Figure 3.4-6.

Whenever a half-street is constructed, if the ultimate street classification has a cross-section with bike lanes, then the half-street construction should also provide a bike lane on each side.

Parking should not be allowed in marked bicycle lanes.

Raised pavement markers or curbing should never be used to delineate bike lanes.

Figures 3.4-6, 3.4-7, and 3.4-8 give example of bike lane configurations for various situations.

For additional information concerning bike lanes and routes not covered in this manual, please refer to the AASHTO Guide for the Development of Bicycle Facilities, 1999.

C. Multiuse Paths

Operation and use of multiuse paths are covered by COS Revised Code, Article IV, Chapter 17.

COS Standard Details for Multiuse paths are found in Figures 3.4-1, 3.4-2. 3.4-3, & 3.4-4.

For additional information not covered in this manual, please refer to the AASHTO Guide for the Development of Bicycle Facilities, 1999. E.G., this guide provides information on minimum radii for curves, grades, sight distances, and stopping sight distances under various conditions.

City of Scottsdale multiuse paths shall have a(n):

- Minimum design speed of 20 mph.
- Typical width of ten feet with a two-foot shoulder on each side.
- Width of eight feet where paths can be paired so each can have one-way travel.
- Width of twelve feet where heavy use is expected, especially with a high percentage of pedestrians/skaters.
- Medium broom finish on the surface. It is desirable to provide traction, but not to a degree that impedes skaters
- Material for the shoulders that can allow for recovery if a user runs off the path. Substances such as turf, decomposed granite, exposed aggregate, or very low shrubs/grasses are appropriate. No spiny/thorny plants.
- Area clear of fixed objects such as poles or tree trunks for another three feet beyond the shoulder
- Handrails for paths or bikeways should 54 inches in height and be flared at the ends.
- Vertical clearance of eight feet over the path and shoulder areas. Figure 3.4 –10.
- Grades of five percent or less. Where this is not feasible, refer to the AASHTO Guidelines. The Transportation Dept. will make the final decision. Maximum side slope is two percent.
- Alignment which is as linear as possible. Avoid compound curves. Unnecessary "meandering" reduces the effective width of the path, can create sight distance problems, and increases possibility of users running off the path. Figure 3.4-9B.
- Adjacent grades should always direct water away from the path surface. Note in Figure 3.4-9A the small swale on the up slope side.
- Provision in tunnels to keep nuisance water off the path, and allow the water to rapidly drain or be removed. One solution is a small channel constructed with a sloping side, built on one side of the tunnel. Sump pumps are needed in areas prone to flooding. Figure 3.4-11.
- Lighted tunnels
- Path ramp design where the pan for any curb ramp shall be as wide as the path. The ramp should be aligned with the path, and not require users to make sudden swerves, or to be directed towards oncoming traffic. Figures 3.4-12A & 12B.

<u>Other special conditions</u>:
Every attempt should be made to avoid having a path adjacent to a street. If this is unavoidable, try to achieve a separation of at least five feet, with landscaping. If the path and street separation will be less than five feet, then a combination vehicular and bicycle railing and traffic barrier must be used. The top of the barrier and rail must be at least 54 inches. These railings perform the dual function of retaining both vehicles in the street and cyclists on the path. Figure 3.4-9A.

Grade-separated crossings, either over or underpasses, for path/street intersections are highly desirable, where feasible.

However, the majority of these crossings will be at-grade. Certain design practices can greatly improve these at-grade crossings, whether or not they are mid-block, controlled intersections, or driveway exits. Some practices found helpful in Scottsdale are making the crossing a contrasting material, striping each side of the crossing, keeping median bullnoses out of the path, or elevating the path on a speed table. Figures 3.4-1, 3.4-12A & B, 3.4-13, 3.4-15, 3.4-16.

D. Riding Surfaces

Drain grates can be a serious potential hazard to trapping wheels. Careful attention should be paid to the choice and installation of drain covers. There are MAG and COS Standards that are applicable. Gaps between the grate and its frame should not exceed ¼ inch.

Paving for bike lanes should meet MAG standards for surface smoothness of asphalt paving.

Rumble strips, raised pavement markers (rpms), or raised curbs should never be used to delineate bike lanes, multiuse paths, or in bikeway crossings.

Multiuse paths will have a medium broom finish. The width of expansion joints should be minimized, and the joints tooled with a small radius.

3-404 TRAFFIC CONTROLS

A. Signs and Markings

Traffic control devices for cyclists, whether they are for an on- or off-street system, must adhere to the same five basic requirements as for motorists: Fulfill a need, command attention, convey a clear, simple meaning, command respect from users, and give adequate time for a proper response.

The use of colors should conform to code specificaitons for signs and markings: Yellow – General Warning, Red – Stop or Prohibition, Blue – Service Guidance, Brown – Recreation, Black – Regulation, White – Regulation.

All regulatory, warning and route marker signs shall be provided in accordance with the standards in the Manual on Uniform Traffic Control Devices, Section IX. In addition, the City of Scottsdale has developed some signs for particular situations, see Figures 3.4-1, 3.4-2, 3.4-4, and 3.4-7 for COS Details # 2281, 2282, and 2284.

Signing and marking for bike lanes is shown in Figures 3.4-6, 3.4-7, and 3.4-8. Signing and marking for paths is shown in Figures 3.4-1, 3.4-2, 3.4-4, 3.4-13, and 3.4-15. Other information is in the AASHTO Guidelines.

For bike lanes, markings shall consist of a directional arrow and a bike/rider symbol. In urban areas, pavement markings shall be placed 50 to 75 feet after every major intersection, or at ¼ mile intervals, whichever is less. In rural areas, the distance may change as judged appropriate by the COS Transportation Dept.

Where a bike lane continues past the left side of a right-turn-only lane, a pair of symbols shall be placed in that continuation.

On leaving an intersection, the lane stripe should start at the crosswalk or where the crosswalk would be. Approaching an intersection, if the volume of right turns is heavy, then the stripe should be dropped 50 -75 feet before the intersection.

Mulituse path striping is shown in Figure 3.4-2, COS Detail # 2282.

Whether for lanes, routes, or paths, any paint or thermoplastic stripes or markings should be reflective and highly non-slip.

B. Detours & Construction

Public information:
Any signage, publication, map, web posting, public service announcement, or other information dealing with any construction closure, restriction, or change, shall always include any expected effects on cyclist or pedestrian movements. This includes, but is not limited to, changes in the operation of sidewalks, multiuse paths, bike lanes, or any other bikeways.

Ideally, detours would be found or built, and well signed. Bikeway detours should only be used when the same type of facility can be provided, e.g., a bike lane directed to other lanes or shoulders, or to a suitable shared street. Path detours should be directed to another path or suitable sidewalk, not to an on-street facility.

Shared Streets, Bike Lanes, and Multiuse Paths:
If a bike lane is closed, it shall be signed “Bike Lane Closed” and also signed “Bikes on Roadway” for the portion where cyclists will be forced to use the traffic lane. This applies to shoulders with high bicycle use, as well as cases where the work is confined to the bicycle lane.

If the traffic lanes are narrowed for construction detours, so that a car and bicycle cannot safely pass side-by-side, then cyclists and motorists should be directed as above.

Special attention needs to be paid to work, such as utility, which takes place only in the bike lane or shoulder area. Sometimes precautions are ignored, because the vehicular traffic is not affected. However, proper signing and barricading, with lights for night warning, is still essential. Irregular surfaces, such as raised metal plates on shoulders or hoses laid across paths, can be especially hazardous and must always be well barricaded.

Signing and barricading should anticipate night use and speeds up to 25 mph. Barricades and signs should be posted at points where people are able to choose an alternate route.

When not in use, barricades, signs, etc., should not be placed or stored in bike lanes or on shoulders or paths.

Bike lanes/shoulders shall always be restored to an excellent paving condition. MAG Standard 321.5.4, Asphalt Base and Surface Course, should apply.

3-405 PARKING

A. Location

The City of Scottsdale Zoning Ordinance, Section 9.100, specifies bicycle parking requirements.

Bicycle parking shall be located within fifty feet of the main entrance(s), in a convenient, highly visible location. Ideally, the bicycle parking will be more convenient to destinations than the motor vehicle parking. On a site with several businesses, bike parking should be dispersed so as to be convenient to individual entrances. A portion of the required parking may be located by an employee entrance.

The Zoning Code gives the requirements for the number of bicycle parking spaces for various public and private development. Typically it is 10% of the vehicle parking.

The COS Standard Detail # 2285 bike rack (Figure 3.4-5) is designed to provide:

- Secure support for the entire frame of the bike by allowing numerous contact points with the frame and one wheel, with those points being spread out both horizontally and vertically. These contact points are all in one plane. This helps prevent damage to paint, eliminates metal points that could stick out to cause damage or injury, and the bicycle is prevented from sliding down or flopping over.
- Accommodation of any size or type of bicycle with any type of luggage or equipment. The bicycle does not have to be lifted up or be supported by a kickstand.
- Ease of use, and manner of use, is clear without instructions. (A poor design; e.g., the "ribbon" rack; leads to misuse: this rack is designed for bikes to be placed perpendicular to the rack, but the first person usually places their bike parallel across the openings.)
- Secure locking with any type of lock or cable, including the "U" locks. If the front wheel is removed and repositioned, then it should be possible to lock the frame and both wheels to the rack. The rack should not require that the lock be fastened close to the bicycle chain.

The City rack may be painted, and may be placed on concrete, turf or gravel. It may be used as singles, doubles, or in rows. Each loop accommodates two bikes.

Any substitutions or exceptions must provide the same functions and be approved by the Bicycle Planner.

3-406 MAINTENANCE

On-Street Bikeways will be maintained by Field Services as part of the regular street sweeping and maintenance. Special attention should be given to drain grates, utility covers, and any surface irregularities.

Off-Street Bikeways Responsibility for the maintenance of a new path should be determined at the time of dedication or purchase or granting of easement. This document should be kept by CM&R, Municipal Services, Transportation, & Risk Management.

Regular maintenance should include:

- Sweeping
- Removal of all dirt, graffiti, and pasted material
- Displaying warning signs when water is present or flooding imminent
- Clean-up after flooding
- Litter pick up
- Manual or chemical removal of weeds
- Pruning to maintain proper clearances. See Figure 3.4-10.
- Periodic removal of silt to maintain low flow channels away from path

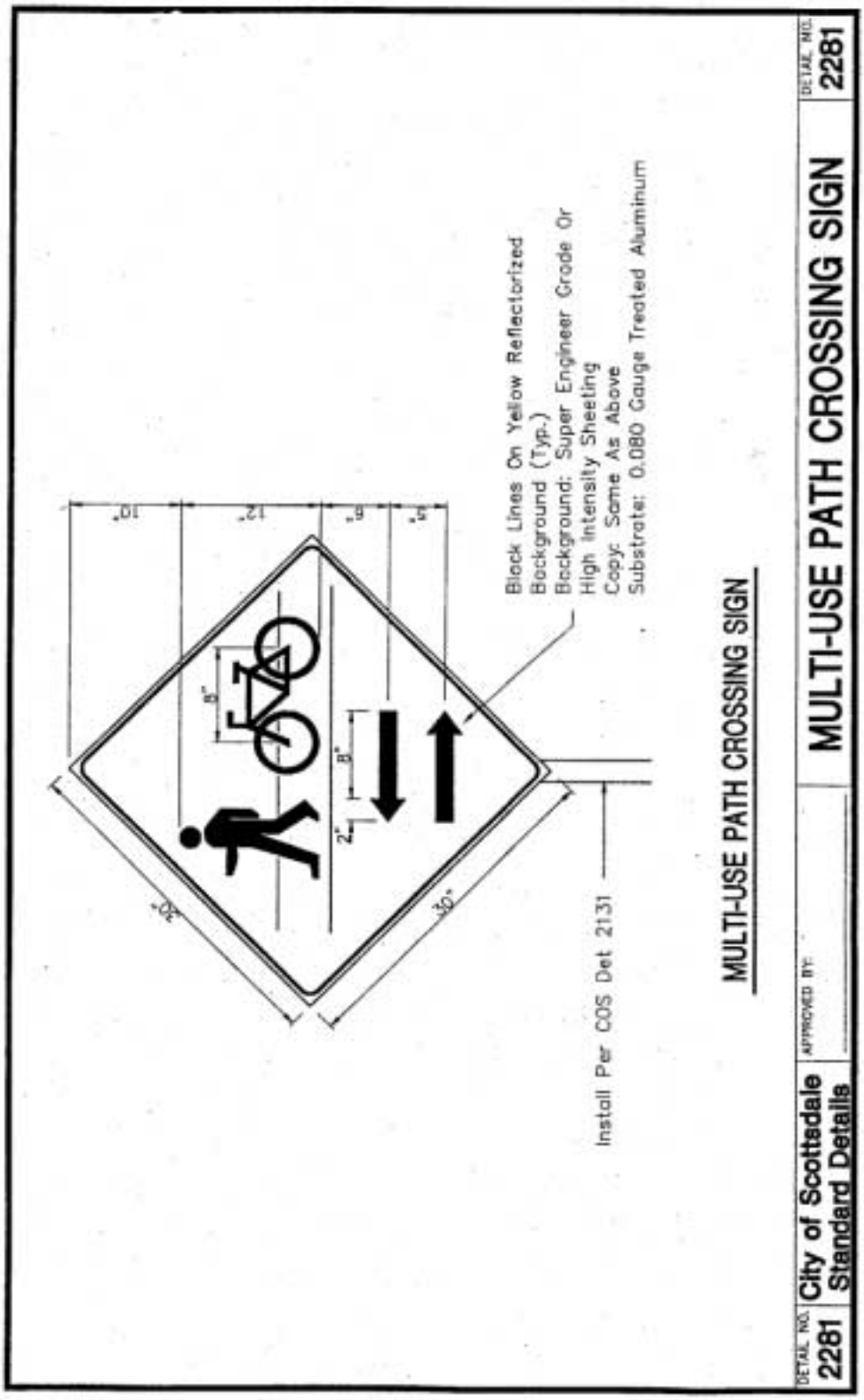


Figure 3.4-1

Multi-Use Pass Crossing Sign

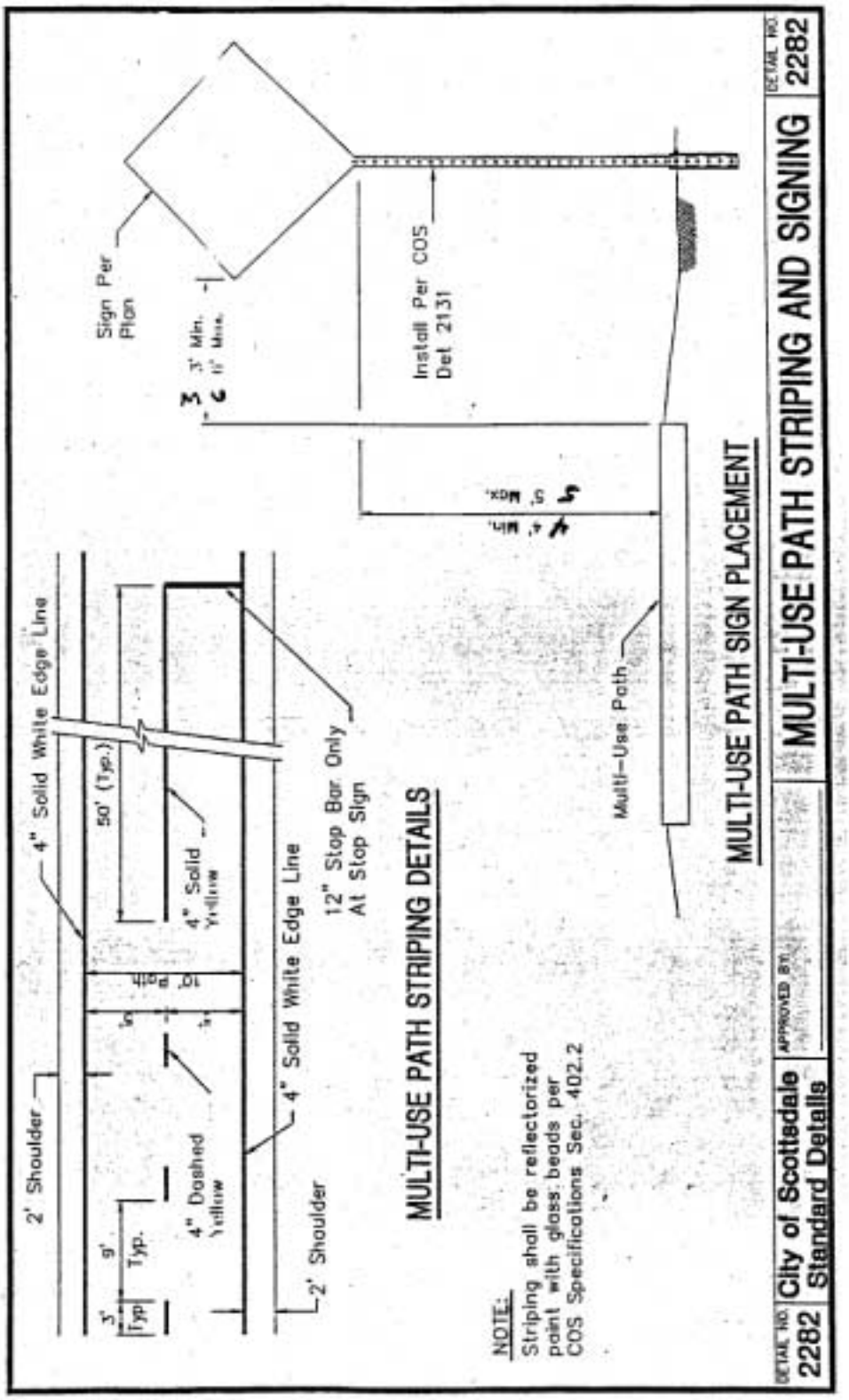


Figure 3.4-2

Multi-Use Pass Striping and Signing

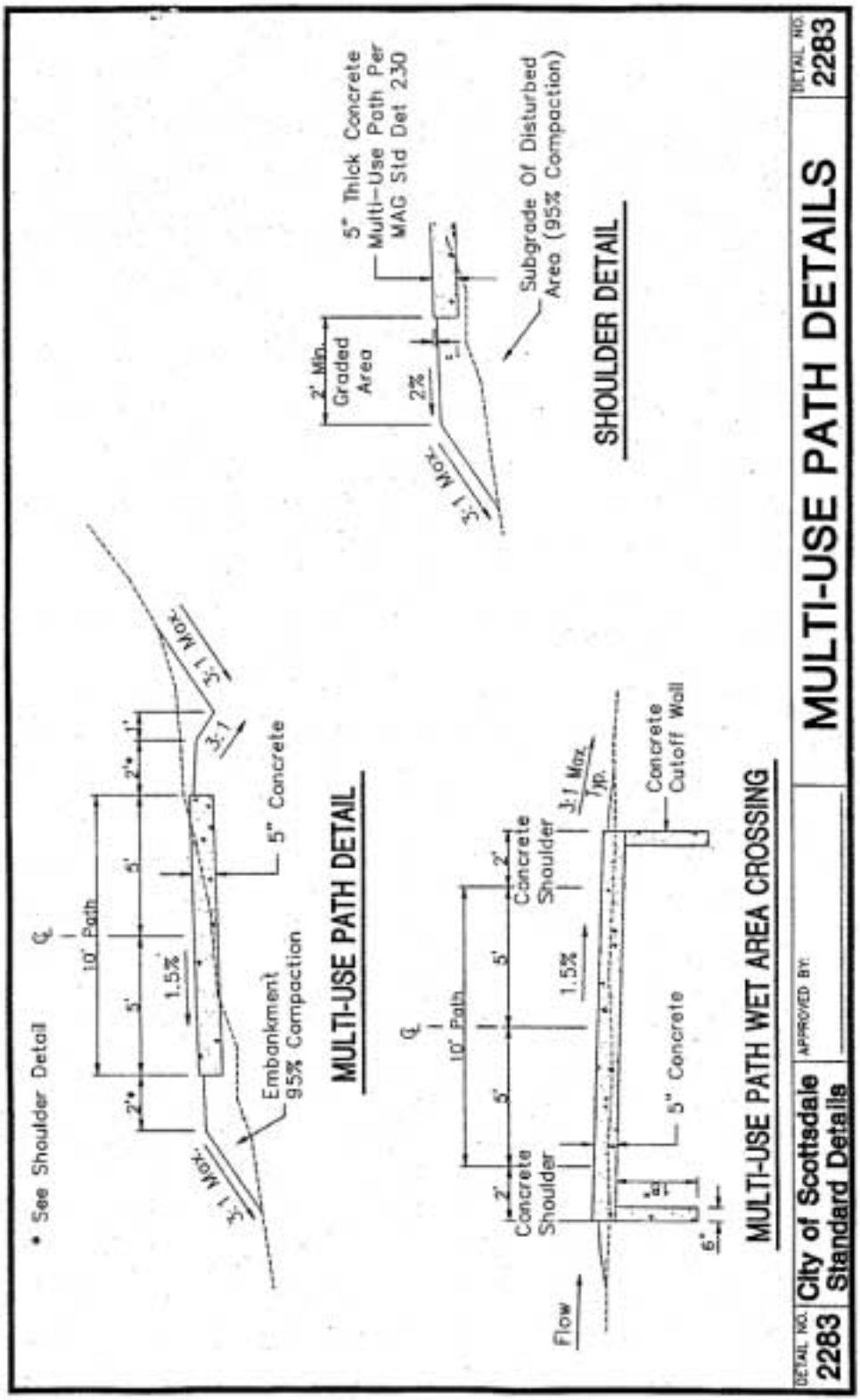


Figure 3.4-3

Multi-Use Pass Details

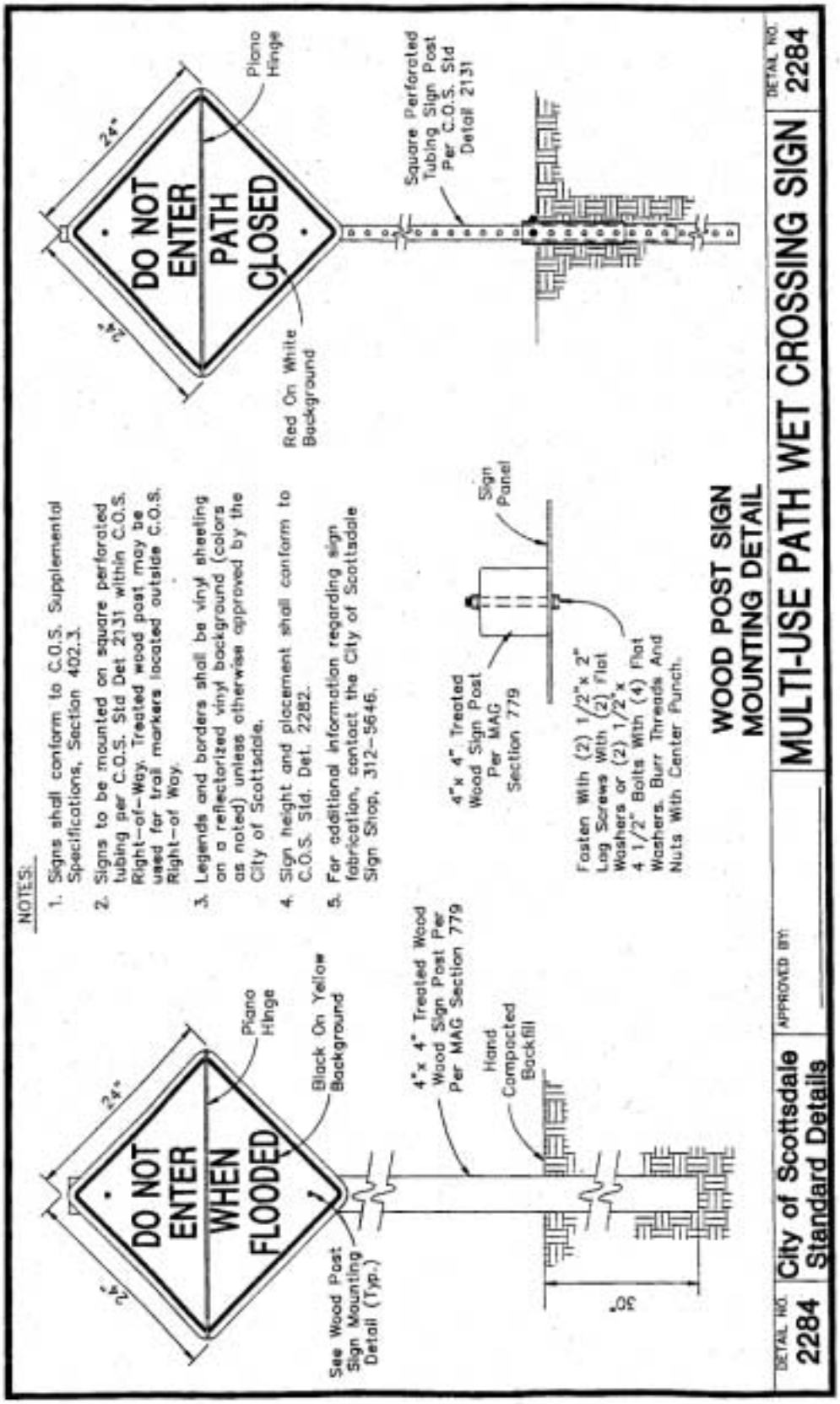


Figure 3.4-4

Multi-Use Pass Wet Crossing Sign

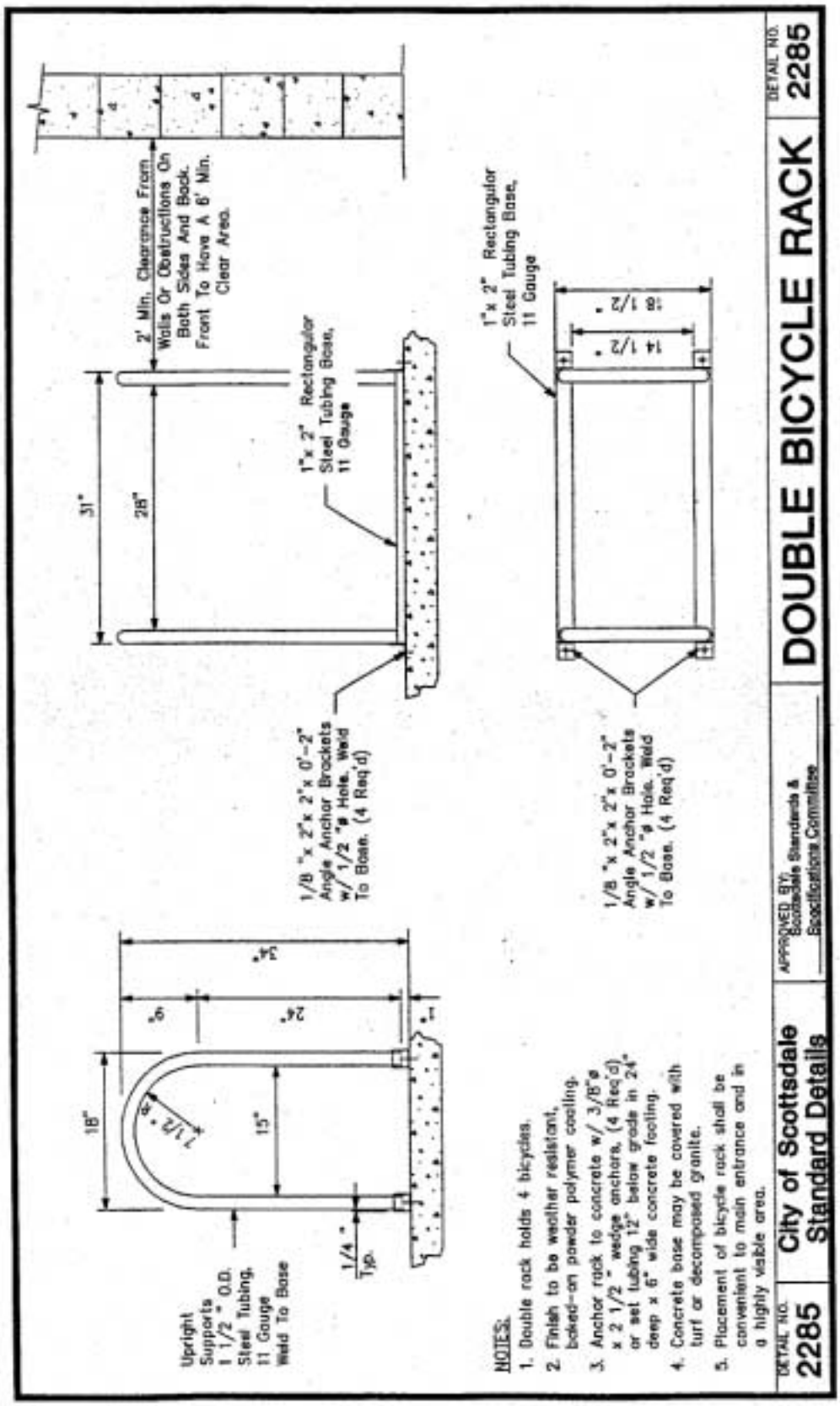
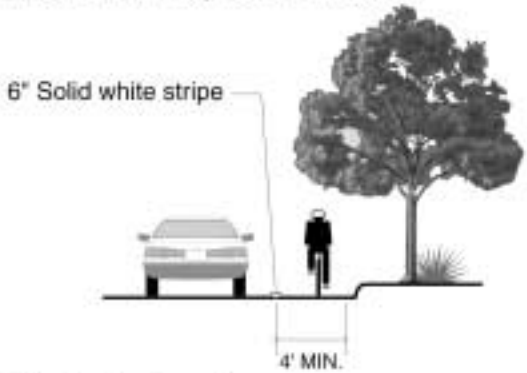


Figure 3.4-5

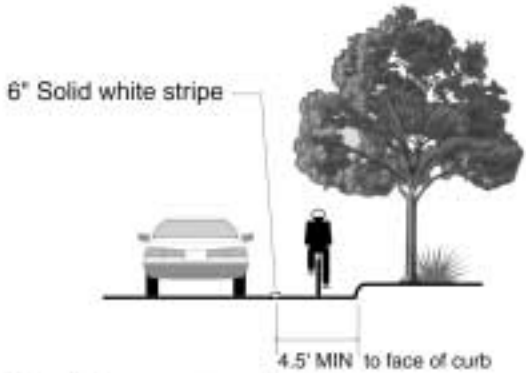
Double Bicycle Rack

Curbed Street Where Parking is Prohibited



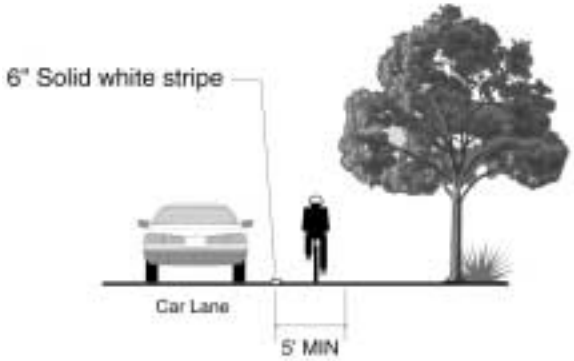
This four foot lane is exclusive of curb & gutter.

Wide Curb Lane

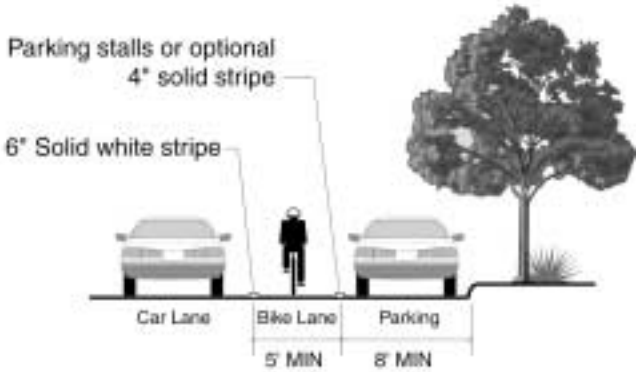


Monolithic concrete curb, gutter & bike lane. No longitudinal joints.

Street Without Curb or Gutter



Curbed Street With Parking



Note: These cross sections are compatible with City street cross sections in Section 3.1.

Figure 3.4-6
Bike Lane Cross Sections

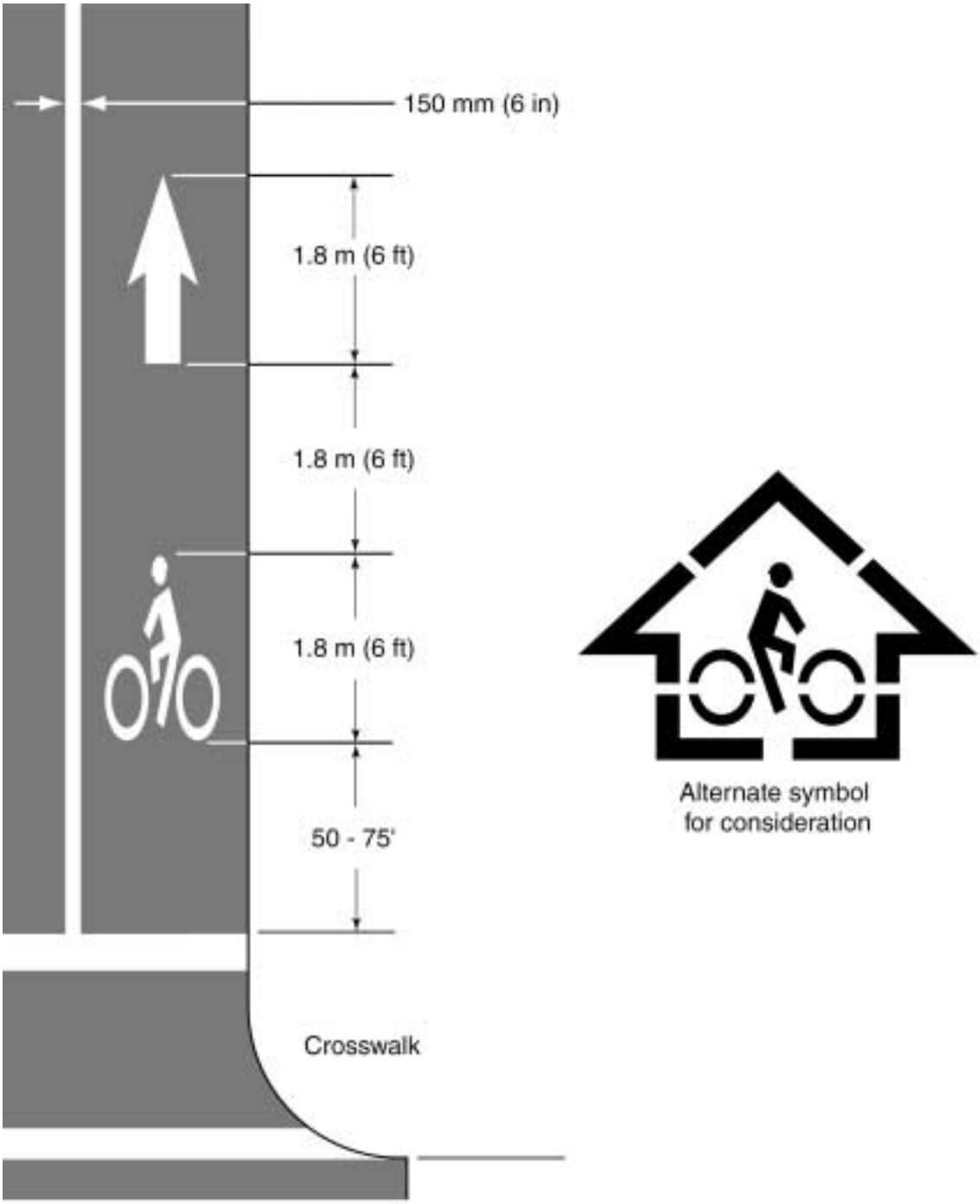
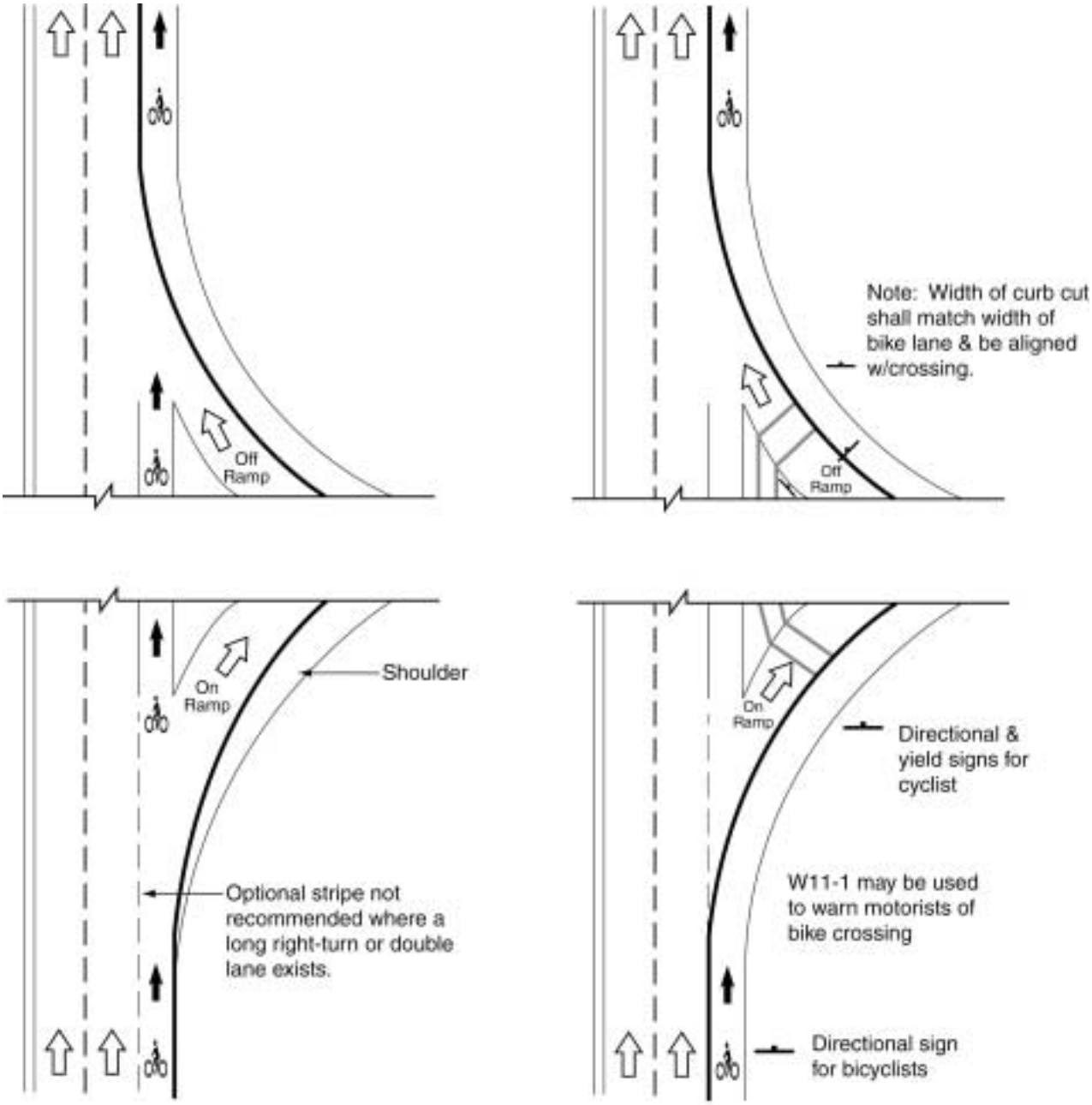


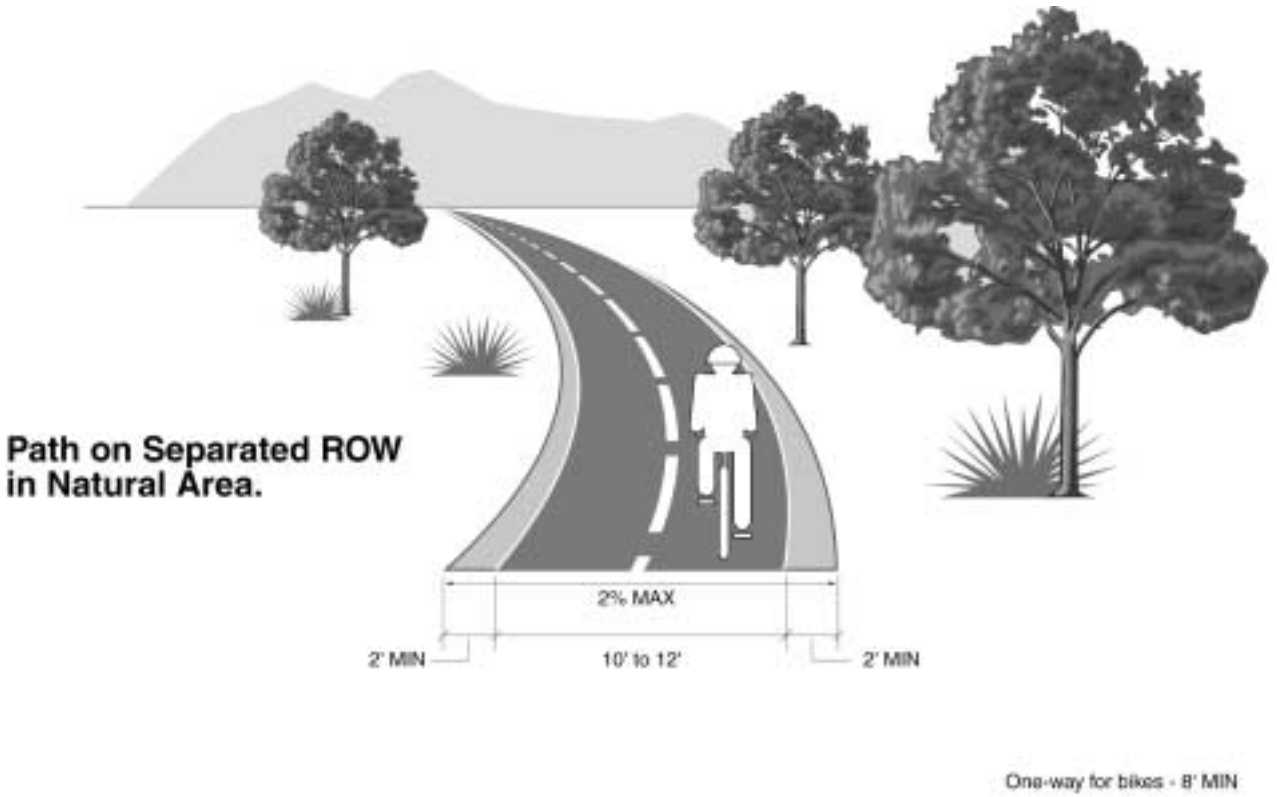
Figure 3.4-7
Bike Lane Markings – Far Side of Intersection

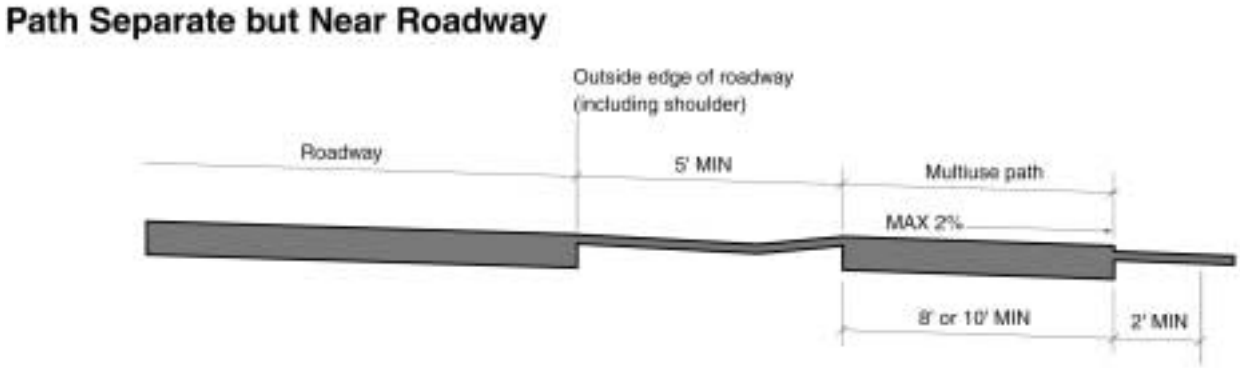


Ramps have low volumes & low speeds

Ramps have moderate to heavy volume & higher speeds

Figure 3.4-8
Bike Lane Ramp Crossings





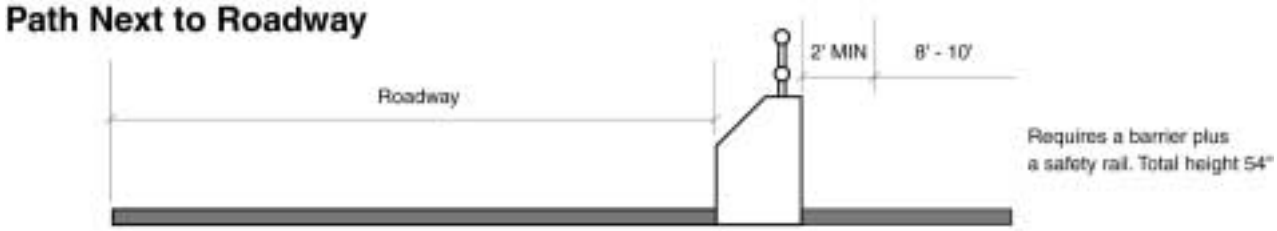
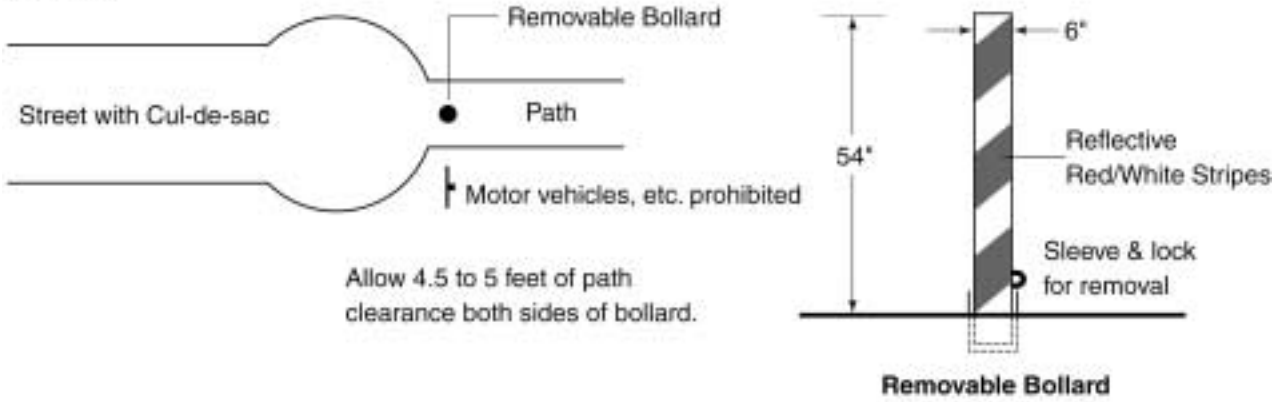


Figure 3.4-9A
Multiuse Path Perspectives

Vehicle Control at Path Entrance Where Needed

EXAMPLE:



Multiuse Path Alignments

Paths shall be constructed to be
as linear as possible. Avoid compound curves.

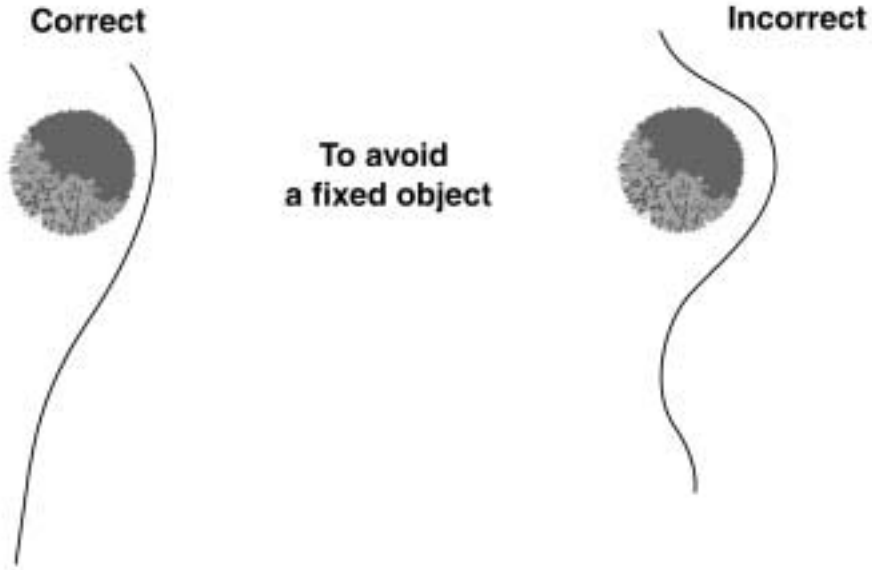


Figure 3.4-9B
Multiuse Path Perspectives

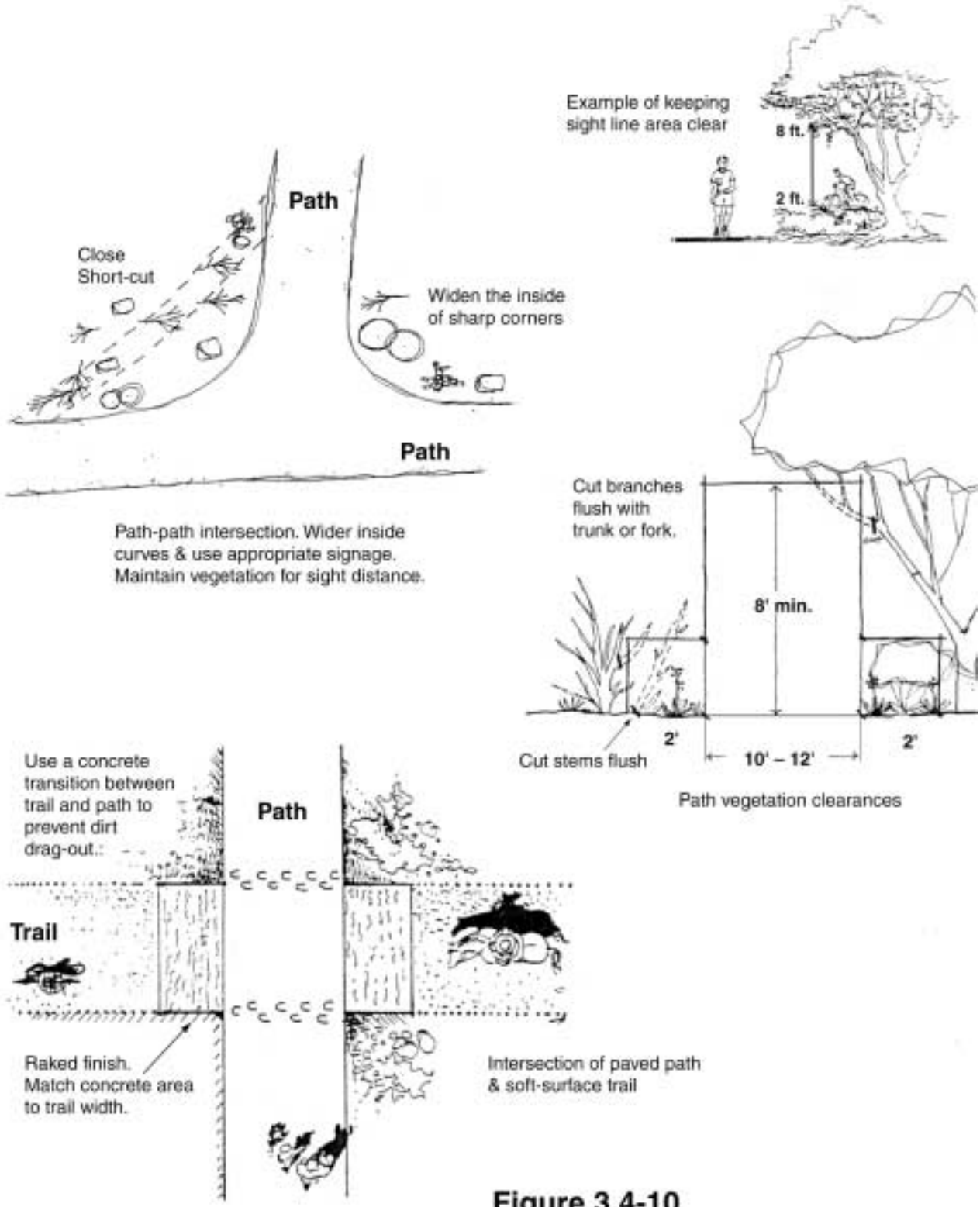


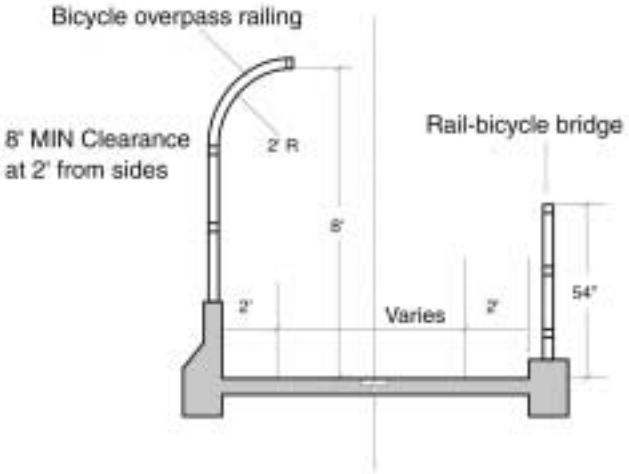
Figure 3.4-10
Multiuse Path Intersections & Clearances

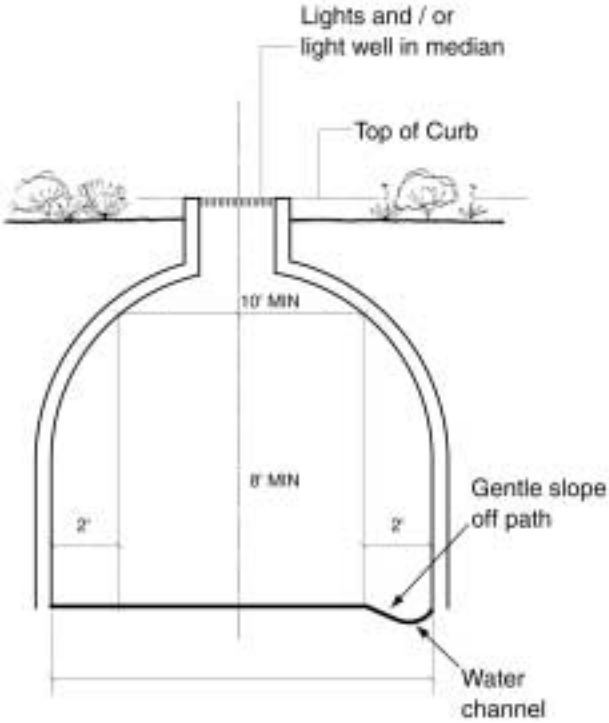
Approach to Overpass

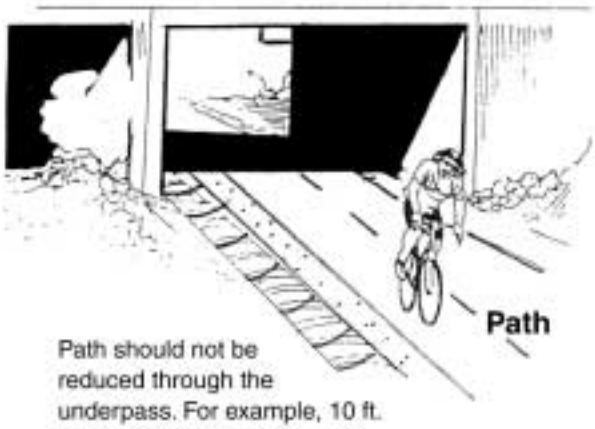
See design standards
for appropriate grades.

Check landing area for stopping
sight distance requirements.
Avoid direct entry into streets.

Multiuse Path Bridge Section



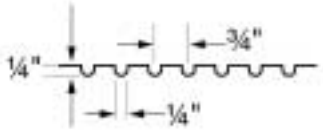




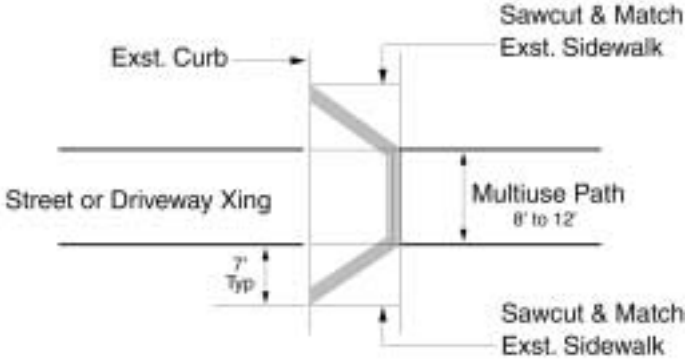
Path should not be
reduced through the
underpass. For example, 10 ft.
plus two 2 ft. shoulders, and
drainage swale as needed.

Figure 3.4-11
Multiuse Path Bridges & Tunnels

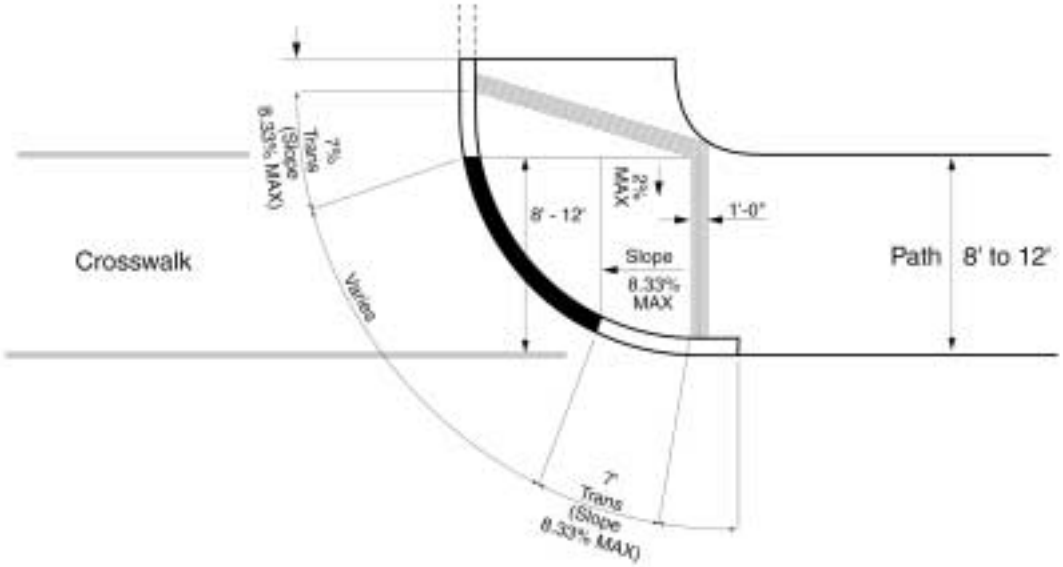
Examples:



Grooving Detail



Path Crossing at Corner Continuing Straight

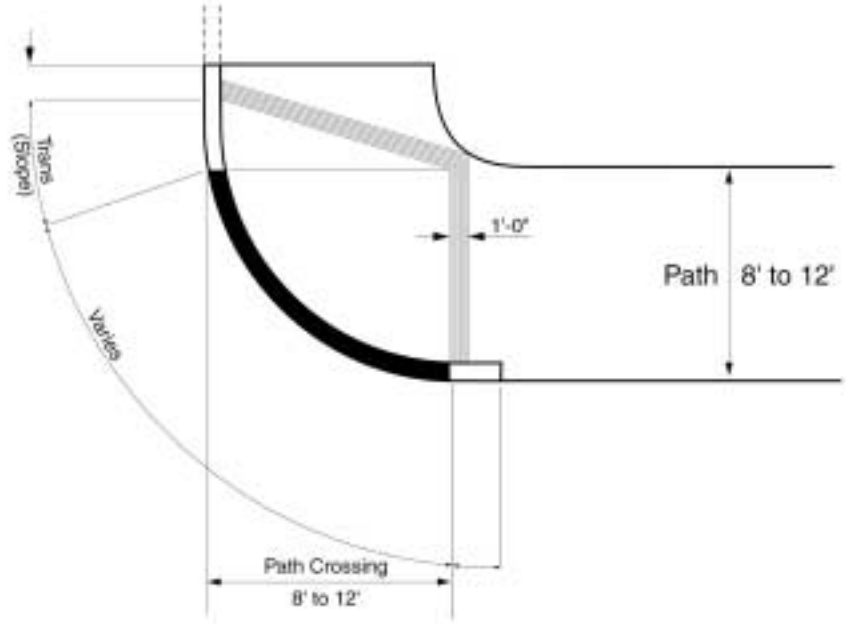


Notes: Where a small elevation change occurs on a path, such as crossing a curb to enter a street, the design shall meet the following:

- The width of the path (minus shoulders) shall equal the width of the center portion of the ramp (minus wings)
- The edges of the path, ramp & any crosswalk shall be a straight line.

Figure 3.4-12A
Ramps for Multiuse Paths

Path Crossing at Corner Then Turning



Path Forced to Come to Corner at Angle

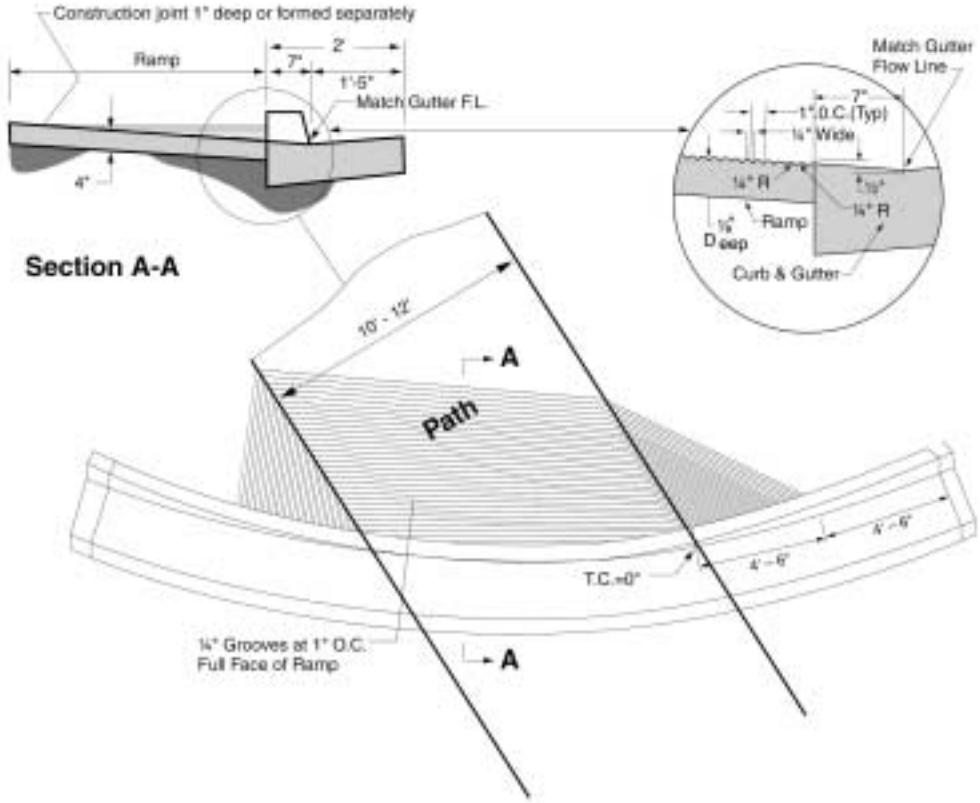
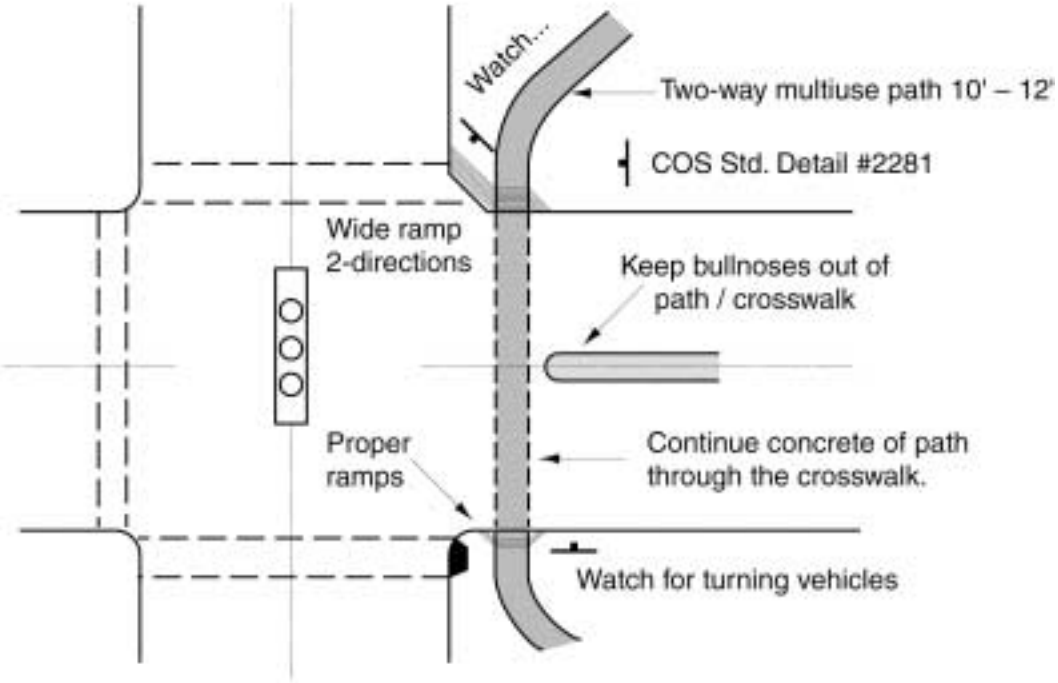


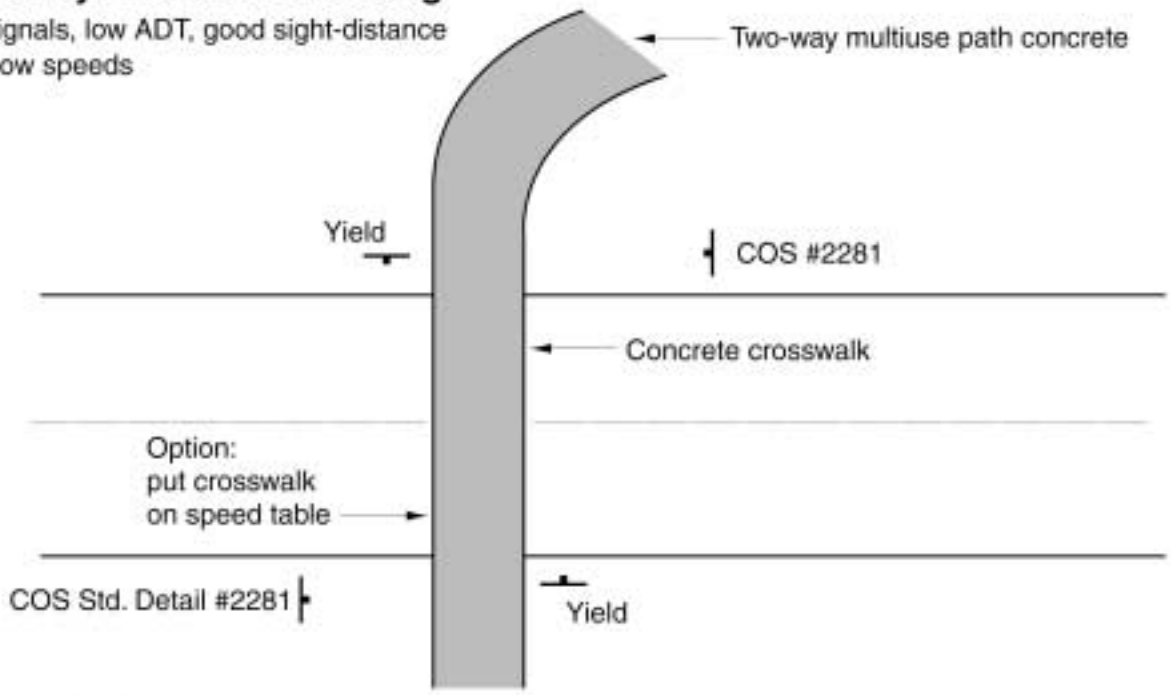
Figure 3.4-12B
Examples of Ramps Options for Paths

Path Crossing at Intersection with signals



Driveway / Midblock Crossing

No signals, low ADT, good sight-distance and low speeds



Note: A midblock crossing on busy, multilane streets will require more safety features, e.g. pedestrian refuge.

Figure 3.4-13
Intersections of Paths & Streets

Safety Rails are Needed Where the Conditions Will Exceed the Below Depicted Limits

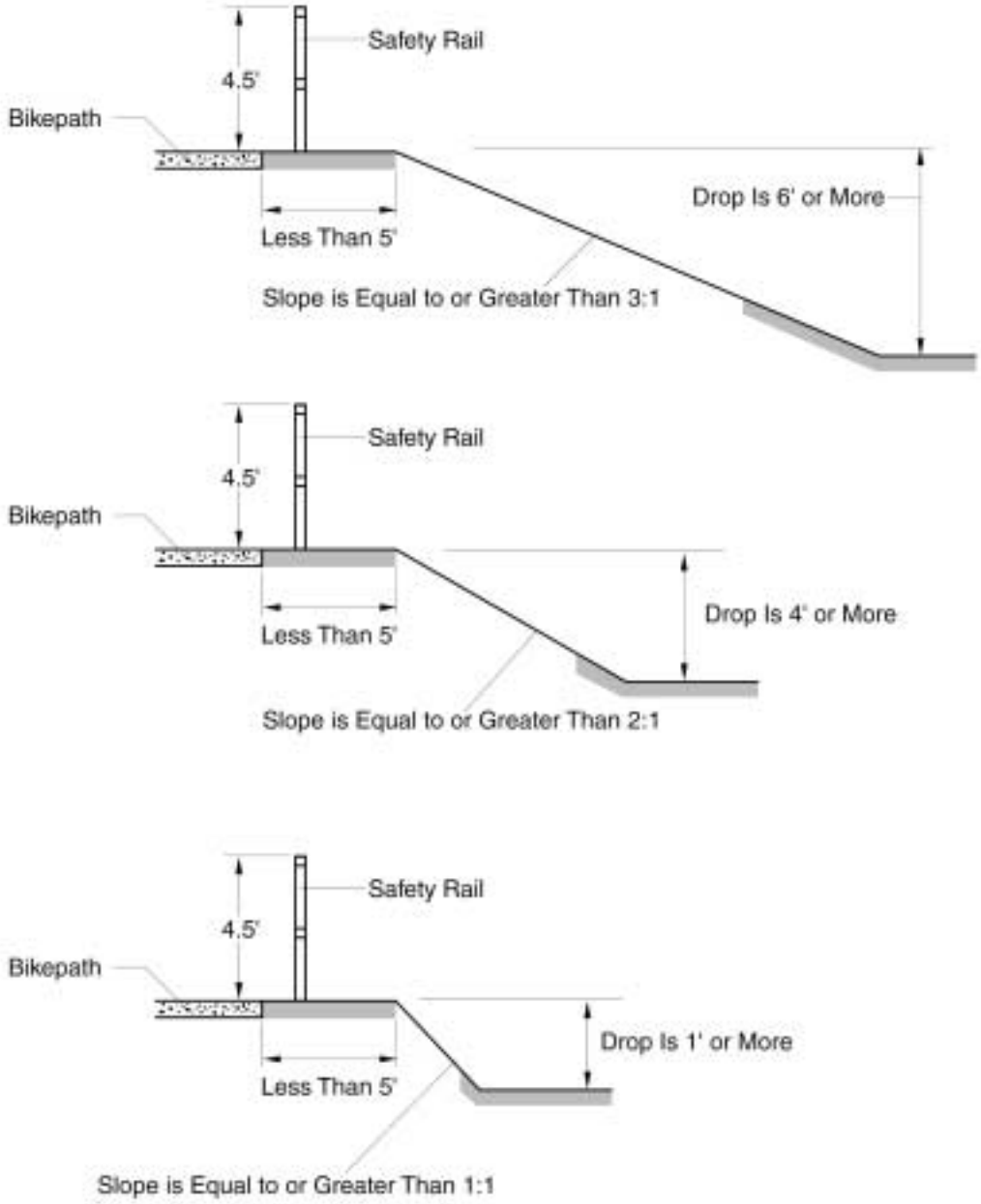
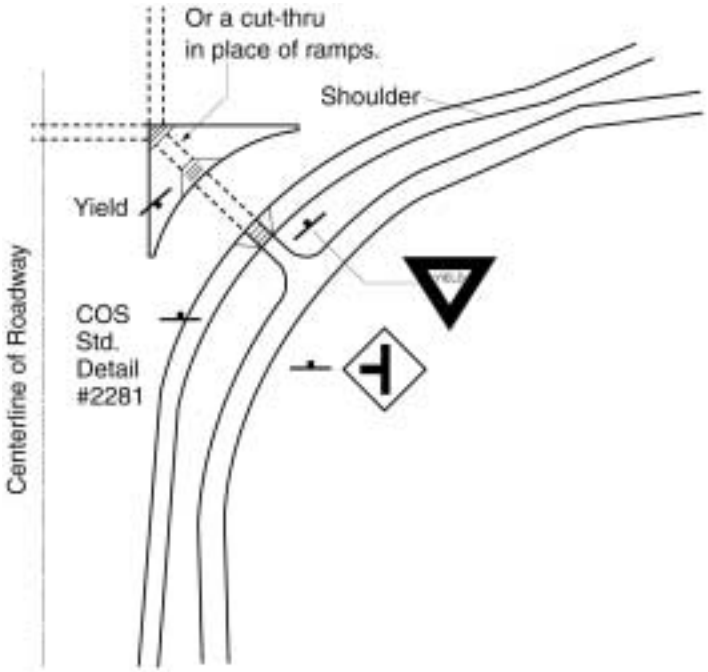
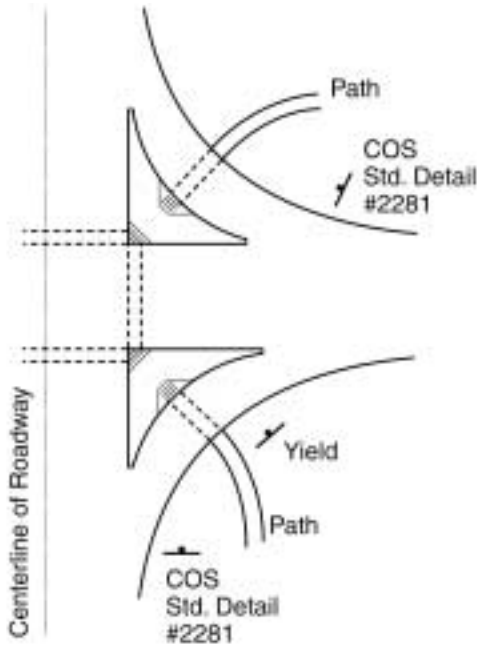
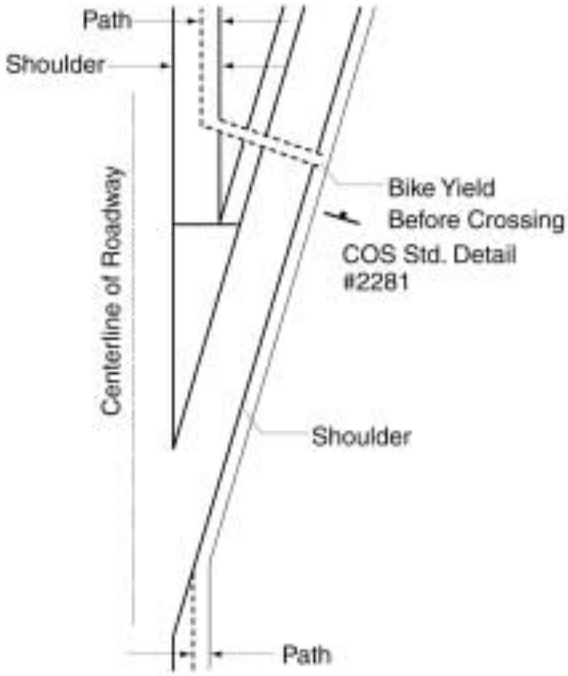


Figure 3.4-14
Multiuse Paths – Safety Rails Along Side Slopes





"Yield" signs or "Watch for Turning Vehicles" as appropriate. Ramps per Figure 3.4-12.



Note: Multiuse path is two-way.
all curb ramps need to be per Figure 3.4-12.
Perpendicular crossings are safest.

Figure 3.4-15
Options for Intersections Paths & Ramps

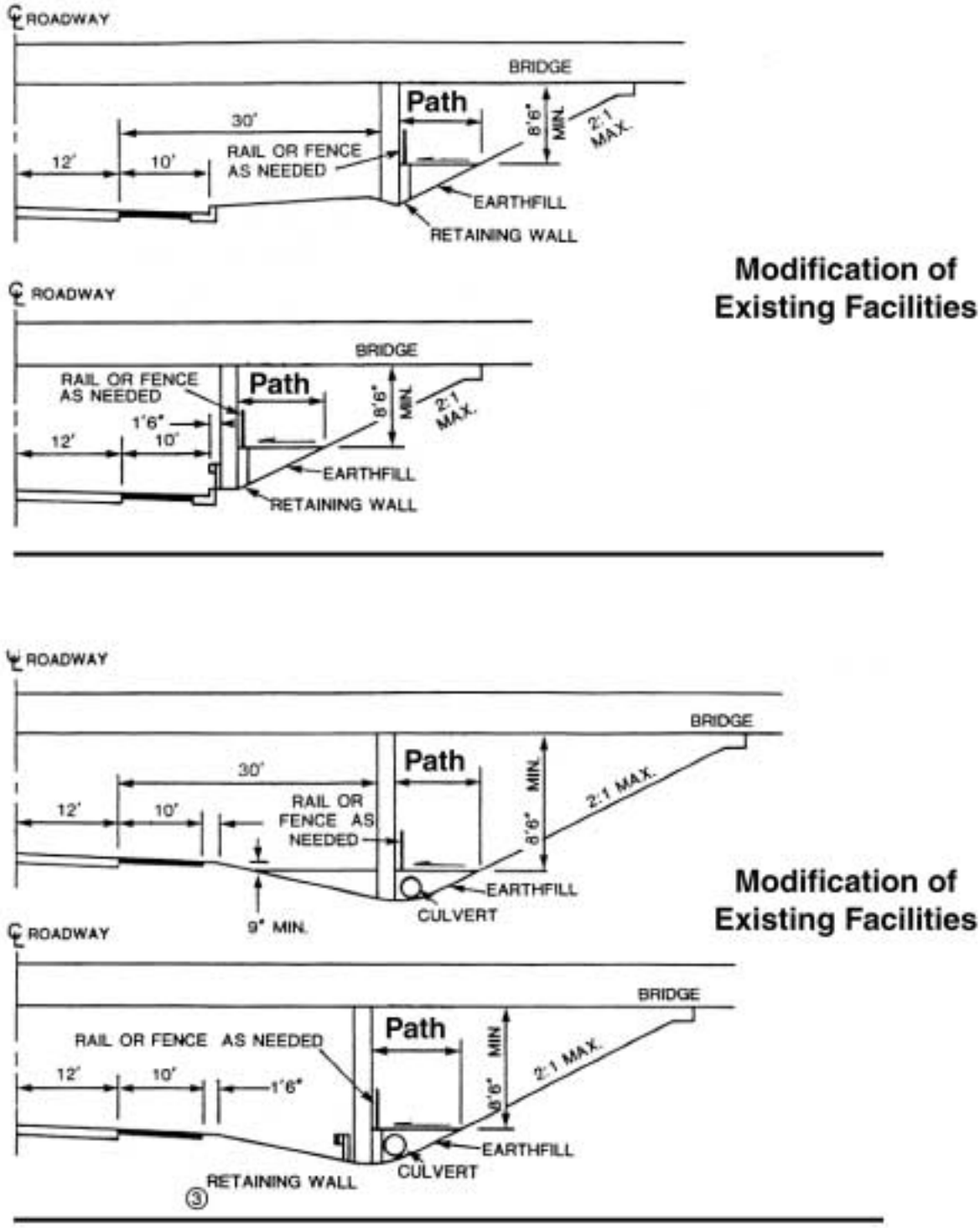


Figure 3.4-16
Under Bridge Structures – Multi-use Paths.

Section 3.5

FLEXIBLE PAVEMENT DESIGN
DESIGN STANDARDS AND POLICIES
REVISED DECEMBER 1999

CHAPTER 3
TRANSPORTATION

SECTION 3.5
FLEXIBLE PAVEMENT DESIGN

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
3-501	GENERAL INFORMATION	1
	A. Definitions	
	B. Methods of Presentation of Standards and Policies	
	C. Street Classifications	
3-502	ASPHALT CONCRETE COURSE	2
	A. Depth and Mix Requirements	
	B. Use of Recycled Asphalt Concrete	
3-503	SOIL TESTING REQUIREMENTS	3
	A. Subgrade Sampling Locations	
	B. Types of Tests	
	C. Pavement Design Report	
3-504	BASE COURSE FOR MINOR STREETS	4
	A. Base Course Design Selection	
	B. Base Course Selection Procedure	
	C. Substitution of Asphalt Concrete for Aggregate Base Material	
3-505	BASE COURSE FOR MAJOR STREETS	5
	A. Base Course Design Charts	
	B. Base Course Selection Procedure	
	C. Substitution of Asphalt Concrete for Aggregate Base Material	
3-506	MODIFIED AASHTO DESIGN PROCEDURES FOR EXPRESSWAYS AND SPECIAL REQUIREMENTS	5
	A. Historical Background	
	B. Assumptions	
	C. Design Parameters	
	D. Design Procedure	

FIGURE LIST

FIGURE	DESCRIPTION
3.5-1	Minimum Depth of Base Course for Local Residential Streets
3.5-2	Minimum Depth of Base Course for Local Collector, Minor Collector, Local Commercial, and Local Industrial Streets
3.5-3	Minimum Depth of Base Course in Inches by Street Classification and R-Values
3.5-4	Design Chart for Flexible Pavements
3.5-5	Illustration of Commercial Vehicle Types

3.5-6 Traffic Loading Calculation Sheet

TABLE LIST

TABLE DESCRIPTION

3.5-1 Minimum Asphalt Concrete Depth Requirements

3.5-2 R-Value and Soil Support Value Relationships

3.5-3 Tabulation of 18K Single-Axle Equivalent Loads by Type of Vehicle

SECTION 3.5
FLEXIBLE PAVEMENT DESIGN

3-501 GENERAL INFORMATION

The purpose of this section is to describe the procedures to be used in the design of structural section of flexible pavements which are to be constructed in Scottsdale's public rights-of-way. Normally, this construction is done by developers of private property in fulfillment of the requirements for development stipulated by the City as a condition for authorization of the development.

A. Definitions

1. "Structural section" means the combination of an asphalt concrete surface course and a base course of either rock aggregate materials or asphalt concrete.

2. "Sub-grade" means native soil or fill material over which the structural section is to be placed.

3. "Asphalt concrete course" means the total depth of asphalt concrete which may be placed in one or more layers. An asphalt concrete course of three or four inches in depth will have two layers which are the asphalt concrete base course (ACBC) and the asphalt concrete surface course (ACSC).

4. "Rock aggregate base material" means the total depth of rock aggregate material which may be placed in one or two layers. If one layer is placed, it will be "Aggregate Base Course" (ABC) in accordance with Table 702 of the MAG Specifications. I f tow layers are placed, the top four inches must be ABC and the bottom layer may be ABC or "Select Material" in accordance with Table 702 of the MAG Specifications. For the sake of brevity, the rock aggregate base material is called the "base course" in this manual.

5. "Minor streets" is a phrase used in this section to refer to a group of streets classified as follows:

   - Local Residential Streets
   - Local Collector Streets

- Minor Collector Streets
- Local Commercial Streets
- Local Industrial Streets

6. "Major streets" is a phrase used in this section to refer to a group of streets classified as follows:

   - Major Collector Streets
   - Minor Arterial Streets
   - Major Arterial Streets

7. "MAG Specifications" are the Uniform Standard Specifications for Public Works Construction distributed by the Maricopa Association of Governments.

B. Method of Presentation of Design Standards and Policies.
The design standards and policies are presented in five parts. These five parts are described below.

1. The first part of the standards and policies, beginning with paragraph 3-502.A., concerns the design of asphalt concrete course.

2. The second part, beginning with paragraph 3-503.A., concerns the soil testing necessary for the design of the base course.

3. The third part, beginning with paragraph 3-504.A., concerns the design of the base course for minor streets.

4. The fourth part, beginning with paragraph 3-505.A., concerns the design of the base course for major streets.

5. The fifth part, beginning with paragraph 3-506.A., contains standards and policies which must be used to design the structural section for an expressway, and , when required by development stipulations, the structural section for certain major streets. These standards and policies may be used, at the option of the design engineer, to design the structural section for any major or minor street.

C. Street Classifications
It is essential to the design process to identify the classification of the street for which the design must be prepared. The basis for this classification is the Circulation Element of the General Plan for Scottsdale. Specific information on street classifications will be provided in the stipulations prepared by the City staff for each proposed development.

3-502 ASPHALT CONCRETE COURSE

A. Depth and Mix Requirements
The asphalt concrete portion of a flexible pavement shall have a minimum depth, number of courses, and mix design called for by street classification in Table 3.5-1 of this section. The mix design references are taken from the East Valley Asphalt Committee Design Standards and from Section 710 of the MAG Specifications and the City of Scottsdale Supplements to MAG. Mix designs and course thicknesses other than those specified in Table 3.5-1 may not be used unless approval to do so is provided by the Project Review Director or appointed designee. Minimum lift thicknesses are also outlined in Table 710-1

of the City of Scottsdale Supplements to MAG Specifications. The mix design and course thicknesses are to be clearly indicated on paving plans for public right-of-way improvements.

B. Use of Recycled Asphalt Concrete
Recycled asphalt concrete may be used in the construction of asphalt concrete pavements in the City of Scottsdale provided that the amount of recycled asphalt mix does not exceed 50% of the total mix required for the job. Recycled asphalt concrete mixes shall conform to City of Scottsdale specifications.

3-503 SOIL TESTING REQUIREMENTS

A. Subgrade Sampling Locations
There should be at least one sample taken at the depth of the planned subgrade for each type of soil found on the project site. There should also be at least one sample for each type of soil used as fill material on which a roadway is to be built. Samples should be taken in locations which the engineer responsible for the pavement design believes will provide an accurate representation of the subgrade which will lie beneath the pavement.

B. Types of Tests
The following tests are required for design procedures indicated and must be performed in accordance with ASTM procedures.

1. In order to use the base course design standards and policies for minor streets described under paragraph 3-504, the following tests are required:

   a. Sieve analysis of each sample is needed to determine the percent passing #200 sieve.

   b. Atterberg-Limits tests are needed for each sample. (The liquid limit and plastic limit to establish the plasticity index.)

2. In order to use the base course design procedures for major streets described under paragraph 3-505, or in order to use the structural section design procedures described under 3-506, R-value testing is required.

   R-value determination shall be made for exudation pressure of 3000psi. Each pavement thickness design must be based on the R-values determined by the tests, and for each length of pavement to be constructed with a constant thickness design, the lowest R-value within that length of pavement will be used. If the engineer elects to not run R-value tests on every subgrade sample, his design report must indicate the basis on which he selected the samples for the R-value tests.

3. Swelling tests are needed if the soil type indicates the presence of soils tending to swell significantly with added moisture.

C. Pavement Design Report
A pavement design report will be required for each development or project in which paving in the public right-of-way is to be done. This report must be submitted with the paving plans (or be a part of them) and it must describe the soil test results and design choices.

The report must include the following:

1. A map of the project area showing identification and location of each sample taken.

2. A description of the soil conditions.

3. A listing of the test results on each sample.

4. A statement of conclusions applicable to the pavement design.

3-504 BASE COURSE FOR MINOR STREETS

A. Base Course Design Charts, Figures 3.5-1 and 3.5-2

There are two design charts for the base courses of minor streets.

1. Figure 3.5-1 is a chart for the design of base courses for Local Residential Streets. The graphic information on this chart is the same as that shown on City of Phoenix Standard Detail P-1102.

2. Figure 3.5-2 is a chart for the design of base courses for:

   - Local Collector Streets
   - Minor Collector Streets
   - Local Commercial Streets
   - Local Industrial Streets

   The graphic information on this chart is the same as that shown on City of Phoenix Standard Detail P-1103.

B. Base Course Selection Procedure
A base course depth is selected for one of the street classifications mentioned above by finding a minimum base depth appropriate to the plasticity index and the percent passing the #200 sieve, which is data determined by the subgrade soils tests. For example: If a minor collector street is to be built on a subgrade soil which has a plasticity index of 12 and 60% of the soil passes the #200 sieve, the base course depth would be 9 inches, according to Figure 3.5-2. A local residential street on the same subgrade soil would have a base course of 7 inches, according to Figure 3.5-1. (Note that the top 4 inches of base course must be ABC.) By referring to Table 3.5-1, we find that at least 2-1/2" inches of 19mm asphalt concrete would be placed over either of these two bases.

C. Substitution of Asphalt Concrete for Aggregate Base Material
If the total structural section depth determined with the use of Table 3.5-1 and Figure 3.5-3 is undesirable, a deeper asphalt concrete section can be used in lieu of some or all of the aggregate base material at a rate of 1 inch of asphalt concrete for 3 inches of aggregate base material. For example: The design for a minor collector street described in the previous paragraph could be changed to a 3-1/2-inch deep asphalt concrete course over a 6-inch deep base course. This reduces the structural section from 11-1/2 inches to 9-1/2 inches.

3-505 BASE COURSE FOR MAJOR STREETS

A. Base Course Design Chart, Figure 3.5-3
The base course depths listed in Figure 3.5-3 are arranged in accordance with the street classifications and the R-values determined in the subgrade testing. The depths were determined by the use of the procedures for design of structural sections described under paragraph 3-506. For a given street classification, the street with the heaviest current and projected traffic loading was used to determine the range of base course depths for all streets of that classification; therefore, it can be said that the base course depths listed in this chart will provide conservative pavement designs.

B. Base Course Selection Procedure
A base course depth is selected for a major street by finding the depth in inches for the appropriate street classification under the proper R-value range. For example: If a major collector street is to be built on a subgrade which has an R-value of 38, according to the tests, the base course would be 12 inches deep. (Note that the top 4inches of the base course must be ABC.) By referring to Table 3.5-1, we find that at least 4-1/4 inches of asphalt concrete must be laid over the base course.

C. Substitution of Asphalt Concrete for Aggregate Base Material
If the total structural section depth determined with the use of Table 3.5-1 and Figure 3.5-3 is undesirable, a deeper asphalt concrete section can be used in lieu of some or all of the aggregate base material at the rate of 1 inch of asphalt concrete for 3 inches of aggregate base material. For example: The design described in the previous paragraph could be changed to a 5-1/4 inch deep asphalt concrete course over a 9-inch deep base course. This reduces the structural section from 16-1/4 inches to 14-1/4 inches.

3-506 MODIFIED AASHTO DESIGN PROCEDURES FOR EXPRESSWAYS AND SPECIAL REQUIREMENTS

A. Historical Background
The American Association of State Highway and Transportation Officials (AASHTO) published a guide for the design of pavement structures in 1961 and a revised guide in 1972. The Arizona Department of Transportation (ADOT) modified the procedures provided in the AASHTO design guide to meet requirements for the State of Arizona. The City of Phoenix uses the ADOT modified procedures and has selected certain design coefficients appropriate to the Phoenix metropolitan area. The City of Scottsdale will also use the ADOT-modified procedures with the City of Phoenix coefficients.

B. Assumptions
As mentioned in paragraph 3-506.A, ADOT uses its own adoption of the procedures outlined in the “AASHTO Guide for Design of Pavement Structures” published in 1961 and revised in 1972. The following assumptions must be made:

1. The soil support capacity of the subgrade soils can be predicted adequately by testing to determine R-values.

2. The R-values can be effectively related to a soil-bearing capacity rating scale called the soil support value (SS).

3. A suitable pavement depth design can be determined by a procedure that considers the soil support value in conjunction with projected traffics loading, environmental

conditions, and weighted structural values for the various components of the pavement structure.

C. Design Parameters

The following design parameters are used to design a pavement:

1. Soil Support Value

   This is a value used to represent the bearing capacity of the subgrade soil. It is determined by a relationship established between its scale and the R-value scale. This relationship is not uniform throughout the country. ADOT has established the relationship shown in Table 3.5-2.

2. Serviceability Index

   This index is a number that represents the surface condition of roadway in terms of ride-ability, cracking, patching, and rutting at some point in its design life. It is used in the design equation to represent the theoretical loss of serviceability over the 20-year design period. The Initial Serviceability Index is 5.0. The Terminal Serviceability Index varies, depending upon the level of service desired. Scottsdale uses a Terminal Serviceability Index of 2.5.

3. The Structural Number

   This is an index number, derived from an analysis of traffic, subgrade soil conditions, and environmental conditions, that is used in conjunction with structural layer coefficients, which are related to the type of material to be used in each layer, to calculate the thickness of a flexible pavement structure consisting of various flexible layers. The following is the equation for the structural number developed from data accumulated by the AASHTO road

   $$SN=-1[\{(10504)(Wt^{0.10684})(R^{0.10684})\}/\{(10^{0.039714(SS-3)}(10^{0.10684(Gt/B)}\}]$$

   WHERE:
   SN=Structural Number
   WT=Total 18,000 pound, single-axle loads
   R=Regional Factor=1.0
   SS=Soil Support Value

   $$B=0.40 + [(0.081*19^{3.23})/(SN+1)^{5.19}]$$

   $$Gt=Log[(P_o-P_t)/(P_o-1.5)]$$

   WHERE:
   P_o=Initial Serviceability Index=5.0
   P_t=Terminal Serviceability Index=2.5

   Since “SN” appears on both sides of the equation, the solution can be most rapidly done by nomograph. Figure 3.5-4 is a nomograph developed by ADOT for this purpose, with a Terminal Serviceability Index of 2.5 and a Regional Factor of 1.0.

4. Projected Traffic Loading

   This is an equivalent daily application of 18,000-pound single-axle loads. All vehicle use data during a 20-year period of time must be converted to equivalent 18K single-axle load applications to be used with Figure 3.5-4. The load applications can be expressed either as a daily 20-year mean or as the total of the load applications

applied over a 20-year mean times 365 times 20. The data required consists of the following:

- Current traffic ADT (traffic flowing in both directions)
- The 20th year ADT (traffic flowing in both directions)
- Percentage of each type of vehicle classification.

The steps described below will provide the vehicle load information which is used in Figure 3.5-4.

a. Determine the average of the current ADT and the terminal year ADT and divide by 2 to arrive at an average ADT in one direction. Express this quantity in terms of thousands of vehicles. For example:

   Current ADT = 19,500 vehicles
   Terminal ADT = 33,000 vehicles

   [(19.5+33.0)/2](0.5)=13.125

b. Calculate the 18K equivalent single-axle load applications using the vehicle distribution percentages determined by a traffic survey and the 18K single-axle load for each type of vehicle listed in Table 3.5-3.

   For example: If commercial vehicles make up 23.9% of all vehicles using the roadway under consideration, heavy four-tire trucks (Type 2S) make up 18.3% of all commercial vehicles, and the Type 2S 18K single-axle equivalent per 1,000 vehicles is 5.8, as indicated in Table 3.5-3, then the load application for this type of vehicle per 1,000 vehicles is:

   (0.239)(0.183)(5.8) = 0.254

c. The sum of all such loads is the equivalent 18K single-axle load per 1,000 vehicles traveling the road. This sum must be multiplied by the average ADT for traffic in one direction calculated in step #a above. The result of this multiplication is the number of daily, 20-year mean, equivalent 18K single-axle loads produced by traffic moving in one direction.

d. If the street has more than one lane in each direction, then the load calculated in subparagraph c above could be multiplied by the following appropriate factor to calculate the design lane load:

   1) If the street is to have two lanes in each direction, multiply the number of equivalent 18K single-axle loads by 0.90 to arrive at a design lane equivalent 18K single-axle loading.

   2) If the street is to have three lanes in each direction, multiply the number of equivalent 18 K single-axle loads by 0.70 to arrive at a design lane equivalent 18K single-axle loading.

e. The calculations described above provide the number of daily equivalent 18K single-axle (20-year mean) loads to be used in Figure 3.5-4.

f. Figure 3.5-7 is an example worksheet illustrating steps a. through e. above. Figure 3.5-6 is a blank worksheet for the design engineer's use.

5. Regional Factor
This factor is used to adjust the Structural Number for climatic and environmental conditions different from those of the AASHTO road test site. The Regional Factor to be used for Scottsdale is 1.0. Since the Regional Factor we are using is 1.0, the nomograph shown on Figure 3.5-4 is an abbreviated form of the nomograph prepared by ADOT. No adjustment of the Structural Number for regional conditions is needed.

6. Structural Coefficients
The components of the pavement structure are assigned structural coefficients to be used with the structural number in developing the design of pavement section. The coefficients shown below were developed by the City of Phoenix from experience, tests, and correlation with information in ADOT design manuals and MAG Specifications.

Local Pavement Component	ADOT Range	Local Coefficient
Asphaltic Concrete (plant mix)	0.34 to 0.46	0.39
Bituminous Treated Base	0.30 to 0.35	0.31
Cement Treated Base*	0.15 to 0.29	0.23
Aggregate Base	0.08 to 0.14	0.12
Select Material	0.05 to 0.12	0.11

*The Cement Treated Base coefficient is for plant mix. If a road mix is used, the percentage of cement to be used must be increased by 0.5%.

D. The Design Procedure

1. Determine the Structural Number (SN) for the pavement to be designed. The following is the method to be used:

a. R-values must be determined by testing and an R-value must be selected for the design. Using Table 3.5-2, select the Soil Support Value (SS) that corresponds to the selected R-value.

b. Calculate the equivalent 18K single-axle load application for the length of the street for which the pavement design is required. The procedure for this calculation is described in paragraphs 3.506.C.4.a. through f. above.

c. Using the Soil Support Value obtained in step #a above, plot that value on the Soil Support Value Scale in Figure 3.5-4.

d. Using the equivalent 18K single-axle, 20-year load total or the daily, 20-year mean traffic loading data obtained in step b above, plot the traffic load on the appropriate scale on Figure 3.5-4.

e. Draw a straight line form the point plotted on the Soil Support Value Scale of Figure 3.5-4 through the point plotted on the equivalent 18K single-axle load scale until it intersects the Structural Number Scale. The Structural Number which can be read at its intersection is the Structural Number to be used for the pavement design.

2. Using the Structural Number, calculate the thickness of the structural components with the following equation:

   C1D1+C2D2+C3D3…CNDN = SN

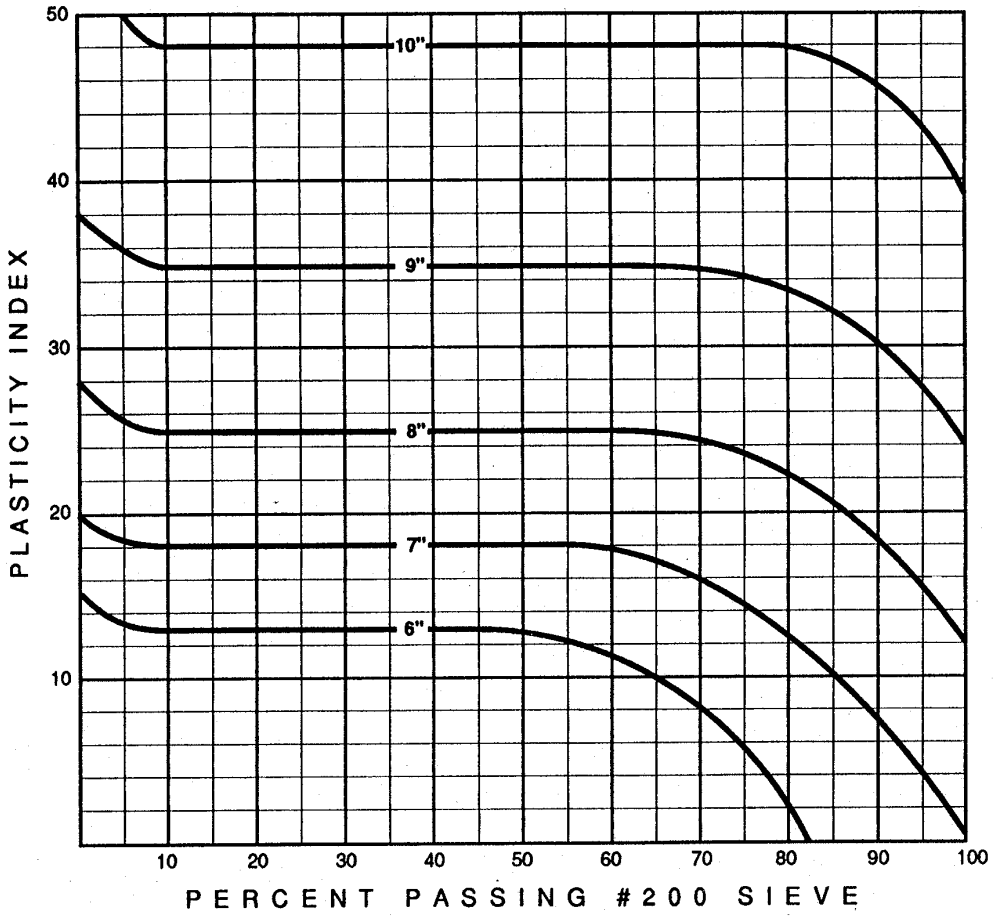
   WHERE:
   C1,C2,C3…=Structural Coefficient from paragraph 3-506.C.6. above.
   D1,D2,D3…=Thickness of Component

   It is necessary to assume the depth of certain elements so that the remaining depths can be calculated. For example: The Structural Number is determined to be 3.2 from Figure 3.5-6 for given soil support and traffic loading conditions, and it has been decided that the asphaltic concrete will be 5” thick and the ABC will be 4” thick. We must determine the thickness of the select material. From paragraph 3-506.C.6. above, we find that the structural coefficients are 0.39 for the asphaltic concrete, 0.12 for the ABC and 0.11 for the select material. The calculation of the thickness of the select material (SM) is accomplished in the following manner:

   C1D1+C2D2+C3D3=SN

   (0.39)(5)+(0.12)(4)+(0.11)(SM)=3.2

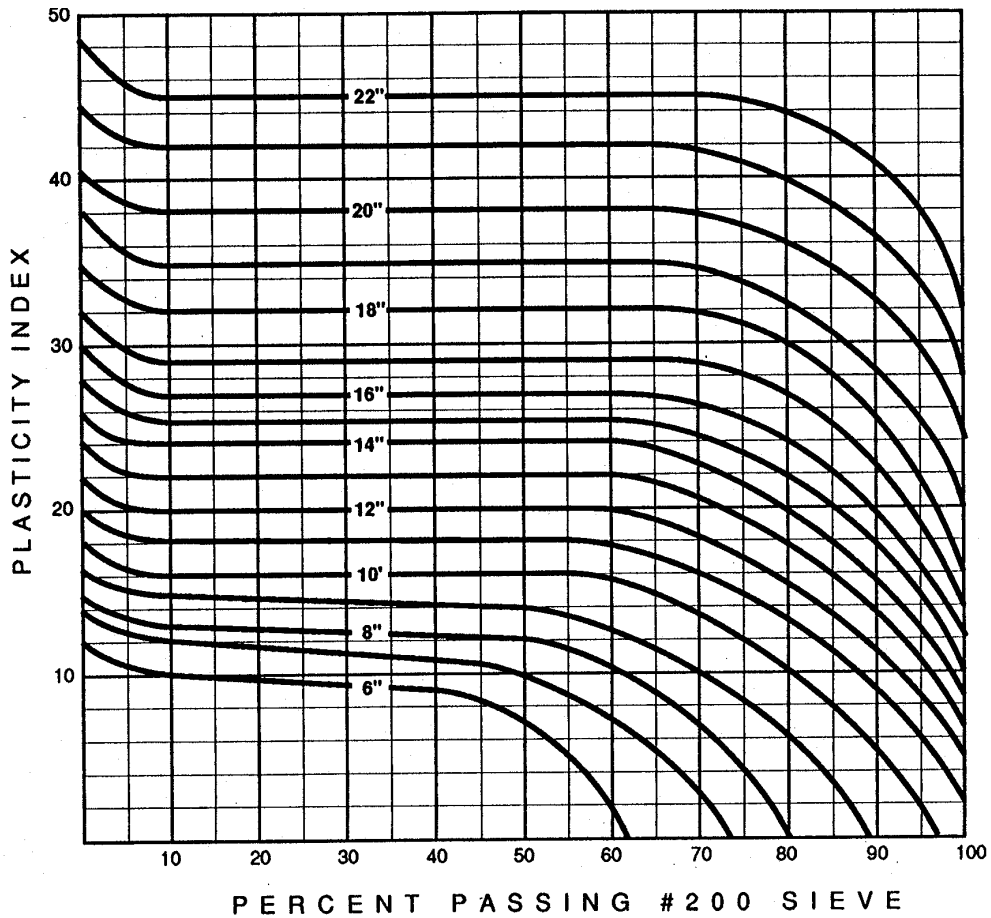
   Solving for SM and rounding off to the nearest inch: SM=7.0 inches



Note: The top 4" of the base course shall be ABC and the balance shall be ABC or select material.

FIGURE 3.5-1

Minimum Depth of the Base Course for Local Residential Streets



Note: The top 4" of the base course shall be ABC and the balance shall be ABC or select material.

FIGURE 3.5-2

Minimum Depth of the Base Course for Local Collector, Minor Collector, Local Commercial, and Local Industrial Streets

Street Classification \ R-Values	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40	40 - 45	45 - 50	50+
Major Collector	26	24	22	20	18	16	14	12	11	10	9
Minor Arterial Major Arterial	29	27	25	23	20	18	16	14	12	10	9

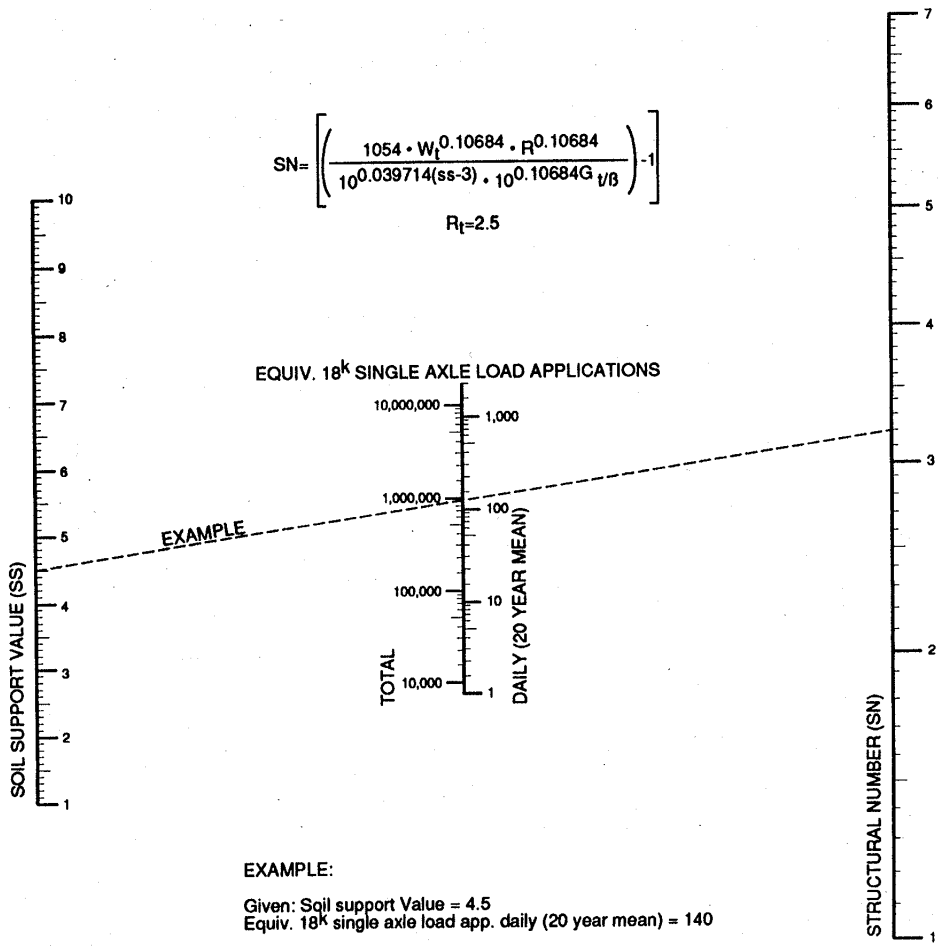
Note: The top four inches of the base course must be ABC. The remaining depth may be either ABC or select material.

FIGURE 3.5-3

Minimum Depth of Base Course in Inches by Street Classification and R-Value

$$SN = \left[\left(\frac{1054 \cdot W_t^{0.10684} \cdot R^{0.10684}}{10^{0.039714(ss-3)} \cdot 10^{0.10684G_{t/\beta}}} \right) - 1 \right]$$

$R_t = 2.5$



EXAMPLE:

Given: Soil support Value = 4.5
Equiv. 18^k single axle load app. daily (20 year mean) = 140

Find SN
(SN = 3.2)

FIGURE 3.5-4

Design Chart - Flexible Pavements, 20 Year Traffic Analysis

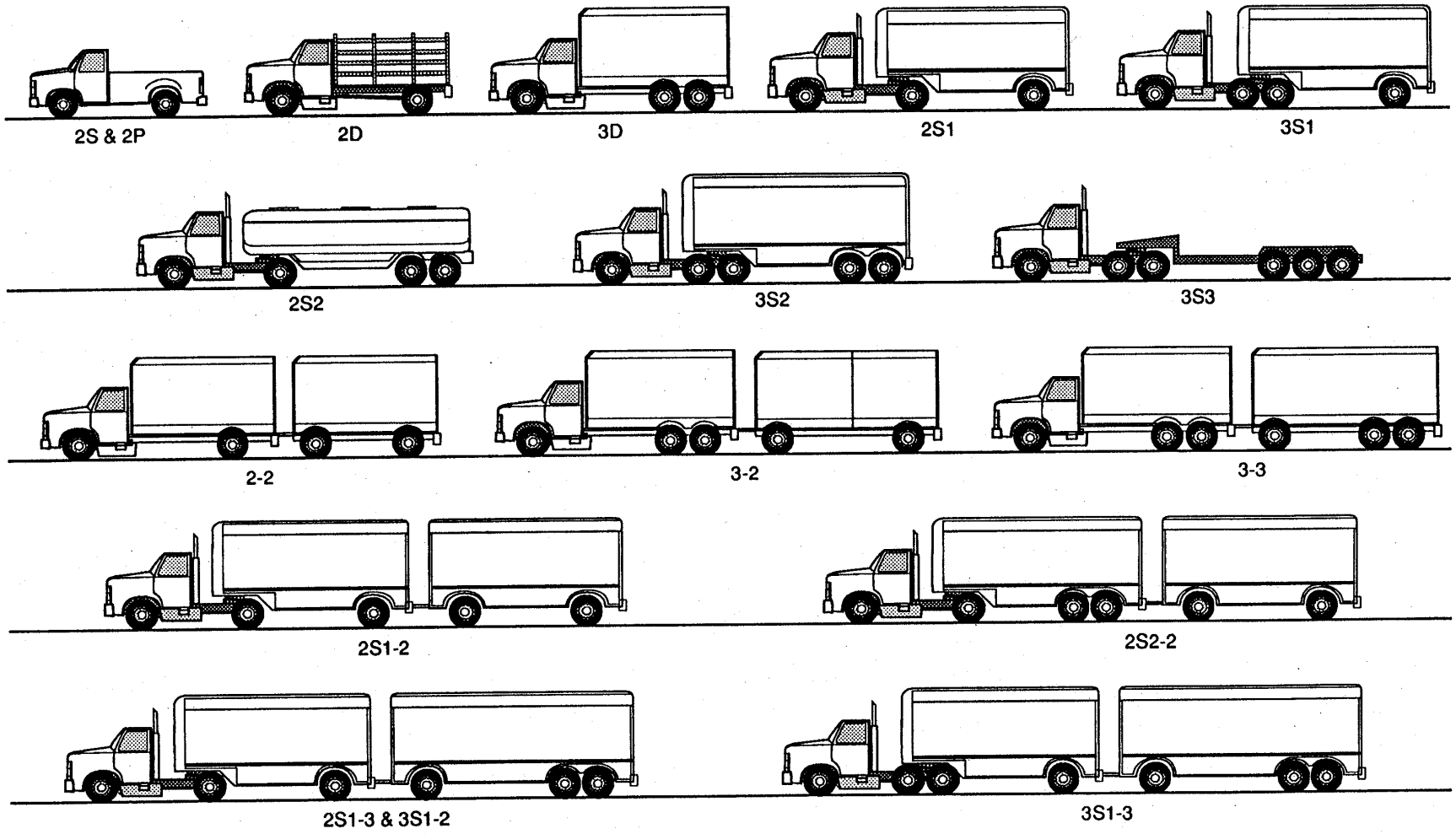


FIGURE 3.5-5

Illustration of Commercial Vehicle Types

TRAFFIC LOADING CALCULATION SHEET

DATE:

STREET NAME AND LOCATION:

STREET TYPE:	CURRENT YEAR AND A.D.T.:	20TH YEAR AND A.D.T.:

CALCULATION OF MEAN, ONE-WAY TRAFFIC (THOUSANDS OF VEHICLES PER DAY):

NOTATION FOR TYPE OF VEHICLE:	PROPORTION BY TYPE OF VEHICLE		18k LOAD BY 1000 VEHICLE	EQUIV. 18k LOAD BY VEHICLE DISTRIBUTION
	PROPORTION THAT ARE COMMERCIAL VEHICLES	PROPORTION BY TYPE OF COMMERCIAL VEHICLE		
			TOTAL OF EQUIVALENT 18^k LOADS PER 1000 VEHICLES:	

CALCULATION OF DAILY, 20 YEAR MEAN, EQUIV. 18^k SIGNLE AXLE LOAD APPLICATIONS FOR ONE WAY TRAFFIC:

CALCULATION OF DESIGN LANE LOADING:

FIGURE 3.5-6

Traffic Loading Calculation Sheet

TRAFFIC LOADING CALCULATION SHEET

DATE:

STREET NAME AND LOCATION:

Shea Blvd., 64th St. to Scottsdale Rd.

STREET TYPE:	CURRENT YEAR AND A.D.T.:	20TH YEAR AND A.D.T.:
Major Arterial	1990-19,500 Veh.	2010-33,000 Veh.

CALCULATION OF MEAN, ONE-WAY TRAFFIC (THOUSANDS OF VEHICLES PER DAY):

$$\frac{19.5 + 33.0}{2} \cdot 1/2 = 13.128$$

NOTATION FOR TYPE OF VEHICLE:	PROPORTION BY TYPE OF VEHICLE		18k LOAD BY 1000 VEHICLE	EQUIV. 18k LOAD BY VEHICLE DISTRIBUTION
C	0.761		0.8	0.609
B	0.0		250.0	0
	PROPORTION THAT ARE COMMERCIAL VEHICLES	PROPORTION BY TYPE OF COMMERCIAL VEHICLE		
2P	0.239	0.599	1.2	0.172
2S	0.239	0.183	5.8	0.254
2D	0.239	0.108	163.2	4.213
3D	0.239	0.067	598.7	9.587
2S1	0.239	0.005	408.2	0.488
2S2	0.239	0.008	956.5	1.829
3S2	0.239	0.005	514.3	0.615
2-2	0.239	0.006	304.3	0.436
3-2	0.239	0.006	936.8	1.343
3-3	0.239	0.003	936.8	0.672
2S1-2	0.239	0.007	846.7	1.417
3S1-2	0.239	0.003	958.0	0.687
			TOTAL OF EQUIVALENT 18k LOADS PER 1000 VEHICLES:	22.322

CALCULATION OF DAILY, 20 YEAR MEAN, EQUIV. 18k SIGNLE AXLE LOAD APPLICATIONS FOR ONE WAY TRAFFIC:

$$13.125 \cdot 22.322 = 292.976$$

CALCULATION OF DESIGN LANE LOADING:

$$0.70 \cdot 292.976 = 205 \text{ (use 200)}$$

FIGURE 3.5-7

Illustrated Traffic Loading Calculation Sheet

Street Classification (Ref. Development Stipulations)	Depth (Inches)	Type of Mix (Table 710-1)	
		Asphalt Base Course	Asphalt Surface Course
Local Residential Local Collector Minor Collector Local Commercial Local Industrial	2-1/2"	N/A	2-1/2" of 19mm
Major Collector	4-1/4"	2-1/2" of 19mm	1-3/4" of 12.5mm
Minor Arterial Major Arterial	5-1/2"	3" of 25mm	2-1/2" of 19mm

TABLE 3.5-1

Minimum Asphalt Concrete Depth Requirements by Classification of Street
Reference Section 710 of the MAG Specifications and City of Scottsdale Supplemements

R-Value	Soil Support Value
0	1.750
1	1.844
2	1.938
3	2.032
4	2.126
5	2.220
6	2.314
7	2.408
8	2.502
9	2.596
10	2.690
11	2.784
12	2.878
13	2.972
14	3.066
15	3.160
16	3.254
17	3.348
18	3.442
19	3.536
20	3.630
21	3.724
22	3.818
23	3.912
24	4.006
25	4.100
26	4.194
27	4.288
28	4.382

R-Value	Soil Support Value
29	4.476
30	4.570
31	4.664
32	4.758
33	4.852
34	4.946
35	5.040
36	5.134
37	5.228
38	5.322
39	5.416
40	5.510
41	5.604
42	5.698
43	5.792
44	5.886
45	5.980
46	6.074
47	6.168
48	6.262
49	6.356
50	6.450
51	6.544
52	6.638
53	6.732
54	6.826
55	6.920
56	7.014
57	7.108
58	7.202

R-Value	Soil Support Value
59	7.296
60	7.390
61	7.484
62	7.578
63	7.672
64	7.766
65	7.860
66	7.954
67	8.048
68	8.142
69	8.236
70	8.330
71	8.424
72	8.518
73	8.612
74	8.706
75	8.800
76	8.894
77	8.988
78	9.082
79	9.176
80	9.270
81	9.364
82	9.458
83	9.552
84	9.646
85	9.740
86	9.834
87	9.928
88+	10.000

This table is based on the equation: $SS = 0.094R + 1.75$

TABLE 3.5-2

ADOT Material Services R-Value and Soil Support Value Relationships

Notation	Type of Vehicle	18k Single-Axle Equiv. per 1000 Veh.
C	Passenger cars	0.8
B	Busses	250.0
2P	Light 4-tire trucks	1.2
2S	Heavy 4-tire trucks	5.8
2D	2-axle, 6-tire trucks	163.2
3D	3-axle trucks	598.7
2S1	2-axle tractor, 1-axle semi-trailer	408.2
2S2	2-axle tractor, 2-axle semi-trailer	956.5
3S2	3-axle tractor, 2-axle semi-trailer	514.3
2-2	2-axle truck, 2-axle semi-trailer	304.3
3-2	3-axle truck, 2-axle full trailer	936.8
3-3	3-axle truck, 3-axle full trailer	936.8
2S1-2	2-axle tractor, 1-axle semi-trailer, 2-axle full trailer	846.7
3S1-2	3-axle tractor, 1-axle semi-trailer, 2-axle full trailer	958.0

TABLE 3.5-3

Tabulation of 18k Single-Axle Equivalent Loads by Type of Vehicle

Source: ADOT weighted arithmetic mean of 197[illegible] 75, and 1976 loadometer data for urban roads.

Section 3.6

Traffic Signs and Markings

Design Standards and Policies
Revised December 1999

Chapter 3
Transportation

SECTION 3.6
TRAFFIC SIGNS AND MARKINGS

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
3-601	Introduction and Definitions	1
3-602	Design Specifications	2
3-603	Design Standards	3
3-604	Standard Plan Layout	4

Figures

3.6-1 Standard Striping Layout
3.6-2 Standard Turning Bay and Trap Lane Layout
3.6-3 Standard Crosswalk Layout
3.6-4 Dual Left Turn Striping Layout

SECTION 3.6
TRAFFIC SIGNS AND MARKINGS

3-601 INTRODUCTION AND DEFINITIONS

This booklet has been prepared to present the criteria and procedures to be utilized by consultants when performing traffic signing and pavement markings design work in and for the city of Scottsdale.

The following abbreviations apply herein:

AASHTO - American Association of State Highway and Transportation Officials

ADOT - State of Arizona Department of Transportation

' AHD - Arizona Department of Transportation Highways Division

City or COS - City of Scottsdale

ITE - Institute of Transportation Engineers

MAG - Maricopa Association of Governments

MUTCD - Manual on Uniform Traffic Control Devices

CAL-TRANS - State of California Department of Transportation

3-602 DESIGN SPECIFICATIONS

The following publications or their current revisions are to be used in conjunction with the design criteria in this booklet when performing traffic signs and markings design work in the City of Scottsdale.

"MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS" - U.S. Department of Transportation, Federal Highway Administration, Current Revision.

"SIGNING AND MARKING" - Standard Drawings, ADOT.

"TRAFFIC CONTROL MANUAL FOR HIGHWAY CONSTRUCTION AND MAINTENANCE" - ADOT 1989.

"MANUAL OF SIGNS APPROVED FOR USE ON STATE HIGHWAY SYSTEM" - ADOT.

"POLICIES, GUIDE AND PROCEDURE MANUAL" - ADOT.

"SUPPLEMENT TO MAG UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" - City of Scottsdale.

"SUPPLEMENTAL STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION" - City of Scottsdale.

"UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION" - MAG.

"UNIFORM STANDARD DETAILS FOR PUBLIC WORKS CONSTRUCTION" - MAG.

“TRAFFIC BARRICADE MANUAL” - City of Phoenix.

3-602 DESIGN STANDARDS

A. General

1. Design shall be in accordance with the MUTCD unless modified by the City as noted herein.

B. Signing

1. All sign posts are to be telespar per COS MAG Supplemental Specification Section 402.

2. Utilize street poles for sign mounting whenever possible.

3. "No Parking" signs shall be R8-3a (12" x 18") modified with a lower arrow plaque. They shall be placed approximately 350-400 feet apart on all arterial and collector street classification 45 degrees to the curb.

4. Speed limit signs (R2-1) are to be installed at 4 per side per mile.

5. Stop signs (R1-1) are to be 30" x 30" minimum size.

6. Street name signs in subdivisions must conform with City colors and standards.

7. Advance street name signs are to be installed at a height of 4 feet to the bottom of sign and placed so that they will not be obstructed by vegetation. Signs shall be installed in medians whenever possible.

8. Median nose signing is to be installed per COS Supplemental Detail No. 2133 as follows:

   a. Type "A" is to be installed at signalized intersections and the first median nose in a succession of medians.

   b. Type "B" is to be used at all other median nose locations.

C. Striping

1. All permanent pavement striping (lines and crosswalks) shall be 60 mil. hot-sprayed thermoplastic. Temporary pavement markings shall be reflectorized traffic paint.

2. All median noses shall be painted per COS Supplemental Detail No. 2225-1, 2225-2, and 2226.

3. COS striping and marking standards are shown in Figures 3.6-1 through 3.6-4.

3-603 STANDARD PLAN LAYOUT

A. General

1. Signing and pavement marking design shall be shown in the same plan view.

2. Plan sheets are to be complete and to scale 1" = 40' unless otherwise approved by the City Transportation Division.

3. Entire length of project is to be shown in plan view. "Typical Sections" representative of striping and/or signing will not be accepted.

4. Signing and pavement marking plans shall include all existing signing and pavement markings for a minimum of 300 feet past the limits of construction and shall include adequate transitions and tapers to maintain traffic at the design speed.

5. The City requires a specific title and signature block to be placed in the lower right corner of each sheet (see Traffic Signal Design, Section 3.2, Figure 3.2-3). The Consultant's title block shall be placed adjacent to the City block.

6. Right-of-way lines shall be stationed and clearly identified.

B. Standard Plan Sheet Notes
These notes along with any additional project specific notes shall be placed on the lead signing and pavement marking plan sheet.

1. All pavement markings, signing, and construction shall conform to Arizona Department of Transportation standard drawings and specifications unless otherwise specified in the "Manual on Uniform Traffic control Devices," latest edition.

2. Traffic control shall conform to the City of Phoenix "Traffic Barricade Manual" and/or as directed by the City Public Works Inspector.

3. Signs shall be installed on telespar posts per COS Standard Detail No. 2131.

4. All signs that are removed and not reinstalled shall be salvaged and delivered to the city of Scottsdale Corporation Yard at 9191 E. San Salvador (Scottsdale).

5. All lane striping, crosswalks, and chevrons shall be 0.060" (60 mil) hot-sprayed thermoplastic, unless noted otherwise on the plans.

6. All pavement symbols, arrows and legends shall be Type I pre-formed pavement markings.

7. Raised pavement markers (RPM's) shall be used on all striped streets. (RPM's) shall be installed per COS Standard Detail No. 2132 and ADOT Standard Drawing 4-M-2.02, with a City approved bituminous adhesive.

8. All existing pavement markings which conflict with proposed markings shall be removed by sandblasting, hydroblasting, or grinding prior to the installation of new pavement markings. Removals shall be to the satisfaction of the City Inspector.

9. "No Parking" signs (R8-3a) with double arrow (or double arrow plaque) shall be installed or reinstalled approximately every 350-400 feet along the length of the project, approximately 5 feet from the back of curb, angled 45 degrees from the roadway. Band to street light poles when feasible.

C. Signing

1. All signs shall be graphically depicted in the direction of travel.

2. All signs shall be stationed and referenced to the appropriate MUTCD sign designation with size noted.

3. New and existing signs shall be visible to traffic for a value equal to 4 times (4x) the Existing or proposed posted speed limit to provide adequate approach visibility. Existing or proposed roadway improvements, vegetation, or structures shall not block traffic sign visibility.

4. Existing signs will be identified to either remain, be removed, or be relocated consistent with note 2 above.

5. Consultant shall field verify all existing advance or approach signing applicable to the project. Reference signs on plan sheet including location or station and note status of sign.

D. Striping

1. Existing striping shall be fully shown (as screened lines or lightly inked pen lines), identified by type and width, and completely dimensioned across roadway.

2. Raised pavement markers shall be graphically shown in plan view and referenced by construction notation.

3. All new striping shall be clearly identified noting color and line width.

4. Striping to be removed shall identified on the plans.

5. All striping shall be fully dimensioned across roadway and tied to a construction centerline or monument line at each side of an intersection.

6. All pavement arrows, legends, crosswalks, etc., shall be located by station or dimension lines.

Skip Lines

4" wide lines, ten feet long, gaps thirty feet.

Short Skip Lines

4" wide white lines, three feet long, gaps ten feet.

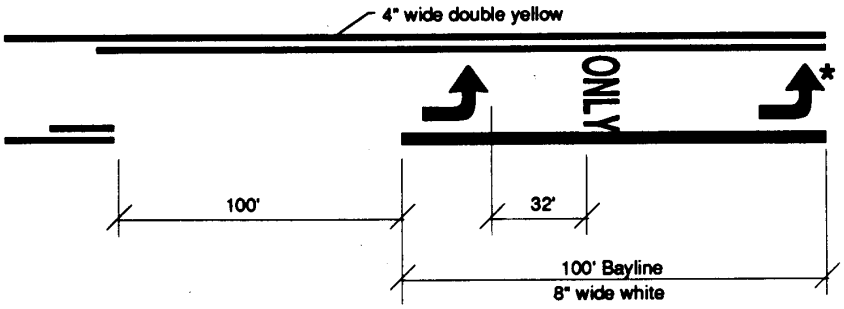
Edge Lines:

4" wide white off the edge of pavement where curbs are omitted.
8" wide white where asphalt tapers for a lane drop, etc.

Two Way Left Turn Lanes

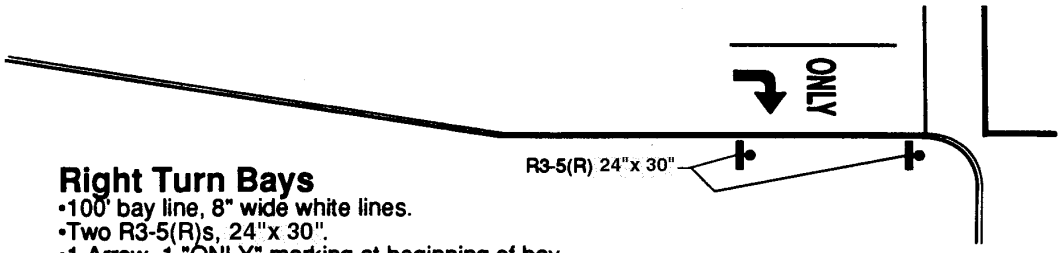
All lines 4" wide yellow, skip lines to follow typical skip line dimensions.

Left Turn Bay (used at signalized intersections and major cross streets)

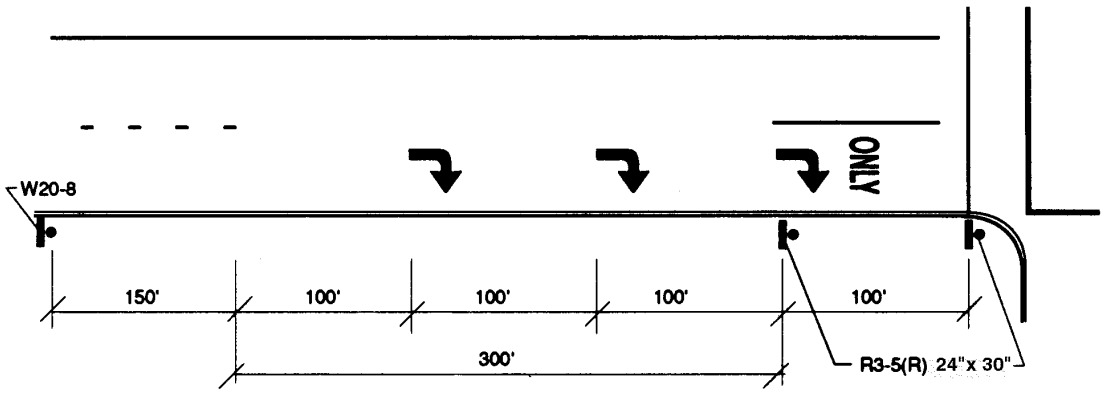


Arrow and "ONLY" to be painted in left turn bays which do not align with opposing left turn bays.
*If bay line is longer than 150', a second arrow is placed at the top of the bay.

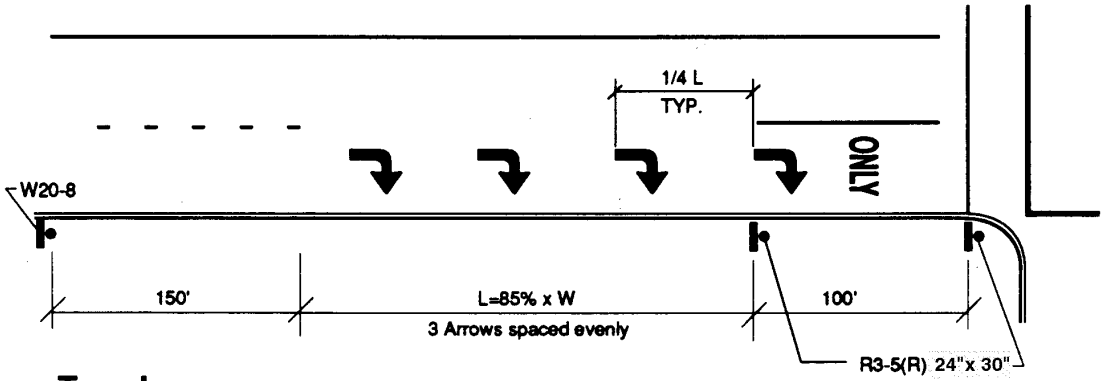
FIGURE 3.6-1
Standard Striping Layout



Right Turn Bays
- 100' bay line, 8" wide white lines.
- Two R3-5(R)s, 24"x 30".
- 1 Arrow, 1 "ONLY" marking at beginning of bay.
- If bay is 150' or more, 2nd arrow to be installed at end of bay.
- For turn bays at stop sign, R3-5(R) not to obstruct stop sign.

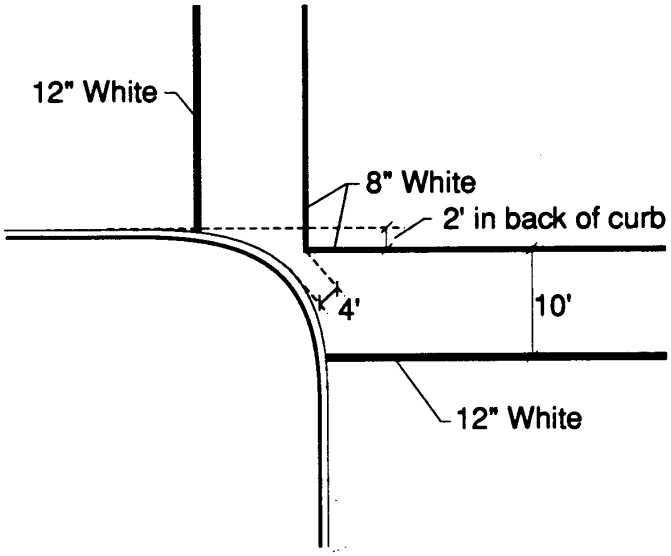


Trap Lanes NTS
40 MPH or less



Trap Lanes NTS
45 MPH or more

FIGURE 3.6-2
Standard Turning Bay and Trap Lane Layout

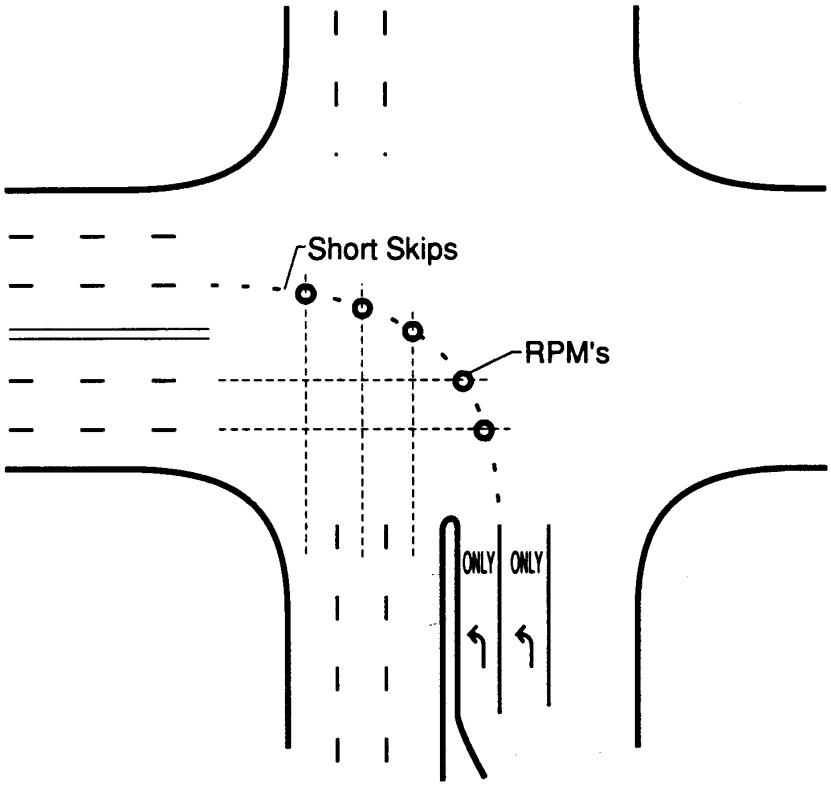


Cross Walk Painting

Cross walks are to be painted at signalized intersections only unless otherwise specified.

FIGURE 3.6-3

Standard Crosswalk Layout



Dual Left Turn Movement

- Paint short skips through intersection.
- Space Raised pavement Markers to align with lane lines or centered in lanes (as shown).

FIGURE 3.6-4

Dual Left Turn Striping Layout

Chapter 4

Water
Design Standards and Policies
Revised December 1999

Chapter 4, Potable Water System Design, provides guidance and minimum design criteria for the modification and construction of the water systems owned and operated by the City of Scottsdale.

Section 4.1

Potable Water System Design
Design Standards and Policies
Revised December 1999

Chapter 4
Water

Section 4.1
Potable Water System Design

Page Index

Section	Paragraph Title	Page
4-100	General Comments	1
	A. Ordinance Requirements	
	B. City Policy	
	C. Reimbursement Agreements	
	D. Oversizing	
	E. Private Water Companies	
	F. Design Reports	
	G. Master Plans	
4-101	Production Systems	6
	A. General Comments	
	B. Wells	
	C. Reservoirs	
	D. Booster Pump Stations	
	E. Pressure Reducing Valves	
4-102	Distribution Systems	7
	A. System Layout	
	B. Design Flows	
	C. Pressure Requirements	
	D. Tract & Easement Requirements	
	E. Pipelines	
	F. Pipe Covers & Separations	
	G. Shutoff Valves	
	H. Fittings	
	I. Service Lines	
	J. Culvert and Utility Crossings	
	K. Sampling Stations	
	L. Backflow Prevention and Cross Connection Control	
4-103	Fire Protection Requirements	14
	A. Fire Flow Requirements	
	B. Hydrant Locations	
	C. Fire Lines	
	D. Auxiliary Storage Tanks	

FIGURES LIST

Figure	Description

4.1-1 Map of Water Service Areas
4.1-2 Pressure Zone Map
4.1-3 Average Day Water Demand Per Dwelling Unit in GPD

SECTION 4.1
POTABLE WATER SYSTEM DESIGN

SECTION 4-100 GENERAL COMMENTS

This document provides guidance and minimum design criteria for the modification and construction of the water systems owned and operated by the City of Scottsdale. It is intended for use in the planning, design and planning preparation processes.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY REQUIREMENTS.
Engineering Bulletin #10, “Guidelines for the Construction of Water Systems”, and, Engineering Bulletin #11 “Minimum Requirements for Design, Submission of Plans, and Specifications of Sewerage Works” published by the Arizona Department of Environmental Quality, contain specific requirements for submittals, approvals, and notifications. It shall be the responsibility of the developer to comply with these regulations and requirements.

a. Prior to submitting Final Plans for City Approval, the developer shall provide "Certificate of Approval to Construct Water and/or Wastewater Systems”. This approval is provided by the Maricopa County Environmental Services Department and shall appear on the cover sheet of the improvement plans.

b. Prior to performing inspections, the developer shall submit evidence that “Notification of Starting Construction” has been submitted to the Maricopa County Environmental Services Department. This evidence will be on a document developed and date stamped by the County.

c. Prior to issuing a Letter of Acceptance, the developer will provide the Maricopa County Environmental Services Department the following documents:

   - The Engineers Certificate of Completion with all test results, analysis results, and calculations as indicated on the form.
   - A "Request for Certificate of Approval of Construction" of Water/sewer Lines with all appropriate quantities and As-Built for the facility when field changes have occurred which modify the approved plans.

d. The developer shall then provide the City's Inspection Services Division with a "Certificate of Approval of Construction" signed by the Maricopa County Environmental Services Department and a copy of the As-Built drawings.

A. ORDINANCE REQUIREMENTS

The developer shall install, at his/her expense, all on-site improvements necessary to service the development. This may include pump stations, reservoirs, transmission mains, pressure reducing valves and other facilities necessary to service the development. This includes payment of all required development fees. The City may elect to participate in the cost of oversizing of any pipeline in accordance with City ordinance requirements. See Section D. Oversizing, Page 2 of this section for more detail.

Each lot in a subdivision shall be supplied with a safe, reliable and potable water in a sufficient volume and pressure for domestic use and fire protection. This shall be verified by the Engineer by performing a flow and pressure test of that part of the potable system to be extended. The flows and pressure must meet minimum requirements for domestic and fire flow requirements. This shall be verified on the cover sheet of the plans by the Engineer. See Sections C (Pressure Requirements) and D (Design Flows) in Section 4-102 in the Distribution System section.

If the residence is to be supplied with domestic service and with fire flows from a storage tank of facility, the engineer must provide a report indicating that sufficient volumes exist as required by Rural-Metro Corporation and are available to meet calculated fire demands as defined by the engineer.

Upon development of the property for which City water and/or sewer is desired and available, the developer shall submit a plan for the water and/or sewer system prepared by a professional engineer licensed in the State of Arizona.

The City requires water mains to be installed along the entire length of the property line frontage of the property to be developed, where future extension of the line is possible. The property line frontage is that portion of the property along a public right-of-way and/or public utility easement. If a parcel to be developed has more than one frontage, the City shall also require improvements to be installed the entire frontage(s).

For current information on ordinance requirements, review of Chapter 48 (Subdivisions) and Chapter 49 (Water, Sewer and Sewerage Disposal) of the Scottsdale Revised Code is recommended.

B. CITY POLICY

Proposed developments determined by the City to have strong impact on the water system shall be analyzed on the current City's Master Plan computer model at the developer's expense. The effects of peak and fire flows from these developments will be examined to ensure proper sizing and layout of proposed water system facilities to meet the demands imposed by large-scale developments. Please contact the Water Resources Department at 391-5685 for more information.

C. REIMBURSEMENT AGREEMENTS

There is established a program for extension of City water and sewer systems to newly developed areas and subdivisions inside the City's service area for which City water or sewer service is desired and available. This program provides for reimbursement agreements with

developers and property owners and for the collection of line reimbursement charges. The elements of the extension policy and program are set forth in Article V of Chapter 49 (Water, Sewer and Sewage Disposal) of the Scottsdale Revised Code and shall apply to all extensions of the City water and sewer systems.

Reimbursement Agreements are set up through the City's Project Review Department. Please contact the Project Review Department at 994-7080 for more details on procedures to initiate the agreement.

D. OVERSIZING

Oversizing of water and sewer lines may be required by the City. Article V of Chapter 49 (Water, Sewer and Sewage Disposal) of the Scottsdale Revised Code provides for such oversizings and specifics that the City may participate in the cost of oversizing, provided there are sufficient funds in the Capital Improvements budget.

Oversizing typically occurs where water or sewer extensions are proposed on mile and half mile (section and mid-section line) streets, or areas with projected future growth. All oversizing projects involving City funds must have an oversizing agreement and meet existing City requirements prior to plan approval and construction. Contact the City Water Resources Department at 391-5685 for oversizing agreements and plan & construction requirements.

E. PRIVATE WATER COMPANIES

Portions of Scottsdale's municipal service area are provided water service by private water companies. Figure 4.1-1 in the Appendix delineates those areas.

Privately owned and maintained water lines shall not be located in the street right-of-way (R.O.W.) or a Public Utility Easement (PUE).

Modifications or construction of water systems within private water company franchise areas should be reviewed by the subject company. The City cannot provide water service within private water company franchise areas. Scottsdale will not review private water systems unless requested by the owner, except for fire protection systems. In cases where the City of Scottsdale is requested to review private water systems, the applicable review fees must be paid and a note placed on the drawing delineating operation and maintenance responsibilities.

F. DESIGN REPORTS

A design report memorandum shall be required. The design report shall present necessary information concerning:

- design assumptions & computations
- demands
- pressures and flows
- cathodic requirements
- right-of-ways or easement that are being provided

The objective of the report is to provide sufficient background information to adequately review the project.

G. **MASTER PLANS**

A copy of the accepted, signed Master Plan shall be submitted when final civil plans are submitted.

When required by the City, a Master Water Plan and Report shall be prepared in accordance with the City's Design Standards and Policies Manual by a professional engineer registered in and licensed to practice in the State of Arizona. The master plan report shall address, but not be limited to the following:

1. The Master Plan will become the basis for a Water and Wastewater Service Agreement between the developer and the City of Scottsdale when such agreement is required by the City. This agreement will specify terms and requirements for water and wastewater service to the development. The introduction to the report should state this.
2. All development projects shall be responsible for determining their specific water system needs and include surrounding developments to ensure there is no strain on the system. Service for proposed developments shall not be provided at the expense of existing customers and the water master plan shall verify this.
3. A computer water network model, using the EPANET or H20NET program, for the analysis of pressure and flows in pipe distribution systems, shall verify that adequate pressures and flows will be available within the development. In addition, if certified flow tests performed on the system which the project is to be connected do not show that sufficient capacity exists, the computer model shall be used to determine the required on-site and off-site facilities such as pump stations and pipelines necessary to serve the project. If the proposed development requires a change in zoning which increases density or proposes a water system different from the City's existing Water Master Plan, then additional off-site calculations will be required. All model data shall include the following:

3.

- Demands shall be calculated according to densities shown in Figure 4.1-3, Average Day Water Demands per Dwelling Unit.
- The system shall provide maximum day demands (2.0 times average day demand) plus fire flow. The fire flow used in all calculations should be 500 gpm residential and 1,500 gpm multi-family and commercial per Fire Code.
- Verification of the ability to provide peak hour demands (3.5 times average day demands) shall be provided.
- The minimum required pressure throughout the water distribution system is 50 psi at the highest finished floor elevation. A residual pressure of 30 psi is allowed under fire flow conditions
- Pipe line calculations shall verify that head loss per one thousand (1,000) feet of any pipe shall not be more than ten (10) ft/ft during peak period demand conditions and not more than eight (8) ft/ft under any maximum day conditions.
- Sufficient supply for demand must be provided without the use of dedicated fire pumps or back-up pumps. Calculations which include both domestic demand plus fire flow may use fire pumps as a portion of the supply.
- A computer disk containing all calculations shall be submitted along with the Master Plan report.

4. Each Master Plan map must show the following:

    - All proposed on-site and off-site facilities including, but not limited to, pump stations, transmission and distribution mains and reservoirs.
    - Proposed street locations, parcel boundaries and proposed lots within each parcel.
    - Contour lines at two foot intervals showing the elevation of the land surface. Sufficient information must be provided to evaluate network node elevations.
    - All pressure zone boundaries, (see figure 4.1-2), Pressure Reducing Valves (PRV's) (showing pressure differentials) and corresponding zone valves.
    - P.R.V. size and pressure settings shall be indicated on the plans by the design engineer.
    - A separate area location map shall be provided showing existing and proposed streets, as well as existing parcels surrounding the project to a distance of one mile from the exterior boundaries of the project. Assessor's maps can be provide the information required to prepare these composite maps.
    - The scale of all maps must be sufficient to show all required information clearly.

5. All water lines which cross golf courses or other open areas must do so within established roads. If dedicated roads are not practical, then the crossing must be within twenty (20) foot wide accessible easement within a tract. No walls shall cross these easements.
6. The Water Master Plan must show compliance with Section 49-199 of the Scottsdale Revised Code to construct pipeline, if not already in place, across all dedicated frontages of the development.
7. A construction schedule shall be included in a table format for all water related construction required to serve the development. The schedule shall have each phase or parcel as column headings and each construction project or system component as right-of-way (ROW) headings. A mark in each box shall specify when each constructed item will be required for each phase of the development.
8. Compliance with the adopted City Water System Master Plan encompassing the respective area.
9. Those Master Planned Developments that design a distribution system that will be phased shall provide a synopsis of the phasing to the Water Production Division of the Water Resources Department upon acceptance of the Water Master Plan.

More specific information regarding water plan requirements and/or the City's current Water System Master Plan, please contact the City of Scottsdale's Water Resources Department at 391-5685.

4-101 PRODUCTION SYSTEMS

A. Unless otherwise agreed to in writing by the City Asset Management Coordinator, each tract or lot dedicated to the city shall be: (1) conveyed by a general warranty deed, and (2) accompanied by a title policy in favor of the City, both to the satisfaction of City staff as designated by the Asset Management Coordinator.

B. WELLS

The City shall be notified of any proposed well drilling and review plans of all proposed groundwater wells. Under the Arizona Groundwater Management Code, the Arizona Department of Water Resources (ADWR) regulates all groundwater wells in Arizona. Before drilling and installing a well, a "Notice of Intent to Drill" and "Application for a Drilling Permit" must be obtained from and filed with ADWR. The well must subsequently be registered with ADWR. Forms and additional information are available from ADWR Operations Division, phone 542-1581.

B. RESERVOIRS

Storage facilities must provide emergency fire protection and maximize the use of water production facilities. Therefore, storage in each pressure zone shall exceed each of the following criteria.

- Three hours fire flows reserve + 25% of maximum day demand, or;
- One average day demand

C. BOOSTER PUMP STATIONS

Booster pumps shall be designed and required to maintain adequate pressure for domestic and fire protection water supply. City of Scottsdale pump system criteria and details are available at the Water Production Division of the Water Resources Department at 391-5650. All stations shall provide at a minimum, chlorination equipment, variable frequency drive pumps, backup power supply and telemetry compatible with the Water Resources Department current system. Designers shall refer to Engineering Bulletin No. 10 by the Arizona Department of Health Services for additional design criteria.

A preliminary or basis of design report shall be prepared and submitted to the City for acceptance prior to final design. This report shall outline the type of equipment and controls proposed for the station. A final design report prepared by a registered professional engineer licensed in Arizona must accompany all pump station design drawing.

D. PRESSURE REDUCING VALVES

Reference figure 4.1-2 for determining pressure zone boundaries. Pressure Reducing Valves (PRV's) shall be required to maintain pressures within the distribution system. Distribution systems shall not be designed to operate at pressures in excess of one hundred-twenty (120) pounds per square inch (psi). PRV's shall be designed in accordance with the criteria delineated in City of Scottsdale Supplemental Detail No. 2342-1 and 2342-2.

The City of Scottsdale operates its system from wells and pumps that commonly have pressures exceeding 80 psi. Changes in demand, supply and the distribution system also vary the pressure at single family residences.

The City requires all buildings to have a PRV installed on the service line. A written variance request may be submitted to Water Resources for their review and concurrence or denial. The Uniform Plumbing Code requires a pressure regulator when local water pressure exceeds 80 psi.

4-102 DISTRIBUTION SYSTEMS

The Water Distribution System owned by the City of Scottsdale operates on a grid system. This grid shall consist of water mains sized as follows unless otherwise approved by the Water Resources Director or his designee.

Mile and half-mile alignments shall be minimum twelve (12) inch.
Quarter mile alignments shall be minimum eight (8) inch.
Water lines located in the county shall be a minimum eight (8) inch.
All other frontages shall be minimum six (6) inch.

Water mains shall be extended across all frontages upon development of a property if an approved source is within six hundred sixty (660) feet.

When lines 12 inch or larger are required, the City may participate in the cost of oversizing. All water lines shall be sized per the adopted City Master Plan and as such may require changes in required water line sizes.

A. SYSTEM LAYOUT

Hydrants, meters, blow-offs and valves shall not be located in washes, detention / retention areas, driveways or sidewalks. All existing water services and or appurtenances shall be utilized by the development or abandoned by disconnecting at the main. In general, tees shall be removed and replaced with an appropriate pipe section. Services shall be excavated at the main and isolated and abandoned at the corporation stop.

Hydrants shall have depth of burial of three and one-half (3.5) feet.

To provide appropriate water pressures and water circulation, all new water mains shall be designed in a loop configuration as required. See figure 4.1-2 for water pressure zone boundaries.

In general, water lines shall be on the north and east side of the right-of-way, two (2) feet behind the curb, sidewalk, roadway or approved by the Water Resources Department.

All water lines shall be aligned parallel to property lines or street center lines and shall not cross and recross the center line except in cases justifiable to the City. Water lines shall be located in water and/or sewer easements located within tracts and in areas where permanent twenty (20) foot minimum access for maintenance purposes are maintained.

Long, straight reaches of transmission mains shall be marked every 440 feet with an electronic marker. Installation of an electronic marker may be omitted when valve locations permit identification of pipeline location.

All water service lines shall be located within two (2) feet of the property line adjacent to adjoining parcels water service line.

B. DESIGN FLOWS

Design flows for transmission mains shall be based in the current City Master Plan to provide for the water system's ultimate demands. Calculations of the flows for the specified development will be calculated to ensure that the existing supply is sufficient to meet proposed development. All improvements necessary to meet proposed flows to include pumping stations, reservoirs, lines and appurtenances are to be part of the design.

Peak flow calculations on transmission mains shall be based on maximum day flows including fire flow, in accordance with the City of Scottsdale Fire Code. See figure 4.1-3 for average day demand flows.

Design flows for all distribution systems shall be based upon existing flows and pressures as documented by the engineer. The engineer must have a flow test performed by a private company who will certify the results in writing to the city. These flows will be used by the engineer for the design and the design report for all water line projects. These flows and pressures will be stamped on the plans and be submitted to the city. **Prior to acceptance by the City, all platted subdivisions shall conduct an additional flow test at the lowest and highest elevation available in which the development is constructed. Developments that cross pressure zone boundaries shall conduct a flow test in each pressure zone as outlined above. The results of this test with a copy of the improvement plans shall be submitted to the Inspection Services Department for subsequent review by the Water Operations Department. Flow test to be conducted during high water use - 6:00 A.M. to 8:00 A.M.**

C. PRESSURE REQUIREMENTS

Pressure extremes in water systems result in potential for contamination to enter the network. Low pressures in the water system may allow polluted fluids to be forced into the system. High pressures may cause ruptures or breaks in some elements of the network. The normal working pressure in the distribution system should not exceed one hundred-twenty (120) psi.

Domestic systems shall be designed to maintain a minimum residual pressure of fifty (50) psi at the highest finished floor level to be served under all flow conditions. (Minimum pressure for fire protection may differ. See section 4-103.A of this manual.)

All water mains and service lines shall be designed for a minimum normal internal working pressure of one hundred-fifty (150) psi plus appropriate allowance for water hammer.

Water hammer may produce momentary pressures greatly in excess of normal static pressures, thus increasing the probability of water main failure. Suitable provisions shall be made to protect the system from water hammer pressures. The occurrence and severity of water hammer can be reduced through the use of slow-closing valves, pressure-release valves, surge tanks, variable frequency drives, soft start motor controllers and air chambers.

In cases where greater than the above noted maximum pressures are required for effective operation, all elements of the system shall be design accordingly. Pressure information for existing water lines may be obtained by having a flow test performed on the system. These tests shall be performed by a private fire protection company who must certify the results and submit them to the City for approval. Contact the Project Review Division at 994-7080 to

obtain a list of those firms who will provide the flow test which is to be performed at the developer's expense.

An encroachment permit issued by the Development Services Department (994-2500) is necessary to perform the test and the City shall be notified a minimum of forty-eight (48) hours before the test by contacting Water Operations at 391-5650.

D. TRACT & EASEMENT REQUIREMENTS

No water lines shall be installed in an easement unless the Water Resources Department has approved in writing the placement of the line(s) in an easement(s) and the property owner has granted the necessary easement(s) and/or right-of-way.

Water lines outside of public rights-of-way may be placed in twenty (20) foot, minimum width, easement within a dedicated tract, with a minimum of six (6) feet between the water line and the edge of the easement and shall be accessible from a public right-of-way. The easement shall be free of obstructions, shall not be located in a fenced area and shall at all times be accessible to City service equipment such as trucks, backhoes, etc. Areas in question shall be approved in writing by the Water Resources Department.

Abandonment of water and/or sewer easements will adhere to the following criteria.

1. A letter requesting the abandonment of the easement and reason for the abandonment shall be submitted to the Water Resources Department with the following exhibits:

a) Detailed map depicting the easement to be abandoned shall be highlighted and the locations of both water and sewer lines shall be shown in reference to the easement in question.

b) If water and/or sewer lines are to be abandoned, a detailed civil plan prepared by a professional engineer licensed in the State of Arizona must be supplied describing the method of abandonment.

2. A letter will be issued stating approval or denial of the abandonment request, certain stipulations may be required in conjunction with the abandonment, and will be stated in the letter from Water Resources Department.
3. The individual will be responsible for submitting original packet with Water Resources Department decision to the Project Review Department for final approval.

Failure to supply the above noted criteria and exhibits will result in denial of the request.

All existing water services and or appurtenances shall be utilized by the development or abandoned by disconnecting at the main. In general, tees shall be removed and replaced with an appropriate pipe section. Services shall be excavated at the main and isolated and abandoned at the corporation stop.

Water line easements located within tracts shall have a ten (10) foot wide hardened path with a cross-sectional slope not greater than 10%. The hardened path shall consist of native soil with 95% compaction and compacted for a depth of one (1) foot from the surface.

E. PIPELINES

Water distribution lines six (6) inch through twelve (12) inch in diameter shall be asbestos-cement (ACP) or ductile iron (DIP). All ACP and DIP pipe shall be at least Pressure Class 150.

Large diameter pipe - sixteen (16) inch and larger may be DIP, mortar lined steel, steel cylinder pretensioned pipe or a City of Scottsdale approved substitute.

Fire line services (three-inches and larger), and all hydrant connections shall be constructed of ductile iron pipe, minimum Class 150 or equal to or greater than the supply line class. C-900 pipe is acceptable for “Fire Lines” only when on-site of the project. If any water line is under a paved area, DIP will be used.

Ductile iron pipe may be required in cases where pipelines could be subjected to heavy external loads. These include, but are not limited to, deep pipelines and pipelines in the roadway alignment which would be exposed to heavy construction vehicle loads prior to paving. The use of PVC C-900 is prohibited in the City of Scottsdale.

Design specifying installations using ductile iron pipe or any metallic pipe, without wrapping, must address soil corrosivity and shall require testing in accordance procedures of the American Ductile Iron Pipe Research Association to determine corrosiveness of the soil. Such tests shall be submitted to the City with the final plans and specifications to determine if cathodic protection is required in the design. As a minimum, polyethylene protection per AWWA C105 will be used on all ductile iron pipe.

The minimum size water distribution mains allowed in the City of Scottsdale shall be six (6) inches. The minimum size water distribution mains allowed in the County is eight (8) inches.

F. PIPE COVER & SEPARATIONS

Mains twelve (12) inch in diameter shall have a minimum cover of forty-eight (48) inches over the top of pipe. Mains larger than twelve (12) inches in diameter shall have a minimum cover of sixty (60) inches over the top of pipe. Water mains in industrial areas or in major collectors and arterial streets shall have a minimum of sixty (60) inches over the top of the pipe. In other locations, mains smaller than twelve (12) inches in diameter shall have a cover of thirty-six (36) inches over the top of pipe unless otherwise approved by the City of Scottsdale’s Project Review Department. All water lines twelve (12) inches or larger shall be marked with locating tape.

Concrete encasement of any water line is prohibited unless approved by the City of Scottsdale’s Water Operations Department.

Cover for water mains shall be measured from existing or proposed finished grade of pavement or natural ground, whichever measurement is greater and results in adequate pipe protection during construction.

Caution should be taken in design and construction to protect all water supplies from wastewater contamination.

When PVC or ACP water lines are exposed during construction and the bedding is disturbed , the water line shall be changed out to ductile iron pipe (minimum Class 150) with mechanical joints or flanged joints.

Where conditions prevent adequate horizontal and vertical separation, both the water and sewer line will be constructed of ductile iron pipe (minimum Class 150) with restrained joints.

Separation of water and electrical or gas lines shall conform to City of Scottsdale Detail #2372.

G. SHUTOFF VALVES

Shutoff isolation valves shall be installed on water mains at locations within the distribution system which allow sections of the system to be taken out of service for repairs or maintenance without significantly curtailing service in other areas. Special consideration should be given to the number of fire hydrants taken out of service. A sufficient number of valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves shall be located such that any section of the system can be isolated by closing no more than four (4) valves.

Maximum spacing of water distribution main isolation valves shall be as follows:

1. In commercial, multi-family and industrial areas, valves shall be located at not more than five hundred (500) foot intervals.
2. In single-family residential areas, valves shall be located at not more than one block or not more than eight hundred (800) foot intervals, whichever is less. In higher density developments, closer spacing may be required.

Maximum spacing of water transmission main isolation valves shall be as follows:

1. At every one mile section line, a cross shall be installed with a valve on each side of the cross.
2. Valves between the main section line shall be located at not more than one thousand three hundred twenty (1,320) feet apart.
3. No valves shall be installed in sidewalks.

Any special spacing must be approved in writing by the City Water Resources Department.

All mains branching from feeder mains or loops should be valved adjacent to the feeders so that the branch mains can be taken out of service without interrupting the supply to other locations. At intersections of distribution mains, the number of valves required will normally be one less than the number of radiating mains; the un-valved branch is usually the line which principally supplies flow to the intersection. Shutoff valves shall be installed in standardized locations so they can easily be found in emergencies. For butterfly shutoff valves sixteen (16) inches or larger in diameter, it shall be required to surround the valve operator or the entire valve with a manhole to allow for repair or replacement. Per City of Scottsdale standard detail #2305, valved by-pass lines are required on all valves sixteen (16) inches or larger in diameter. In important installations and for deep pipe cover, entrance access manholes shall be provided so that the internal valve parts can be serviced.

Valving shall be provided to allow isolation of lines crossing major washes, railroads, major highways, bridges and airports. A valve shall be provided on each hydrant branch.

Resilient wedge gate valves are required for all valves twelve (12) inches or smaller. Sixteen (16) inch or larger valves may be low torque resilient wedge gate valves or butterfly valves. All valves sixteen (16) inches or larger shall have by-passes.

Pressure rating on valves shall be equal to or greater than the pressure rating of adjacent pipe.

All valve boxes shall be Type C, MAG Detail 391-1, with locking lids. All valves shall be installed with debris caps. The handle color shall be blue to indicate valve type. Acceptable manufacturer is SW Services or approved equal.

H. **FITTINGS**

Capped dead end lines shall be tapped with a flushing device as per MAG Standard Detail 390, Type “B”. Valves on dead end lines which may be extended should be provided with two full lengths of pipe between the valve and the plug for lines twelve (12) inches and larger and one full joint for lines smaller than twelve (12) inches. Blow-off valves, fire hydrants, or other suitable means shall be installed at the end of dead-end mains to allow periodic flushing of the lines. Flushing devices shall not be located in washes, detention / retention areas, sidewalks or driveways.

Air release valves shall be installed at all changes in slope of water transmission mains eight (8) inches or larger in diameter, as follows:

1. When water line changes from a positive slope to a zero slope in primary direction of flow.
2. When water line changes from a positive slope to a negative slope in primary direction of flow.
3. When water line changes from a zero slope to a negative slope in a primary direction of flow.
4. For vertical alignment changes to undercross or overcross another facility (i.e., utility, drainage washes, etc.), please refer to Item J (Culvert and Utility Crossings) in this section.

NOTE: Slopes less than or equal to 0.002 ft/ft shall be treated as zero slopes.

In the absence of any changes in slope, air release valves shall be installed not more than 2,640 feet apart.

All air release valves shall be a combination air / vacuum release type detail 2348 of the City of Scottsdale’s Supplemental Standard Details.

No water line shall be deflected either vertically or horizontally, in excess of that recommended by the manufacturer of the pipe or coupling without the appropriate use of bends or offsets. Fittings may be required where more than two pipe lengths are deflected.

Thrusts on pipelines with unrestrained joints occur wherever a bend or branch outlet exist. If the lengths of pipe are joined by tension joints, such as welded joints in a steel pipeline and lugged joints in concrete pipelines and cast-iron pipelines, other forms of anchorage may not be required. The determination of whether or not a given section of pipeline needs restrained joints or other means of anchorage shall be made by qualified professional engineer and approved by the City. All thrust anchorages shall be designed for a safety factor of not less than 1.50 under maximum pressure loading. Thrust blocks will not be allowed on the system. Joints will be restrained with restraining systems approved by the City’s Water Operation Department and restraint length shall be submitted to the City’s Project Review Department at the time of plan submittal.

All horizontal changes in direction in water lines shall be marked with an electronic marker. Valve locations permit adequate identification of pipeline location (typically at crosses and tees). Electronic markers shall be a self-leveling type and operate on a frequency of 145.7 kHz and detectable at a depth of four (4) feet. An electronic marker shall be placed at the center of all fittings at a depth of three (3) feet.

I. **SERVICE LINES**

Water service lines and meters shall not be located in driveways, sidewalks, washes or retention / detention areas. Branch service tees are not allowed.

Installation of water service taps shall be in accordance with City of Scottsdale Detail No. 2330 and 2345. The water service(s) and meter(s) shall be sized based on the total demand placed upon the system by the developed parcel(s). For commercial developments, water used for irrigation shall be separately metered. Connection of two or more meters or services in a manifold configuration is prohibited. Water services lines shall be a one (1) inch minimum unless otherwise approved by the Water Operations Department.

Due to the City's water billing rate structure, meter sizes shall not exceed the size of the service (i.e. a one and one-half (1-1/2) inch meter will not be allowed on a one (1) inch service. Extra attention is recommended when sizing services for custom home lots where meter sizes often exceed one (1) inch.

Construction plans must indicate location of meter service lines and sewer taps to each unit referenced with stations and dimensions from the street center line or monument line. Location of sewer service relative to the water service shall also be shown.

No service connections or fire protection systems shall be made to water lines fourteen (14) inches or larger in diameter or to water lines designed solely to transmit water from one pressure zone to another pressure zone.

All galvanized iron and polyethylene water service lines is sizes three-quarter (3/4) inch through two (2) inch which are exposed during construction shall be replaced in their entirety with Type "K" copper tubing. This will include the replacement of iron service saddles with bronze saddles and the replacement of both the corporation stop and the meter stop in all cases.

In general, all water service lines shall be located within two (2) feet of the property line adjacent to adjoining parcels water service line, at the edge of right of way, perpendicular to the water main.

J. CULVERT AND UTILITY CROSSINGS

For minimum clearance under culverts, storm drains and other utilities, please refer to City of Scottsdale Details #2370 and #2372. The crossing shall be constructed of Ductile Iron Pipe and shall not be deflected or swept. Air release valves and isolation valves shall be installed as per the following.

1. Isolation valves shall be installed on each side of the vertical realignment to minimize disruption of service should the crossing need to be isolated for maintenance or repair.
2. For dead-end water lines, air release and isolation valves will be required on both sides of the vertical realignment.
3. For all other applications, air release valves will be installed at a location calculated by the engineer to release any air trapped in the system.
4. Tees, service lines and other appurtenances shall not be located within the vertical realignment.
5. Special attention shall be given to vertical realignments on existing waterlines to avoid conflict with the distribution system. Vertical realignments over twenty-five (25) feet in length (bottom measurement) shall be constructed offset from the existing line and tested

per MAG and C.O.S. specifications prior to connection. All changes in direction shall be horizontal or vertical.

K. **SAMPLING STATIONS**

Sampling stations are to be located in all new residential sub-divisions as determined by the City of Scottsdale Water Resource Department. Developments are required to contact the Water Quality Division at 480-312-5685 prior to Preliminary Plat submittal. The sampling stations are to be located mid-street, three (3) feet behind the sidewalk, on the property line, perpendicular to the R.O.W., and shall be located within the right-of-way. It shall be constructed per the City of Scottsdale Standard detail #2349 of the MAG supplemental specifications. A sampling station will be required for all platted subdivisions of twenty (20) dwelling units or more as determined by the Water Resource Department. One sampling station will be required for every three hundred (300) dwelling units or portion thereof. A large development constructed in phases will be required to install the sampling station on the first phase and each subsequent phase when the dwelling units for all phases constructed exceed 300 units. Manufacturer of these sampling stations shall be Koraleen or approved equal with a stainless steel ball valve.

L. **BACKFLOW PREVENTION AND CROSS CONNECTION CONTROL**

To determine the requirements for backflow protection, please refer to the City of Scottsdale Ordinance No. 3117. For installation requirements, please refer to the most current set of City of Scottsdale Supplemental Standard Detail for Public Work Construction.

4-103 FIRE PROTECTION REQUIREMENTS

A. **FIRE FLOW REQUIREMENTS**

Water distribution facilities shall be sized to deliver a minimum fire flow of one thousand five hundred (1,500) gallons per minute (gpm) to commercial, industrial and multifamily residential properties, one thousand (1,000) gpm for properties located in the county and a minimum of five hundred (500) gpm to one and two family dwelling unit residential properties. These fire flow requirements are based on the requirements of the City of Scottsdale Fire Code in fully sprinklered developments.

B. **HYDRANT LOCATIONS**

The spacing of fire hydrants is to be measured along the street or roadway in which a fire hose would be laid. Generally, this spacing is measured along the curb line.

Fire hydrant locations shall be stipulated by the local authority, The following standards shall be used as guide:

1. The spacing of the fire hydrants in developments consisting of lots with single family residences on each lot shall be no more than one thousand two hundred (1,200) feet.
2. In commercial and multifamily developments, hydrants shall be spaces a maximum of seven hundred (700) feet apart for the entire perimeter of the development.
3. The spacing of the fire hydrants in the county shall be no more than six hundred (600) feet.

4. Two-way, reflective blue raised pavement markers must be provided to identify the location of the fire hydrants, in accordance with the information in figure 4-7. These markers are readily available from businesses providing highway marker materials.
5. Dead-end lines one thousand (1,000) feet or less may be six (6) inch minimum diameter provided adequate pressure and flow rates are maintained.
6. Dead-end lines shall not be longer than 1,200 feet in length.
7. Fire hydrant runs or fire lines shall not be utilized for sprinkler service.
8. Auxiliary fire hydrant valves must be connected to the main water line by flanged tee.

Please contact Rural Metro for any Fire requirements.

C. **FIRE LINES**

Location of on-site fire lines and taps should be determined by the site relationship of the fire department connection, riser location, emergency access and fire hydrant locations. Size of fire lines shall be determined by City design criteria and flow test data provided by the engineer for the design of the project. Fire systems must include a back flow prevention device.

Four (4) blueline print sets of plans for on-site fire lines, including the back flow prevention device, shall be submitted to the fire protection authority for review and approval prior to installation. Design shall be based on a flow test as per section 4-103.A of this manual, but may be submitted after permit is issued. The drawings shall be of uniform size (24-inch by 36-inch) and shall be drawn to scale. One set of the approved civil water plans shall accompany this submittal.. Applicable City of Scottsdale and NFPA construction notes shall also be included on the working drawings.

Installation will be per approved working plans. Any deviation from approved plans will require written permission of the authority having jurisdiction.

Inspections will be per NFPA 24 and as may be required by the local fire protection authority.

Fire lines will not be connected to transmission mains that are 14 inches or larger.

D. **AUXILIARY STORAGE TANKS**

Pressures and discharge flows required by Rural-Metro Corporation will be for a minimum of two (2) hours for commercial projects and may require a fire pump package installation when the building's construction type, occupancy fire load commodities' classification, volumetric building areas, building height and individual square footage areas per floor level produce a pressurized fire flow demand in excess of the water transmission mains capabilities.

For residential storage requirements see Section 4-100.A, ordinance requirements.

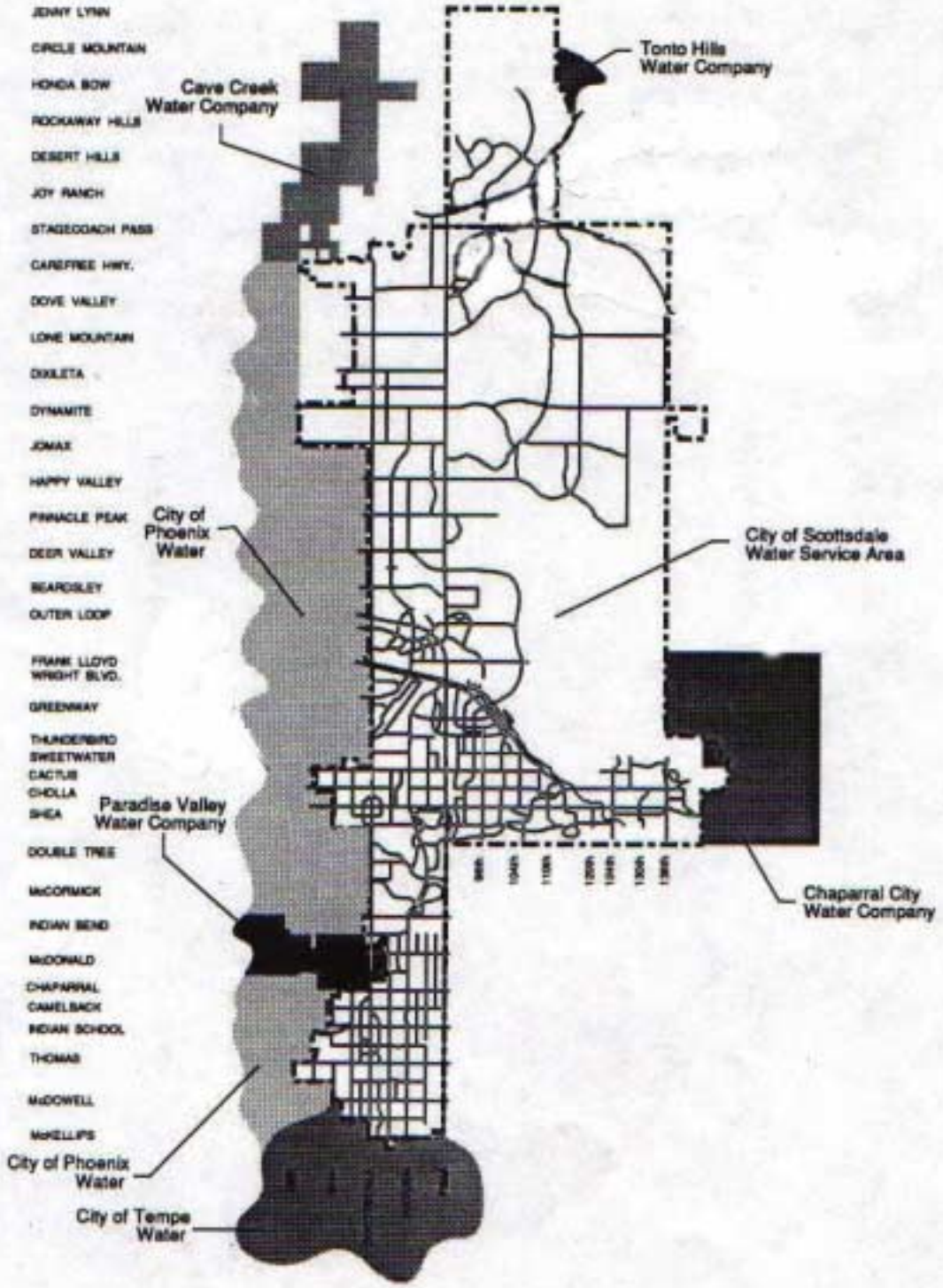
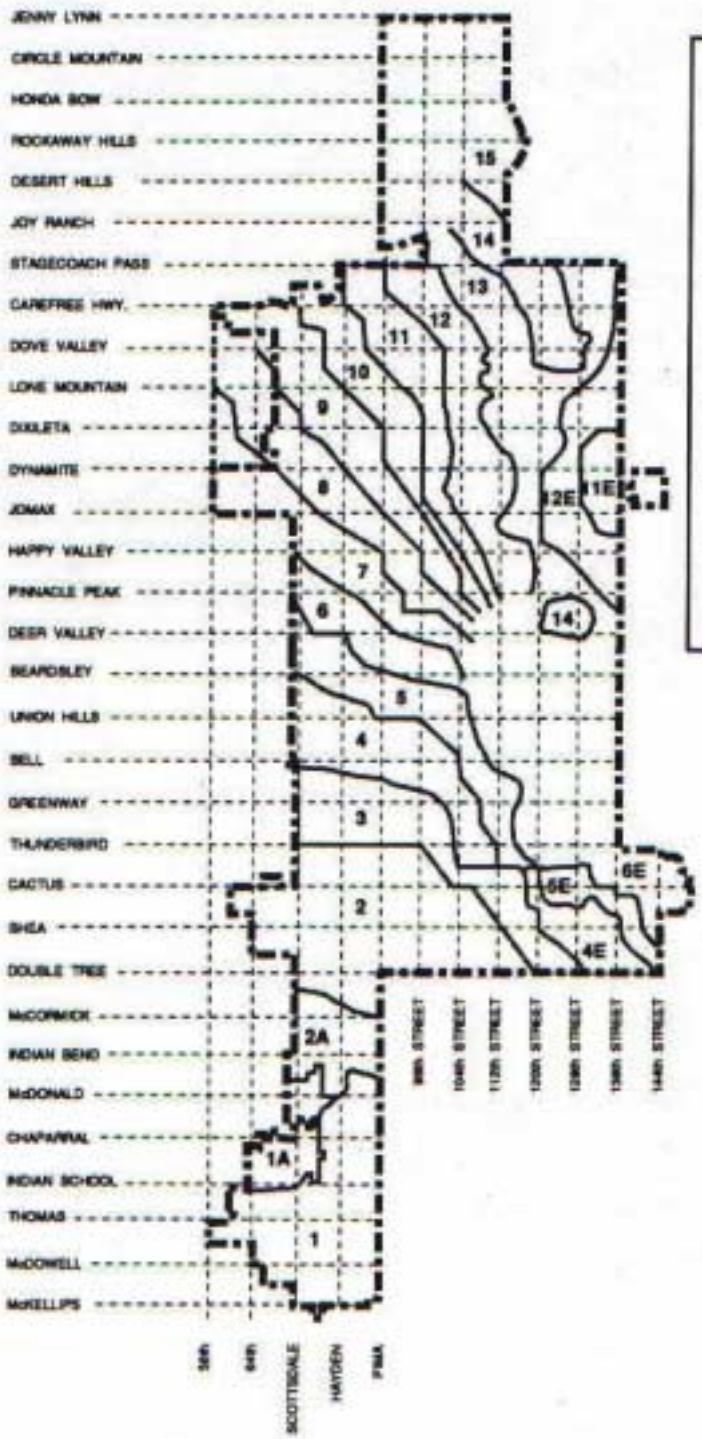


FIGURE 4.1-1

Map of Water Service Areas - March 1994



Zone	Ground Elevation Range (Ft.)
1	1180 - 1280
1A	1250 - 1330
2A	1280 - 1330
2	1330 - 1440
3	1440 - 1550
4	1510 - 1650
4E	1550 - 1650
5	1650 - 1790
5E	1650 - 1750
6	1790 - 1920
6E	1750 - 1934
7	1920 - 2050
7E	1934 - 2065
8	2050 - 2180
8E	2065 - 2200
9	2180 - 2310
10	2310 - 2440
11, 11E	2440 - 2570
12, 12E	2570 - 2700
13	2700 - 2830
14	2830 - 2960

FIGURE 4.1-2
Pressure Zone Map

Average Day Water Demand Per Dwelling Unit in GPD†

Land Use	Inside Use	Outside Use	Total Use
Residential < 2 DU per acre	208.90	276.70	485.60
Residential 2 - 3.99 DU per acre	193.70	276.70	470.50
Residential 3 - 7.99 DU per acre	175.90	72.30	248.20
Residential 8 - 11.99 DU per acre	155.30	72.30	227.60
Residential 12 - 22 DU per acre	155.30	72.30	227.60
Resort Hotel (per room)	401.70	44.60	446.40
Resort Hotel Low Intensity (per room)	401.70	35.70	437.40
Commercial (per square foot)	0.75	0.11	0.90††
Cultural/Institutional (per acre)	669.50	669.50	1339.10
Office (per square foot)	0.50	0.075	0.60††
Industrial (per acre)	873.10	154.40	1027.50
Utility (per acre)	0.00	1785.40	1785.40
Open Natural (per acre)	0.00	0.00	0.00
Open Developed (per acre)	0.00	1785.40	1785.40
Open Golf (per acre)	0.00	4285.00	4285.00

†City of Scottsdale Water Supply - Distribution Mast Plan, June 1987, Prepared by NBS/Lowry Engineers & Planners.

††City of Phoenix Memorandum Water Demand and Wastewater Flow Generation Rates, April 1985.

FIGURE 4.1-3

Average Day Water Demand Per Dwelling Unit in GPD

Chapter 5

Wastewater
Design Standards and Policies
Revised December 1999

Chapter 5, Sewer System Design, provides guidance and minimum design criteria for the modification and construction of the water systems owned and operated by the City of Scottsdale.

Section 5.1

SEWER SYSTEM DESIGN
DESIGN STANDARDS AND POLICIES
REVISED DECEMBER 1999

CHAPTER 5
WASTEWATER

SECTION 5.1
SEWER SYSTEM DESIGN

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
5-100	GENERAL COMMENTS A. ORDINANCE REQUIREMENTS B. CITY POLICIES C. REIMBURSEMENT AGREEMENTS D. PRIVATE SEWER COMPANIES E. EPA REGULATIONS	1
5-101	SEWER COLLECTION SYSTEMS A. PIPELINES B. SYSTEM LAYOUT C. DESIGN FLOWS D. HYDRAULIC DESIGN E. MANHOLES AND CLEAN OUTS F. PIPE LOCATIONS AND SEPARATIONS G. HOUSE AND BUILDING CONNECTIONS	3
5-102	SEWAGE PUMP STATION A. SITE SELECTION B. PUMP STATION DESIGN C. FORCE MAINS	9
5-103	SEWAGE TREATMENT A. TREATMENT PLANTS B. SEPTIC SYSTEMS C. WASTEWATER RECLAMATION AND ADVANCEDTREATMENT	11
5-104	PLAN PREPARATION A. GENERAL NOTES B. PLAN REQUIREMENTS C. DESIGN REPORTS D. RECORD DRAWINGS E. REVIEWS AND APPROVALS F. MASTER PLANS	12

FIGURE LIST

FIGURE	DESCRIPTION
5.1-1	PRIVATE SEWER COMPANY FRANCHISE AREAS

5.1-2 FORCE MAIN – MANHOLE DISCHARGE
5.1-3 FORCE MAIN CLEAN-OUTS
5.1-4 SEWAGE AIR RELEASE VALVE

SECTION 5.1
SEWER SYSTEM DESIGN

SECTION 5-100 GENERAL COMMENTS

This document provides guidance and minimum design criteria for the modification and construction of the wastewater collection and treatment systems owned and operated by the City of Scottsdale. It is intended for use in the planning, design and planning preparation processes.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY REQUIREMENTS.
Engineering Bulletin #10, “Guidelines for the Construction of Water Systems”, and, Engineering Bulletin #11 “Minimum Requirements for Design, Submission of Plans, and Specifications of Sewerage Works” published by the Arizona Department of Environmental Quality, contain specific requirements for submittals, approvals, and notifications. It shall be the responsibility of the developer to comply with these regulations and requirements.

a. Prior to submitting Final Plans for City Approval, the developer shall provide "Certificate of Approval to Construct Water and/or Wastewater Systems”. This approval is provided by the Maricopa County Environmental Services Department and shall appear on the cover sheet of the improvement plans.

b. Prior to performing inspections, the developer shall submit evidence that “Notification of Starting Construction” has been submitted to the Maricopa County Environmental Services Department. This evidence will be on a document developed and date stamped by the County.

c. Prior to issuing a Letter of Acceptance, the developer will provide the Maricopa County Environmental Services Department the following documents:

- The Engineers Certificate of Completion with all test results, analysis results, and calculations as indicated on the form.
- A "Request for Certificate of Approval of Construction" of Water/sewer Lines with all appropriate quantities and As-Built for the facility when field changes have occurred which modify the approved plans.

d. The developer shall then provide the City's Inspection Services Division with a "Certificate of Approval of Construction" signed by the Maricopa County Environmental Services Department and a copy of the As-Built drawings.

A. ORDINANCE REQUIREMENTS

The City requires sewer lines to be installed along the entire length of property frontage(s) of the property to be developed whenever future extension of the line is possible. The property line frontage is that portion of the property along a public right-of-way. If a parcel to be developed has more than one property line frontage, the City will require a sewer line to be installed along all frontages.

1.) When a public sewer is located within six hundred sixty (660) feet of the boundary of the subject project, the sewer shall be extended to sewer the project. A private sewage disposal system may be constructed only when a public sewer system is not available. Private sewage disposal system must comply with all laws and regulations of the State of Arizona, Maricopa County, and the City of Scottsdale. Sewer lines shall not be privately owned if future connections to said sewer lines will be necessary to serve adjacent parcels.

The City may participate in the cost of oversizing sewer line extensions when said extension is intended to serve properties other than the user's property.

Upon development of property for which City sewer service is desired and available, the developer shall submit a plan for the sewer system prepared by a professional engineer licensed in the State of Arizona.

The developer shall install, at his/her expense, all on-site and off-site improvements necessary to serve his/her development. This includes payment of all required development fees.

The City may require users who have a non-residential discharge to monitor their discharges and obtain an Industrial Waste Discharge Permit.

For more specific information on ordinance requirements, review of Chapter 48 (Subdivisions) and Chapter 49 (Water, Sewer and Sewage Disposal) of the Scottsdale Revised Code is recommended.

B. CITY POLICIES

Sanitary sewer~~s~~ shall be designed to serve the ultimate population density expected in the tributary area. The design must be in conformance with the current City-approved Wastewater Master Plan and Wastewater Facilities Management System - User's Manual and, shall take future connections into consideration.

Sewer lines shall not be privately owned if future connections to said sewer lines will be necessary to serve adjacent parcels.

Private sewer lines shall meet Maricopa County Health Department and City of Scottsdale Building Inspection requirement for approval. Privately owner and maintained sewer lines shall not be located in the street right-of-way (R.O.W.) or a Public Utility Easement (PUE).

On-site sewer collection systems within commercial shopping centers and multi-family projects with private streets shall be designed as private systems. Developers of privately owned and operated sewer lift stations shall provide to the Water Production Department, the name and certification of an appropriately certified operator by the Arizona Department of Environmental Quality.
Design of small diameter, low pressure, or alternative sewer systems may be allowed by the Water Resources Department upon the engineer's demonstration that conventional or lift stations cannot provide adequate service to the development.

C. REIMBURSEMENT AGREEMENTS

Reimbursement agreements are provided for developers and property owners who extend the City's water and/or sewer systems to developing areas within the city's service area. These agreements provide a mechanism for reimbursing the developer for partial costs of the lines by those who subsequently tie to the line and therefore benefit by the line extension.

The elements of the extension policy and program are set forth in Article V of Chapter 49 (Water, Sewer, Sewage Disposal) of the Scottsdale Revised Code and shall apply to all extensions of the city water and sewer system.

D. PRIVATE SEWER COMPANIES

Portions of Scottsdale's municipal service area are provided sewage disposal service by private sewer companies. Figure 5.1-1 in the Appendix delineates these areas.

Modifications or construction of sewage collection and disposal systems within private sewer company franchise areas should be reviewed and signed by the subject company prior to City of Scottsdale approval. The City of Scottsdale will review private sewer systems within the City limits upon request and payment of applicable fees. A note must be placed on the drawings delineating operation and maintenance responsibilities.

E. EPA REGULATIONS

The City is required by the USEPA to develop and implement a program to control discharges that might harm the Publicly Owned Treatment Works (POTW). The program establishes local discharge limits for non-residential users and provides for a permitting process based on the users discharge~~s~~ and type of business. Details of the program and requirements are found in Article IV of Chapter 49 (Water, Sewer, Sewage Disposal) of the Scottsdale Revised Code. Specific information may be obtained by calling the Water Resources Department at 480-312-5685.

5-102 SEWER COLLECTION SYSTEMS

A. PIPELINES

In selecting pipe material for sewers, consideration should be given to all chemical characteristics of the wastewater, especially in industrial waste flow areas. The possibility of septicity, exclusion of infiltration, external and internal pressures, abrasion and similar problems encountered with the established grades.

Sanitary sewer lines shall be vitrified clay pipe (VCP), SDR35 polyvinyl chloride (PVC), up to fifteen (15) inches, ASTM F679 - T1 for PVC eighteen to twenty-seven (18-27) inches or

ductile iron pipe (DIP) with an approved interior and exterior liners. Those systems designed with velocities of 2.5 feet per second shall be constructed of either Vitrified Clay or Ductile Iron pipe. Alternate material will be considered by the City upon submittal of written request by the engineer.

In general, pipe material~~s~~ should not change between manholes.

Where standard strength pipe is not structurally sufficient or when proper cover cannot be maintained, additional strength must be obtained by using extra-strength pipe, special bedding specifications or special construction methods.

All types of pipe material used in design shall have established ASTM, ANSI, or NSF standards of manufacture or seals of approval and shall be designated for use as sewer pipe.

No public sewers shall be less than eight (8) inches in diameter unless permission is received in writing from the Water Resources Department.

B. SYSTEM LAYOUT

If the horizontal direction or slope of the sewer line changes, a manhole shall be constructed. The horizontal angle formed between the two lines shall not be less than ninety (90) degrees. In sewers that are twelve (12) inches or larger, angles formed shall be between one hundred-twenty (120) and one hundred-fifty (150) degrees to the downstream pipe, for odor control purposes.

Horizontal curvilinear sewers will not be allowed.

Sewer flows shall not pass through collection systems that have not been accepted by the City of Scottsdale.

Public sewer flows shall not flow through a private sewer system.

All public sewer lines shall be located within a dedicated street right-of-way or private street access easement. All sewers shall be aligned parallel to and south or west of the street centerline. In general, sewer lines should not cross the street centerline except in cases where curvilinear roadway alignments are encountered.

C. DESIGN FLOWS

In the absence of flow data provided by the designer, new domestic sewage systems shall be designed in accordance with the following:

1. Sewers eight (8) to twelve (12) inches in diameter shall be designed with peak capacities, when flowing full, of not less than four hundred (400) gallons per capita per day (gpcd).

2. Sewer lines larger than twelve (12) inches in diameter shall be designed using one hundred five (105) gpcd and a peaking factor developed from “Harmon’s Formula”:

   $Qmax=Qavg[1+14/(4+P^{1/2})]$
   WHERE: P = Population / 1,000

   Commercial flows should be based upon known regional data or accepted engineering reference sources, approved by the City.

Density data to be used in sewer design*:

Single-family units	2.5 persons/unit
Multi-family units:	
Townhouse/Patio homes	2.5 persons/unit
Apartments	2.5 persons/unit

*Subject to regional variations as approved by the City's Planning Department.

D. HYDRAULIC DESIGN

Sewer lines should be designed and constructed to give mean velocities of not less than 2.5 fps, based upon Manning's Formula, using an "*n*" value of 0.013. Hydrogen sulfide problems continue to be a concern, therefore must be analyzed in the Design Report and be provided for the design of the system where required. Conversely, to prevent abrasion and erosion of the pipe material, the maximum velocity shall be limited to 10 fps at estimated peak flow. Where velocities exceed this maximum figure, the line shall be constructed of DIP or its equivalent. In no case shall the velocities greater than 15 fps be allowed. All velocities should be analyzed under peak flow conditions.

The d/D ratio for gravity sewer pipes 12 inches in diameter and less shall be no greater than 0.65 in the ultimate peak flow condition. The d/D ratio for gravity sewers greater than 12 inches in diameter shall be no greater than 0.70 in the ultimate peak flow condition.

E. MANHOLES AND CLEAN OUTS

Manholes in City streets must be located near the center of the traffic lane of the interior lane, rather than on or near the line separating traffic lanes. Manholes should not be located in bike trails, equestrian trails, sidewalks, or crosswalks. Manholes shall be installed at the end of each line, at all changes of grade, pipe sizes, alignments and at distances not to exceed those shown below:

SPACING: Pipe Size - Inches	Maximum Manhole Spacing - Feet
8 - 15	500
18 - 30	600
36 - 60	800
Over 60	1,300

Cleanouts may be used in place of manholes at the end of laterals which cannot be extended and are less than one hundred fifty (150) feet in length. Cleanouts must be placed on the end of all line extensions to allow for cleaning and televising of lines. To assure line, grade and material compatibility, a manhole shall be installed at the point of connection when a cleanout is removed for a sewerline extension.

All manholes should be the pre-cast concrete type as detailed in the Maricopa Association of Governments (MAG) standard details for Public Works Construction, detail No. 420, excluding the steps and/or cast in anchors for steps. If a manhole is more than ten (10) feet deep or the line is over twelve (12) inches in diameter, the manhole shall be five (5) feet in diameter.

A water stop gasket shall be installed on all manholes except when Vitrified Clay pipe is used.

The flow channel through the manhole shall be steel-trowel finished to conform in shape and slope to that of the sewers. The manhole shelf shall be brush or broom finished, with a slope of one inch per foot. The manhole bottom should be filleted to prevent solids depositions and channeled to ensure satisfactory flow to the lower invert.

Manholes shall be protected from storm drainage and flooding conditions. Sewers will not be allowed in washes or drainage areas unless otherwise approved in writing by the City's Water Resources Department. When designs specify manholes to be located in washes or drainage areas, bolted watertight covers shall be used to prevent inflow. The rim elevation of these manholes shall be a minimum of eighteen (18) inches above grade. If a manhole is located in a wash, it shall be watertight and the engineer shall provide appropriate protection under Q-100 conditions. This may require encasement of the entire manhole using sono-tube, form material, or the construction of a monolithic manhole. The manhole shall be designed by the engineer to meet the amount of protection as dictated by the flow conditions of the wash. Providing for the elimination of infiltration and/or exfiltration in washes is the Engineer's responsibility in the design of the system.

1. Intersecting Lines Within Manholes

   Manholes shall be required for all lines intersecting at angles other than 180° and/or a change in slope. The manhole shall have a minimum 0.10 foot drop across the manhole unless otherwise approved by the Water Resources Department. When sewer lines of different sizes enter the same manhole, the upstream pipe shall not have its crown lower than the crown of the downstream pipe. In large trunk lines, inverts at junctions should be designed to maintain the energy gradient across the junction and prevent backflow.

2. Drop Manholes

   If the difference in invert elevations between inflow and outflow sewers exceed one pipe diameter, a drop connection shall be installed in accordance with MAG standards detail No. 426. The manhole bottom shall be filleted to prevent solid deposition.

3. Monitoring Vaults

   The City shall determine whether or not a sewer user will be required to have a monitoring manhole to test the flow and composition of their sewage. As a general rule, sewer users with a projected water consumption of 25,000 gallons per day or a discharge of a categorical industrial nature or as otherwise required by the City's Water Quality Division of the Water Resources Department, shall be required to have a monitoring manhole.

4. Monitoring Manholes

   On sewer service lines that require monitoring manholes shall be the standard MAG detail 420 modified manhole with a straight channel and no taps or bends for two (2) pipe lengths downstream.

   Design details for monitoring manholes on sewer lines six (6) inches or larger with a peak flow greater than forty (40) gpm shall be approved by the City.

   Monitoring manholes shall be located in a twelve (12) foot PUE which extends from the manhole to the existing public sewer. The monitoring manhole shall be accessible at all times for monitoring crews and vehicles.

F. **PIPE LOCATIONS AND SEPARATIONS**

When street location is not possible, public sewer lines shall be located within a twenty (20) foot easement within a dedicated tract that maintains unrestricted vehicular access at all times. Sewer lines shall be located a minimum of six (6) feet from a property or easement line. Sewers will not be allowed in easements between houses / private properties that do not meet the above criteria unless otherwise approved.

1. Depth of Sanitary Sewers

   Sewer shall be installed at a depth sufficient to ensure gravity drainage of wastes from each service. Sewer design shall ensure gravity drainage from the ultimate drainage area, and shall allow for future extensions of service to adjacent parcels. In no case shall sewer lines be installed with less than four (4) feet of cover over the top of the pipe unless otherwise approved. If sewer lines are located in washes and / or drainage areas, the pipe must be placed four (4) feet below scour depth and shall be constructed of DIP.

   All sewers shall be designed to absorb superimposed live loads and backfill overburden without damage to the pipe material and without adversely affecting the hydraulic characteristics of the pipe. The Engineer shall specify minimum depths of cover to be provided during the construction of roadways or other facilities affecting cover over the sewer line.

2. Separation of Water and Sewer Lines

   Caution should be taken in the design and construction of the sewer lines to protect all water supplies from wastewater contamination. To minimize the potential of contamination, the engineer shall design the horizontal and vertical separation of water and sewer lines in accordance with Arizona Department of Health Services Bulletin 11.

   Where conditions prevent adequate horizontal and vertical separation, both the water and sewer lines shall be constructed of ductile iron pipe (class 150 minimum) with mechanical restraining joints

3. Separation from Other Utilities

   The minimum horizontal distance from a sewer line to any other line shall be six (6) feet wall-to-wall unless otherwise approved. Please see detail 2372 in the City of Scottsdale Supplemental Standard Details.

4. Separation from Storm Drains and Culverts

   Sewer lines crossing less than two (2) feet below a storm drain or culvert, or under large structures such as box culverts and bridges will require additional protection such as the use of ductile iron pipe or encasement. Sewers crossing over storm drains and culverts must be a minimum of one (1) foot above and be adequately protected.

5. Sewer Connections

   Developers shall utilize all sewer lines to property. Those lines not used shall be abandoned by the developer by disconnecting the line at the main.

G. **HOUSE AND BUILDING CONNECTIONS**

1. Sizes
   Sewer taps shall be the following minimum sizes:

Residential :	4”
Multi-family :	6”
Commercial :	6”

2. Installation
   All service line connections shall be installed perpendicular to the lateral in accordance with MAG Standards. Taps installed for future connection shall be marked.

3. Location
   All proposed sewer service lines shall be shown on the plans with stations and dimensions. Typical separation dimensions from the water service line~~s~~ shall be shown. Each lot unit must be provided with its own individual sewer service unless otherwise approved in writing by the City. The location should be coordinated so as to avoid conflicts of other utilities, with driveway locations and should be located within the downstream 1/3 of the fronting sewer line length.

   Because water lines are located behind the curb in many locations, conflicts with sewer service lines are possible. Sewer lines should be designed to allow sewer service lines to pass under water mains behind the curb with twelve (12) inches of clearance to minimize potential health hazards.

   When it is not possible to maintain sufficient clearance or the sewer service will pass over the water main, the sewer service must be encased in concrete of six (6) inches minimum thickness, six (6) feet from each side of the crossing, or ductile iron pipe must be used for the same distance. See MAG detail 404.

4. Requirements for Sewer Service Lines on Large Sewer Lines
   Sewer lines fifteen (15) inches or larger may be tapped only with a manhole. Sewer service lines into manholes may be angled, but the flow line of the sewer service line shall not be more than four (4) inches below the crown of the line to be tapped.

5. Taps into Manholes
   No more than four (4) sewer service lines may be made into any individual manhole without written approval from the City. Sewer service line inverts shall be a maximum of one service line pipe diameter above the crown of the outflow pipe.

6. Grease and Oil Traps
   Grease, oil and sand interceptors which are acceptable to the City shall be provided for laundries, restaurants, automobile service facilities and other facilities when in the opinion of the City, they are necessary for the proper handling of liquid wastes. Interceptors shall be supplied and maintained by the owner. For more details, please contact the Wastewater Division of the Water Resources Department at 480-312-5685.

H. **EASEMENTS WITHIN TRACTS REQUIREMENTS**

Easements within tracts for sewer lines shall not be less than twenty (20) feet in width and shall run parallel to the property line. The tract shall extend to the dedicated street right-of-way.

Sewer line tracts must be free of obstruction and accessible to City service equipment. Areas in question must be reviewed by the City's Water Operations Department.

Sewer line easements located within tracts shall have a ten (10) foot wide hardened path with a cross-sectional slope not greater than 10%. The hardened path shall consist of native soil with 95% compaction and compacted for a depth of one (1) foot from the surface.

Abandonment of water and/or sewer easements will adhere to the following criteria.

1. A letter requesting the abandonment of the easement and reason for the abandonment shall be submitted to the Water Resources Department with the following exhibits:
   a) Detailed map depicting the easement to be abandoned shall be highlighted and the locations of both water and sewer lines shall be shown in reference to the easement in question.
   b) If water and/or sewer lines are to be abandoned, a detailed civil plan prepared by a professional engineer licensed in the State of Arizona must be supplied describing the method of abandonment.
   2. A letter will be issued stating approval or denial of the abandonment request, certain stipulations may be required in conjunction with the abandonment, and will be stated in the letter from Water Resources Department.
   3. The individual will be responsible for submitting original packet with Water Resources Department decision to the Project Review Department for final approval.

Failure to supply the above noted criteria and exhibits will result in denial of the request.

5-103 SEWAGE PUMP STATIONS

Any improvements that require deeded properties shall not be accepted for service until clearance from the City of Scottsdale's Asset Management Department has been issued.

A development that will not provide service to adjacent properties that provide service to less than 30 connections shall be considered private and shall be maintained by the Home Owners Association and/or Property Owners Association. The sewer system in this development must also be a private sewer system.

A. **SITE SELECTION**

In selecting a site for a sewage pumping facility, consideration should be given to:

- Accessibility
- Drainage Characteristics
- Visual Impact
- Function and Design Constraints

The potential for flooding should be considered when selecting a pump station location. The station's equipment shall be protected from damage and remain operable during a 100-year flood.

Prior to the construction of any site to be dedicated to the City, the developer shall deliver the deed to said property to the Water Production Manager of the Water Resources Department. This deed shall be free of any lien or encumbrances and shall be accompanied by a title report.

B. PUMP STATION DESIGN

Sewage pump station requirements are provided by the State of Arizona Department of Health Services and are published in their Engineering Bulletin No. 11. Additional requirements specific to the City of Scottsdale must be obtained from the Water Production Division of the Water Resources Department before beginning design. At a minimum, telemetry, dual pumps, backup power supply, three phase power and odor control will be required. The site shall be large enough to contain all the equipment and service equipment for repairs.

Prior to the preparation of construction drawings, a preliminary or basis of design report will be prepared and submitted to the City of Scottsdale for acceptance. The preliminary report should outline the type of equipment and controls proposed for the station. A final design report prepared by a registered professional engineer licensed in the State of Arizona must accompany all pump station design drawings.

C. FORCE MAINS

1. Velocity Requirements
   The velocity of flow in the force main shall be between 4 and 6 fps.

2. Materials of Construction
   All types of pipe material used in design of the force mains shall have established ASTM, ANSI, AWWA and NSF standards of manufacture or seals of approval and shall be designated as pressure sewer pipe. Force mains shall be identified as such with marking tape one foot above the pipe.

3. Air Release Valves
   Air release valves designed for sewage shall be provided on force mains at all peaks in elevation. (See figure 5.1-6 in the Appendix of this manual.)

4. Cleanouts
   Two-way cleanouts shall be provided every one thousand three hundred (1,300) feet apart or one-way cleanouts every six hundred fifty (650) feet. See figure 5.1-4 in the Appendix of this manual for a detail of force main cleanouts.

5. Force mains shall be constructed of restrained D.I.P. for the following conditions:
   a) At all locations where a vertical realignment is required.
   b) Crossing of drainage areas.
   c) Air Release Assemblies.
   d) Clean-out Assemblies.

6. Water Line Separation

Where a force main crosses a water main or transmission line, protection shall be provided as per ADEQ Bulletin 10 and 11. At a minimum, the force main shall be constructed of ductile iron pipe for a distance of ten (10) feet on each side of the water line.

For details regarding force main discharge into a manhole, refer to Figure 5.1-2 in the Appendix of this manual.

The minimum separation between the force mains and water lines shall be two (2) feet wall-to-wall vertically and six (6) feet horizontally under all conditions. Where a sewer force main crosses above, or less than six (6) feet below a water line, the sewer shall be encased in at least six (6) inches of concrete for ten (10) feet on either side of the water line.

7. Testing
   Prior to issuance of a Certificate to Operate, all force mains shall be pressure tested.

   Preparatory to testing, the section of the pipeline to be tested shall be filled with water and placed under slight pressure for at least forty-eight (48) hours. The pipeline shall then be brought up to one hundred fifty (150) psi over or to one hundred twenty-five (125) percent of system operating pressure, whichever is greater, and shall be maintained on the section under test for a period of not less than four (4) hours, with no leakage.

5-104 SEWAGE TREATMENT

A. TREATMENT PLANTS

The subject of wastewater treatment plant design is beyond the scope of this design booklet. The engineer is urged to contact Maricopa County Health Department and the City of Scottsdale Water Resources Department for further information pertaining to the development of wastewater treatment facilities within Scottsdale.

B. SEPTIC SYSTEMS

When sewer service is not available, a septic system may be allowed with the approval of both the City of Scottsdale and the Maricopa County Health Department.

For planned developments, a “dry” sewer line shall be installed along the entire length of the property line frontage. The property line frontage is that portion of the property along a public easement. If a parcel to be developed has more than one property frontage, the City will require a sewer line to be installed along all frontages. Sewer taps on a dry system shall be described as such by marking the end of the tap with a permanent marking.

The operation and maintenance of septic systems are the responsibility of the owner. The City of Scottsdale will not accept any septic system for operation and maintenance.

C. WASTEWATER RECLAMATION AND ADVANCED TREATMENT

The City’s current Sewer Master Plan calls for the development of regional wastewater reclamation facilities. Reclaimed water is to be used to satisfy the demand for water to irrigate golf courses and parks. Reclaimed water in excess of the irrigation demand shall be

provided advanced treatment and stored under ground for subsequent recovery. Contact the City's Water Resources Department for more detailed information on this plan.

5-105 PLAN PREPARATION

A. GENERAL NOTES

Notes which apply to construction on the City of Scottsdale's sewer system are required on each set of improvement plans which include work on the City's sewer system or a sewer system which is to be dedicated to the City. These notes are provided in Chapter 1, Figure 1.13.

B. PLAN REQUIREMENTS

The following paragraphs highlight improvement plan requirements pertaining to the preparation of sewer improvement plans which are to be submitted to the City for approval.

1. Sewer line stationing shall be along the centerline of the pipe.

2. Concrete encasement shall be shown in both plan and profile. The beginning and ending stations of the encasement shall be called out.

3. If a line is to be connected to an existing system, the following note shall be placed on the plans: "Contractor shall verify the location of the existing sewer line before proceeding with trenching."

4. All sewer improvements shall be shown in both plan and profile. Plan and profile sheets shall be standard 2' x 3' size with a scale of either 1" = 20' or 1" = 40' horizontally and 1" = 2' or 1" = 4' vertically unless otherwise approved by the City.

5. Both slopes and elevation shall be shown on all proposed sewer main stubs.

6. Where sewer lines cross water lines, storm drains or drainage culverts, the relationship shall be shown in both plan and profile and a minimum separation~~s~~ shall be called out.

7. For permitting purposes, quantities for all items of work within the public right-of-way and public utility easements shall be included on the cover sheet of the plans.

8. Sewer service line invert elevations shall be called out for all plans showing sewer service line connection.

9. The drawings shall show all utility locations, sizes, easements, right-of-way and other structural features of the sewer.

10. Lift station details shall show all invert elevations, structural elevations, existing and finished grades, control setting elevations, structural design of wet well~~s~~ and dry well~~s~~, valves and piping, surge control devices, pump suction and discharge details and any other details which will provide a clear understanding of the design.

11. Plans and profiles of force mains shall show size, invert and grade elevations, material~~s~~ of construction, utility locations and any other details which define the force main construction requirements.

12. Private and dry sewer lines shall be noted as such on plans. The responsibility for operation and maintenance should also be called out.

13. Easements within tracts shall be noted and shown in plan view including docket and page numbers or recorder~~'s~~ number.

14. All plan documents for sewers and/or wastewater treatment work shall be prepared by a registered professional engineer licensed in the State of Arizona under the provisions of ARS 32:141-145.

15. Must have specific Design Review or Preliminary Plat stipulations.

There are additional requirements for the preparation of improvement plans in the City of Scottsdale. The additional requirements are presented in Section 1.1 of the City of Scottsdale Design Standards and Policies Manual.

C. DESIGN REPORT~~S~~

A design report may be required depending on the complexity of the work. The design report serves to present necessary information concerning design assumptions and computations.

The objective of the report is to provide background information for review of the project. All proposed lift station designs shall be accompanied by a signed and sealed design report.

D. RECORD DRAWINGS

Record drawings are required for all sewer system improvements. Upon approval of the improvement plans, the developer shall provide the City of Scottsdale with one set of full size photo mylars (4 ml) of the approved set of plans prior to occupancy certificate and letter of acceptance.

E. REVIEWS AND APPROVALS

All improvement plans which include work on the City of Scottsdale's sewer system or on a system which is to be dedicated to the City must be submitted for review and approval by City staff. Plan review submittals are made to the Community Development Department at the "One Stop Shop", 7447 E. Indian School Road, Suite 125, Scottsdale, Arizona 85251, 480-312-2500. Plan review fees must be paid at the time of plan submittal.

Maricopa County Health Department approval is required prior to City approval. No permits for public sewer installation will be issued until the owner / developer has provided the necessary easements and rights-of-way. The instruments of dedication must be approved by the City of Scottsdale and recorded at the Maricopa County Recorder's Office.

F. **MASTER PLANS**

A copy of the accepted, signed Master Plan shall be submitted when final civil plans are submitted.

A Wastewater Master Plan and report shall be prepared in accordance with the City's Design Standards and Policies Manual by a registered professional engineer who is licensed to practice in the State of Arizona. The master plan and report shall address, but not limited to:

1. The Master Plan will become the basis for a Water and Wastewater Service Agreement between the developer and the City of Scottsdale when such agreement is required by the City. This agreement will specify terms and requirements for water and wastewater service to the development. The introduction to the report should state this.
2. All development projects shall be responsible for determining their specific wastewater system needs. Service for proposed developments shall not be provided at the expense of existing customers and the wastewater master plan shall verify this.
3. Adequate sewer capacity must be shown for the development. In addition, sewer system calculations or a sewer model shall be used to determine the required on-site and off-site facilities such as sewer lines, lift stations and force mains necessary to serve the project.

    a. If no change in zoning is proposed, then the wastewater system for the project must be analyzed to he point of discharge to an existing sewer which has sufficient capacity to serve the project and which is included in the current City <u>Wastewater Master Plan.</u>

    b. If the proposed development requires a change in zoning which increases density or proposes a sewer different from the City's existing <u>Wastewater Master Plan</u>, then additional off-site calculations may be required as directed by the City's Water Resources Department.

    c. Calculations should be based on Manning's equations using a Manning's "*n*" of 0.013 and the invert elevation and pipe diameters of all existing and proposed pipes.

    d. Wastewater flows generated within the development shall be calculated as specified in section 5.102C - Design Flows.

    e. Off-site calculations shall be based on a sewer sub-basin which shall be shown on an accompanying map. The sub-basin shall include all areas upstream and downstream of the development to the next interceptor sewer. An interceptor sewer shall be defined as 15-inch diameter or larger.

    f. Off-site wastewater flows shall be as specified in the City's current <u>Wastewater Master Plan.</u>

    g. A computer disk containing all calculations shall be submitted along with the master plan report. Common spreadsheet formats compatible with Microsoft Excel are acceptable.

4. Compliance with the current City's Wastewater and Wastewater Facilities Management System Master Plans.
5. Each Master Plan must include a map showing the following:

    - All proposed on-site and off-site facilities; including, but not limited to,

    - interceptors
    - sewer lift stations
    - force mains
  - Proposed street locations
  - Parcel boundaries
  - Proposed lots within each parcel
  - Contour lines at two (2) foot intervals showing the elevation of the land surface. If drainage requirements will require extensive grading, then finished grade should be shown. Sufficient information must be provided to evaluate pipe cover.
  - A separate area location map shall be provided showing existing and proposed streets, as well as existing parcels surrounding the project to a distance of not less than one (1) mile from the exterior boundaries of the project. Assessor's maps can provide the information required to prepare these composite maps.
  - The scale of all maps must be sufficient to show all required information clearly.

6. All sewer lines which cross golf course areas must do so within established roads. If dedicated roads are not practical, then crossing must be made within twenty (20) foot wide paved easements. All other sewer lines outside dedicated rights-of-way must be on easements not less than twenty (20) feet wide. No walls shall cross these easements.

7. Easements within tracts for sewer lines shall not be less than twenty (20) feet in width and shall run parallel to the property line. The tract shall extend to the dedicated street right-of-way with a manhole. Sewer line tracts must be free of obstruction and accessible to City service equipment. Areas in question must be reviewed by the City. Sewer line easements located within tracts shall have a ten (10) foot wide hardened path with a cross-sectional slope not greater than 10%.

8. The Wastewater Master Plans must show compliance with Section 49-199 of the Scottsdale Revised Code to construct pipelines, if not already in place, across all dedicated frontages of the development. If the slope of the existing ground is such that other properties fronting the sewer would not benefit, then this condition must be justified in the report.

9. A construction schedule shall be included in a table format for all wastewater related construction required to serve the development. The schedule shall have each phase or parcel as column headings and each construction project or system component as row headings. A mark in each box shall specify when each constructed item will be required for each phase of the development.

More specific information regarding master wastewater plan requirements and the City's current Wastewater and Wastewater Facilities Management System Master Plan can be obtained by contacting the City of Scottsdale Water Resources Department at 480-312-5685.

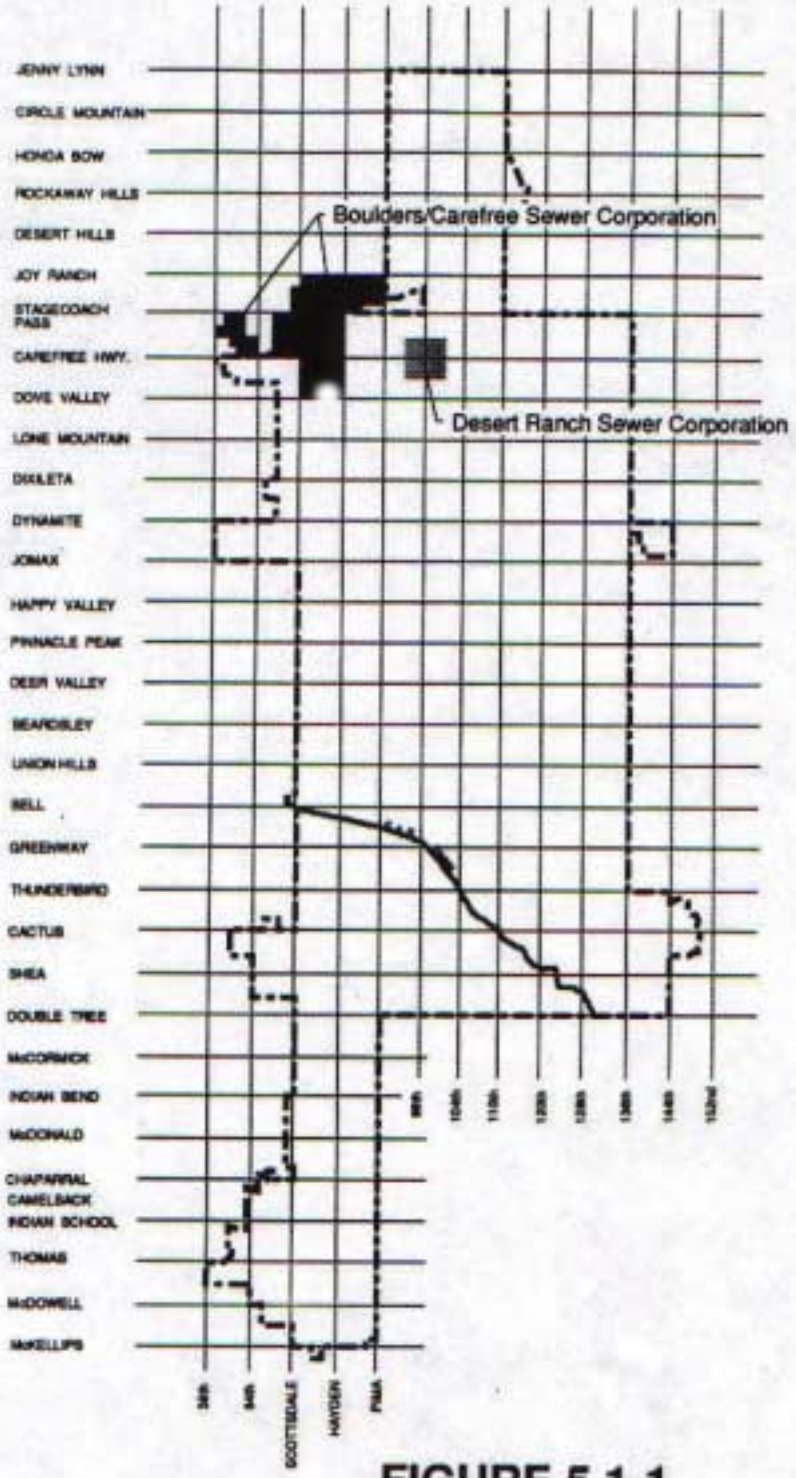
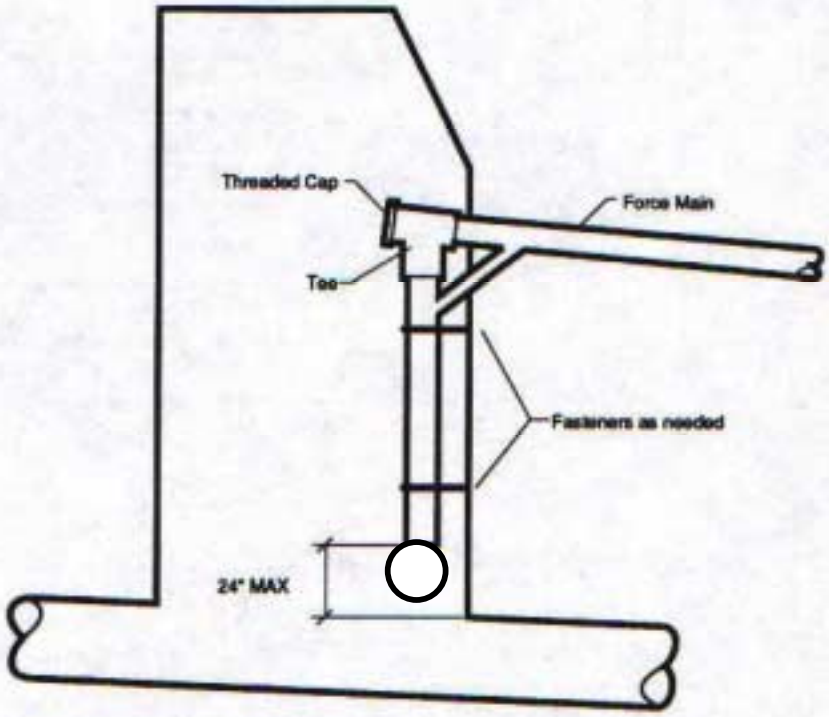


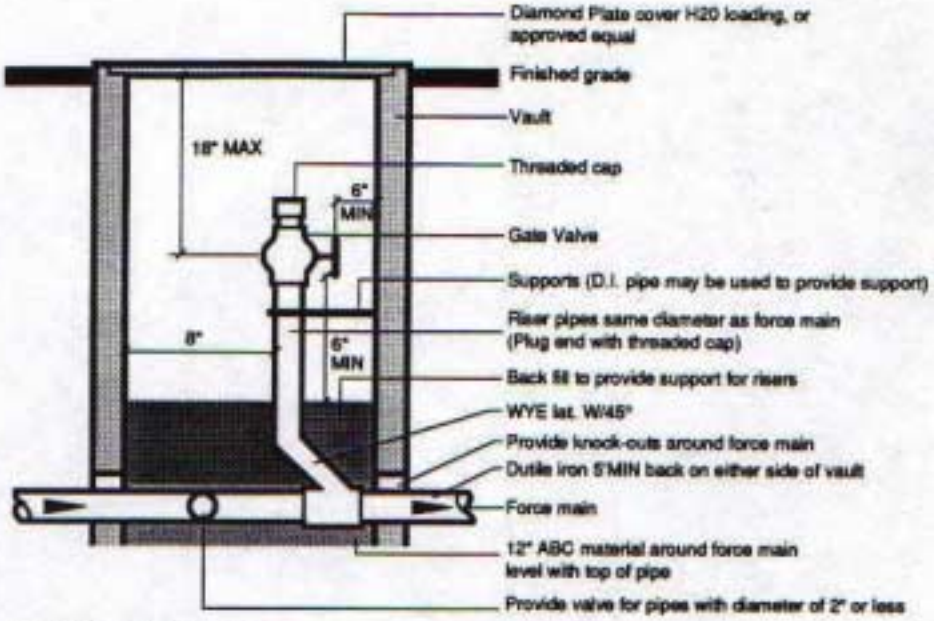
FIGURE 5.1-1

Private Sewer Company Franchise Areas - January 1994



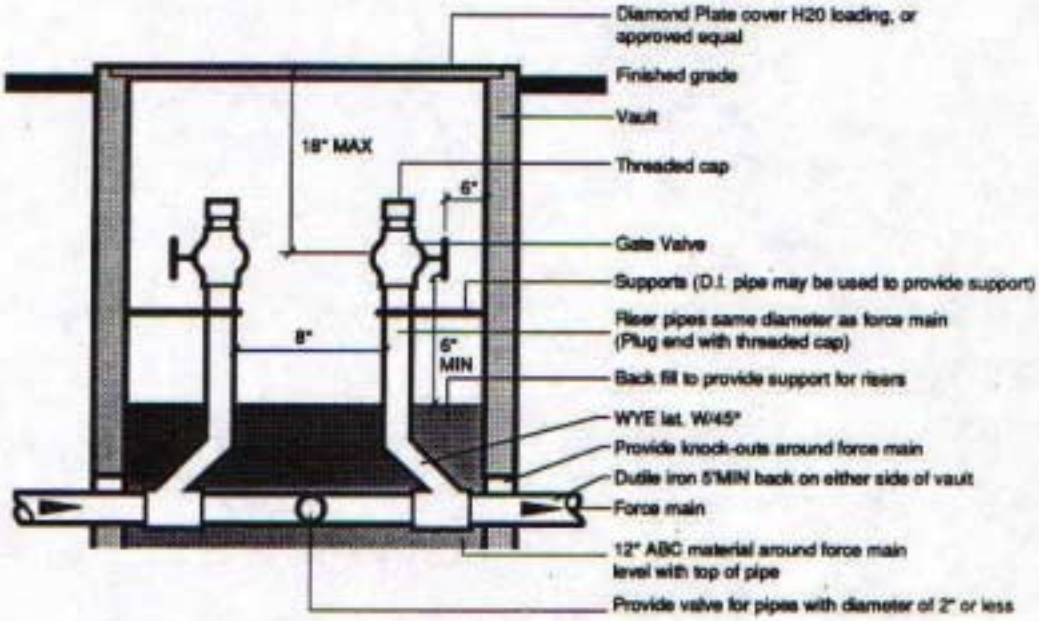
NOTE: Discharge outlet shall never be below crown of downstream pipe.

FIGURE 5.1-2
Force Main - Manhole Discharge



One Way Clean-Out

NOTE: One-Way clean outs shall be installed on maximum 650 foot centers along force main. Rotate vault as required to keep behind back of curb.

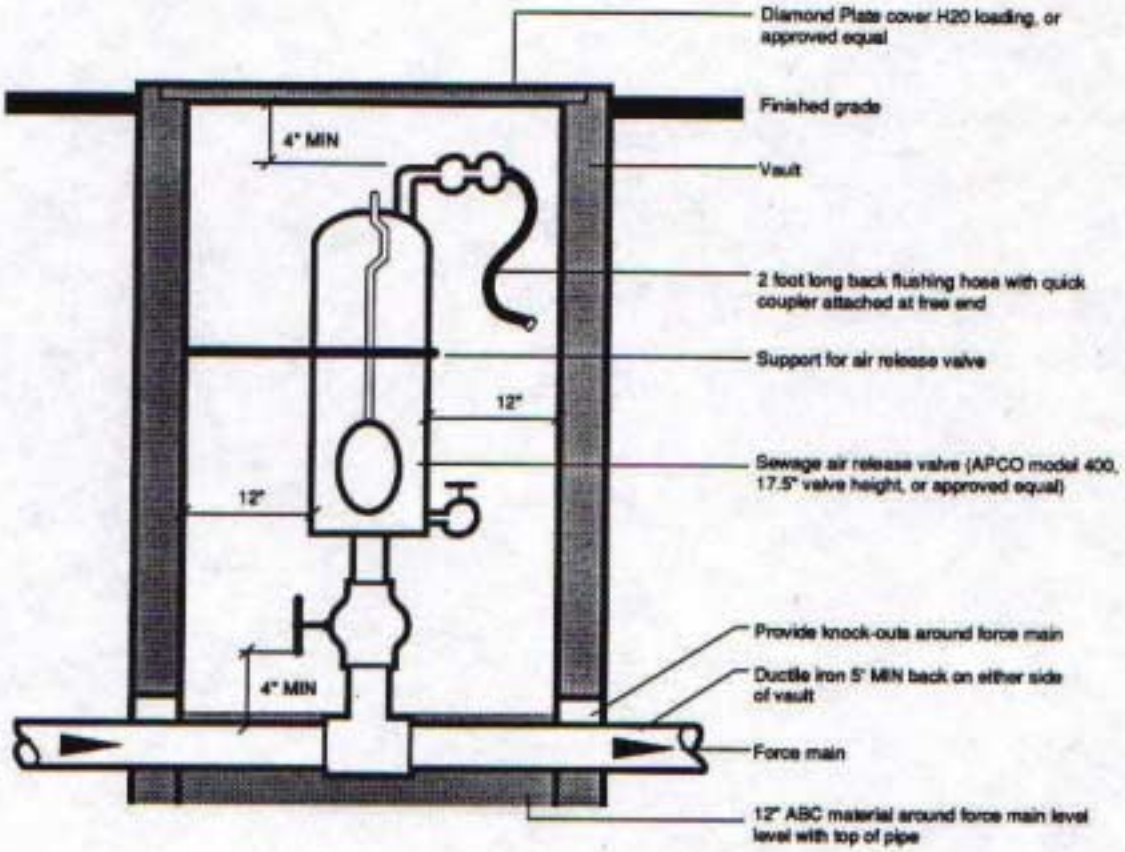


Two Way Clean-Out

NOTE: Two-Way clean outs shall be installed on maximum 1300 foot centers along force main. Rotate vault as required to keep behind back of curb.

FIGURE 5.1-3

Force Main Clean-Outs



NOTE: Rotate vault as required to keep behind back of curb.

FIGURE 5.1-4
Sewage Air Release Valve

Chapter 6

Platting and Right-of-Way
Design Standards and Policies
Revised December 1999

Chapter 6, Platting and Right-of-Way, describes the City's requirements for preliminary and final plats for subdivisions, for condominium development plans, and for maps dedicating land to the public and easements for public use.

Section 6.1

Subdivision Plats

Design Standards and Policies
Revised December 1999

Chapter 6
Platting and Right-of-Way

SECTION 6.1

SUBDIVISION PLATS

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
6-100	GENERAL INFORMATION	
	A. General Comments	1
	B. Completion of Improvements	1
6-101	SUBDIVISION PLATS	
	A. Preliminary Plats	1
	B. Final Plats	6
	C. Plats to be Recorded	10
	D. Amended Plats	10
6-102	CONDOMINIUM DEVELOPMENT PLATS	
	A. General Comments	11
	B. Condominium Development Plats that Do Not Include Dedications to the Public	11
	C. Condominium Development Plats that Include Dedications to the Public	13
6-103	MAPS OF DEDICATION	
	A. General Comments	14
	B. Map Requirements	14
	C. Maps to be Recorded	16

SECTION 6.1
SUBDIVISION PLATS

6-100 GENERAL INFORMATION

A. General Comments

This chapter describes the City's requirements for preliminary and final plats for subdivisions, for condominium development plats, and for maps dedicating land to the public and easements for public use.

B. Completion of Improvements

No occupancy of any structure built within the development will be authorized by the city until the facilities shown on the improvement plans have been completed.

6-101 SUBDIVISION PLATS

A. Preliminary Plats

1. General Comments
   A preliminary plat shows the approximate location of the street system, the approximate size and configuration of each lot and tract, and other information needed by the City to evaluate the proposed subdivision.

2. General Requirements
   The following requirements apply to the preparation of a preliminary plat for a proposed subdivision.

   a. A pre-application meeting is required.

   b. Submittal requirements for the application will be determined in the pre-application meeting.

c. Other requirements for the plat may come from the zoning ordinance requirements such as the PRD and ESL sections, or from specific zoning stipulations. The applicant is responsible for meeting these requirements.

3. Submittal Standards

a. The drawing of the plat shall be to a scale of 1 inch = 100 feet. A plat may be submitted drawn to a scale of 1 inch = 50 feet if the subdivision is equal to or less than ten acres in size.

b. All lettering, numbers, and drawings must be of sufficient size and clarity to enable the City to have usable records when the drawings are microfilmed. For example, 12 point type size is the minimum size lettering and numbering for plats. Design Standards and Policies manual, Section 1-100 – Improvement Plan Requirements describes the minimum requirements for lines, lettering, and numbers which must be met.

c. The names of the proposed subdivision must be shown prominently.

d. Following the subdivision name, state the quarter section(s) within which the proposed subdivision is to be located. For example: "A Subdivision of Part of the SE ¼ of Section 10, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona." This statement should be followed by a complete legal description of the subdivision boundaries.

e. Provide a statement of the name, address, and telephone number of the developer of the subdivision.

f. Provide a legend with appropriate abbreviation and drawing symbol explanations. See "Design Standards and Policies" manual, Section 1.1 – Improvement Plan Requirements, for specific requirements with regard to symbols.

g. Provide a statement describing the identification, location, and elevation for at least two vertical control benchmarks for the development. The benchmark elevations must be on City of Scottsdale datum.

h. Provide a statement describing the types of utility services to be provided and the names of the utility companies that will be providing the services.

i. Provide statements describing the existing zoning, the gross subdivision area in acres, the number of lots, the minimum lot size, and the average lot size. Each tract or area which is not to be a lot or public right-of-way must have a note indicating its approximate area, the planned use and improvement, if any, and the agency which is to be responsible for maintaining the tract.

j. Prepare the drawing of the proposed plat so that the direction of north will either be toward the top of the sheet or toward the right side of the sheet. (The top of the sheet will have the 36 inch dimension.) All notations should be oriented to read with north pointed up. A north arrow shall be provided in a prominent manner, with a bar scale indicating the scale of the plat drawing.

k. Provide a small vicinity map showing the relationship of the proposed subdivision to the nearest existing and planned arterial and major collector streets. The orientation of the vicinity map must agree with the orientation of the plat drawing. The vicinity map need not be drawn to a particular scale.

l. Each subdivision must have two survey ties to two existing monuments in Scottsdale's Integrated Geodetic Network (S.I.G.N.). The monuments in SIGN are to be used as the basis the Bearing. SIGN monument locations, descriptions, and state plane coordinate values are a available through the City Survey office – 391-5782. These ties must be shown on the plat drawing, together with the bearings and distances, curve lengths, central angles, and radii, etc. for all of the subdivision boundary lines.

m. The location and size of all existing easements, rights-of-way, and man-made structures or facilities within the boundary of the proposed subdivision must be shown on the drawing.

n. Show and identify all rights-of-way, easements, subdivision names, unsubdivided land, etc. on the property adjacent to and within 150 feet of the boundaries of the proposed subdivision.

o. Show the topography of the area to be subdivided under pre-development conditions. The portrayal of the topography must extend to at least 150 feet outside the boundaries of the proposed subdivision. Use contour lines with the contour intervals listed below:

(1) Outside of the Environmentally Sensitive Lands (ESL) areas – one (1) foot intervals.
(2) Within Environmentally Sensitive Lands (ESL) areas – two (2) foot intervals or at appropriate intervals as determined by the Community Development Administrator.
(3) In Hillside District (HD) areas – two (2) foot intervals.
(4) In Hillside Conservation areas – ten (10) intervals.

p. Indicate by arrows the location, direction, and amount of flow of all natural washes or man-made drainage channels which exist or which are planned and which flow through, adjacent to, or begin within the proposed development.

q. Number all lots sequentially and identify all tracts by letter. Provide dimensions to indicate the sizes of the lots and tracts. All preliminary plats shall show required setback lines and proposed building envelopes (if used).

r. Care should be taken in establishing the size and shape of corner lots. A corner lot should not be so small or narrow that the space left for construction of homes and fenced yards is not adequate for the builder or ultimate homeowner. The space limitations on corner lots are:

(1) Almost all corner lots will have an eight (8) foot public utility easement adjacent to the property line in the yard facing the side street as well as in the front yard. Fences and walls cannot be constructed within these easements. It is also recommended that mail boxes, etc. be located outside of these easements.

(2) Good lot design suggests that lots with drainage easements, on adverse terrain or where substantial cuts or fills occur, or along subdivision perimeters will also need to be larger than the average lot size.

s. Show and dimension all proposed utility and drainage easements. The easements along side or rear lot lines for underground utility lines and drainage pipe must be entirely on a lot, i.e. not split with half on one lot and half on an adjacent lot, and must be at least twelve (12) feet wide. Utility system easements along the front of lots and tracts must be at least eight (8) feet wide.

t. Easements for surface drainage must be wide enough to provide a channel which meets the requirements of good engineering and esthetic design. Surface drainage easements may be split so that one half lies on one lot and one half lies on the adjacent lot. If approval of a development will require that a wash be retained in its natural state, then supporting hydrologic and hydraulic calculations must be submitted in sufficient detail with the preliminary plat to demonstrate that the easement or tract set a side for drainage will be of sufficient width to carry the peak 100-year-storm drainage flow without endangering life or property which is outside the easement or tract and to accommodate usual maintenance equipment. If a development is to have a property owners association, the land area set aside for surface drainage should be on a tract which will be maintained by the property owners association and not on an easement where maintenance responsibility would be split among several property owners.

u. Show the areas to be used for storm drainage retention or detention. These areas shall be tracts to be maintained by a property owners association. Sufficient dimensions and other information must be provided to describe the size of the area, the approximate depth, and the slope of the sides.

v. Show all proposed streets and indicate the right-of-way widths. Provide sufficient approximate information on street curvatures, intersection offsets, etc. to enable City staff to verify compliance with the subdivision ordinance and applicable design standards.

w. Show the proposed layout and distribution for any Natural Area Open Space (NAOS) that is required. NAOS may be maintained by a property owner's association and shall be dedicated as an easement over the appropriate areas. In addition, indicate approximate amounts of NAOS which will be dedicated at the time of final plat.

x. Show the proposed layout of the water and sewer lines to be constructed to serve the development. Indicate the size of the lines and direction of flow.

y. Show the street drainage pattern by arrows and indicate those points at which is it intended to add concentrated flow to the street drainage and to remove drainage from the street.

z. Show the proposed locations of bikeways and horse trails which must be within the boundaries of the plat to coincide with the City's approved development plan for such paths and trails.

aa. Any development on property containing protected native plant material as identified in Section 46-105 of the City code shall submit a native plant program in accordance with the requirements of Section 7.500 of the Zoning Ordinance.

bb. If the subdivision is to have a property owners association, indicate this on the plat with an appropriate statement as it relates to the duties and requirements as outlined in the CC & R's – i.e. maintenance.

cc. If the streets are to be private, indicate this with a note on the plat, and state that the streets and any streetlights to be located within the private right-of-way are to be maintained by the property owners association.

dd. If the developer intends to have one recorded plat for the whole subdivision, but plans to phase the improvements, the plats should have a statement which indicates this intent, and the proposed phasing should be shown by suitable marking on the plat drawing. Indicate any temporary cul-de-sacs, infrastructure lines, valves, etc.

ee. If a developer has a large parcel of land which he intends to subdivide with several recorded plats over a period of time, he/she should not attempt to secure a preliminary plat approval for the whole parcel. He/she should submit a master plan for the whole parcel and a preliminary plat for only the "first phase" for which the developer intends to secure a recorded plat. In the future, subsequent preliminary plats may be submitted which would be in agreement with the master plan.

ff. Provide in block form in the lower right hand corner of the plat the following information:

1. The name, address, and telephone number of the individual or agency that prepared the preliminary plat.
2. "Preliminary Plat for (name) subdivision."
3. Date prepared and job number.
4. Scale.
5. "Sheet ___ of ___ sheets."

gg. All projects subject to the E.S.L.O. shall provide Natural Area Open Space as required in Section 7.853 of the Zoning Ordinance. All exempted hillside ordinance projects shall provide N.A.O.S. as required in former section 6.806.A.1 of the Zoning Ordinance.

B. Final Plats

The following requirements apply to the preparation and submission of a final plat for a subdivision.

1. Two copies of the final plat must be submitted to the City on 24-inch by 36-inch paper: one copy with the improvement plans and one copy for planning review. Review comments on the final plat will be transmitted to the engineer who submitted the plat.

2. The drawing of the plat shall be to a scale of one inch = 100 feet. A plat may be submitted drawn to a scale of one inch = 50 feet if the subdivision is equal to or less than ten acres in size.

3. Submit an updated title report dated within 30 days prior to submittal date, with and in support of the final plat.

4. All lettering, numbers, and drawings must be clear and distinct and of sufficient size to enable the City to have usable records when the drawings are micro-filmed. "Design Standards and Policies" manual, Section 1-100 – Improvement Plan Requirements, describes the minimum requirements for lines, lettering, and numbers which must be met.

5. The name of the subdivision must be shown prominently. List any parcel, unit, phase, or number which may apply.

6. Following the subdivision name, state the quarter section(s) within which the proposed subdivision is to be located. For example: "A subdivision of part of the SE quarter of Section 10, Township 3 North, Range 5 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona." This statement should be followed by a complete legal description and tied to S.I.G.N.

7. Prepared the drawing of the proposed plat so that the direction of north will either be toward the top of the sheet or toward the right side of the sheet. (The top of the sheet will have the 36-inch dimension.) All notation should be oriented to read with the north pointed up. A north arrow shall be provided in a prominent manner with a bar scale indicating the scale of the plat drawing.

8. Provide a small vicinity map showing the relationship of the proposed subdivision to the nearest existing and planned arterial and major collector streets. The orientation of the vicinity map must agree with the orientation of the plat drawing. The vicinity map shall be drawn to a particular scale.

9. Provide a legend with appropriate abbreviation and drawing symbol explanations. See Design Standards and Policies manual, Section 1-100 – Improvement Plan Requirements, for specific requirements with regard to symbols.

10. Each subdivision must have two survey ties. See 6-101.A.1. These ties must be shown, together with the bearing and distances, curve lengths, central angles, radii, etc. for all the subdivision boundary lines. All corners must be identified and notes must indicate whether they were found or set.

11. Show and identify all abutting rights-of-way, easements, subdivisions, property lines, etc. on the property within 150 feet adjacent to the proposed subdivision. The Maricopa County Recorder's office recording information for adjacent dedications, plats, etc. must be shown.

12. Identify all lots by sequential numbering and all tracts by letter. Show all lots, tracts, and street rights-of-way to be within the subdivision. Provide the bearings, dimensions, and curve data necessary for the complete description of each lot, tract, and street right-of-way. All areas within the plat boundaries not occupied by lots or public streets shall be designated as tracts. The tracts shall

be labeled as to use, and the agency (property owners association or City) responsible for the maintenance of the tracts shall be identified by an appropriate note.

13. Care should be taken in establishing the size and shape of corner lots. A corner lot should not be so small or narrow that the space left for construction of homes and fenced yards is not adequate for the builder or ultimate homeowner. The space limitations on corner lots are:

    a. Where a corner lot abuts a key lot, the height and location of walls and fences in the yard facing the side street must conform to the front yard requirements for walls and fences. See Figure 6.1-1.

    b. Almost all corner lots will have an 8-foot wide public utility easement adjacent to the property line in the yard facing the side street as well as in the front yard. Fences and walls should not be constructed within these easements.

14. If the subdivision is to have a property owners association, indicate this on the plat with an appropriate statement.

15. Show and dimension all proposed utility and drainage easements. The easements along side or rear lot lines for underground utility lines and drainage pipe must be entirely on a lot, i.e. not split with half on one lot and half on an adjacent lot, and must be at least 12 feet wide. Utility system easements along the front of lots and tracts must be at least 8 feet wide. If a development is to have a property owners association, the land area set aside for surface drainage should be on a tract which will be maintained by the property owners association and not on an easement where maintenance responsibility would be split among several property owners.

16. All easements that are for drainage and flood control, landscaping, buffer zones, NAOS, vista/scenic corridors, etc. that are not within lot boundaries must be provided with a statement indicating the agency responsible for their maintenance. See Figure 6.1-2. A drainage easement which is to lie within lot boundaries must be configured so that each segment along its length lies entirely within one lots. In order words, lot boundaries must not split the drainage easement.

17. Public utility easements shall provide the same utility easement rights to the approved City of Scottsdale Cable TV franchise as they do to any other public utility.

18. Provide a note stating that when an easement lies within the boundaries of a subdivision lot, maintenance of the easement is the responsibility of the lot owner except when otherwise specially noted on the plat as approved by the City.

19. A dedication statement is required for all road rights-of-way and easements that are to be dedicated to the public. All private streets or roadways must be tracts. The signature of the owner must be acknowledged by a Notary Public or other authorized officer, as set forth in Arizona Revised Statutes. See Figure 6.1-3 for examples of a dedication statement.

20. If any property is encumbered by a deed of trust, a mortgage, and/or an agreement, the lender must ratify (consent to and approve) the plat. The ratification must reference the date the lien was recorded and the docket and page in which the instrument was recorded by the Maricopa County Recorder's office. See Figure 6.1-4 for examples.

    a. If the lender is a corporation, a certified copy of a resolution showing who is authorized to sign on behalf of the corporation shall accompany the plat when submitted to the City for recording.

    b. If a partnership and/or a joint venture is involved, a copy of the partnership or the joint venture agreement must be submitted to the City for review. If either agreement does not designate an individual to sign on behalf thereof, it should be accompanied by a resolution covering same.

    c. Lender's signature must be acknowledged before a notary.

21. If the streets in the subdivision are to be private streets, than the plat must have a note stating the following:

    "The streets are private streets, to be owned and maintained by the property owners association. Normally, after this plat is recorded, the City of Scottsdale will not accept dedication of the streets to the public in order to relieve the property owners association of street maintenance responsibilities unless all street improvements and rights-of-way meet current applicable City standards."

    Private streets require tracts separate from the lots with equal dimensions as the equivalent public right-of-way unless approved by City Council through the amended standards zoning process. Easements for access or private streets is unacceptible.

22. Prior to recording the final plat, it must have the certification of the Project Review Director and the Planning Coordination Manager, and the approval of the Mayor. The City Clerk must attest to the Mayor's signature. Places for these signatures must be provided on the plat. See Figure 6.1-5 for an example.

23. An assured water supply must be available for each subdivision; therefore, one of the following statements must appear on the plat:

    a. If the development is within the City of Scottsdale water service area, use the following:

        "This subdivision is on the City of Scottsdale Water System, which has a certification of assured water supply."

    b. If the development is served by any water district other than the City of Scottsdale, the following must be used:

        "A certificate of assured water supply has been submitted to the City of Scottsdale for this development."

24. A certification must be provided by a land surveyor registered to practice in Arizona stating that the plat was made under his direction and that it meets the minimum standards of Arizona Land Boundary surveys. His seal must be placed on each sheet of the plat. See Figure 6.1-6 for an example.

25. Sight distance triangles must be clear of landscaping, signs, or other visibility obstructions between 2 feet and 7 feet in height and 6 inches maximum width or diameter.

26. Provide in block form in the lower right hand corner of the plat the following information:

    a. Land surveyor's name and address.
    b. "Plat for (name) subdivision."
    c. Date prepared and job number.
    d. Scale.
    e. "Sheet ___ of ___ sheets."

27. Projects requiring dedication of NAOS shall submit a detailed worksheet and graphic depicting the required and provided amounts of NAOS being dedicated for the subdivision.

28. Submit a separate document at the time of final plat submittal identifying how NAOS will be secured prior to and during construction to ensure that those areas will remain undisturbed.

29. Other requirements included on the Final Plans Submittal Requirements sheet which is part of the preliminary plat stipulation package must be met.

30. Shaded areas or screening that is in a lighter shade than the entire map is prohibited as the map is not reproducible by County Recorder.

C. Plats to be Recorded (Including Amended Plats)

Within ninety (90) days after the final plat has been approved by the City Council, the subdivider shall tender the original plat drawing plus two photo mylar copies, or three photo mylar copies of the original plat drawing for recording at Maricopa County Recorders' Office. Ammonia mylar copies of the plat are not acceptable. Shaded areas or screening that is in a lighter shade than the entire map is prohibited as the map is not reproducible by County Recorder.

Within thiry (30) days of receipt of the plat mylars and fee for recording the final plat, the city will shall record the plat.

The city shall issue permits only after the final plat has been recorded and all engineering plans have been approved by the city staff. Approval of the engineering plans does not assure the issuance of any permits, nor does it constitute authorization to record the final plat.

The fee for recording the final plat shall be as set forth in the current Fee Schedule adopted by the city.

Staff may approve recordation by a reputable title company. When the approval signatures have been provided, the City will contact the title company to have the plat recording handled by the company. The mylar film should be at least 4 mils thick. All signatures on the plat must be in black ink. If the developer or engineer wishes, additional "originals" may be submitted for approval signatures and recording purposes. Plats shall not be recorded until they have received City Council approval and certain requirements have been met.

1. All the required improvement plans (water, sewer, paving, grading, etc.) must be approved by the city before the plat can be recorded.

2. When the improvement plans have been approved, the plat will be signed by the appropriate City officials to indicate the City's approval, and the title company representatives will be given the plat to have it recorded.

D. Amended Plats

One of the three following methods shall be used to amend a recorded plat. The developer shall arrange an initial contact meeting to determine the method of amendment. Any replatting or amendment to plats may be subject to changes of ordinance, city codes, or state statues which may have occurred since the original plat, as determined by city staff.

1. Return to the preliminary plat/final plat procedure (major changes):
This method shall be used when there are major changes proposed to any of the following: Zoning, type of lot, number of lots (+/- three or more), tracts, or common area facilities. Any change which substantially alters the original approved plat, as determined by city staff, shall require a preliminary plat and final plat procedure.

2. Replat procedure (moderate changes):
This method shall be used when there are proposed changes involving any of the following: Number of lots (+/- one or two), lot lines (+/- three feet or more) of more than three lots, roadway alignment, abandonment of public right-of-way, vacation of easement, rededication of easements or rights-of-way, changes to common areas tracts, third party involvement (i.e. lien holders, financial institutions, property owners association). No preliminary plat is required with this procedure.

3. Certificate of Correction (minor changes):
This method shall be used when there are three or fewer minor changes proposed involving any the of the following: lot lines (+/- 2 feet or less) of one or two lots, bearing or distance changes, minor corrections to language of dedication, notes, or legal description. Certificates of correction shall typically be prepared by the original engineer or surveyor.

6-102 CONDOMINIUM PLATS

A. General Comments

Improvement plans for condominium development in Scottsdale are handled by the City staff in the same manner as an apartment development is handled except that plats are required for the division of living space for the future condominium owners.

B. Condominium Development Plats That Do Not Include Dedications to the Public.

If the plat is not also used as a map to dedicate land to the public or to grant easements for public purposes, the minimum requirements described in the following subparagraphs must be met to secure City approval of the plat.

1. One copy of the plat must be submitted to the City on 24-inch by 36-inch paper for review.

2. Because of the need to update its quarter section maps, the City prefers the plats to be drawn to a scale of 1 inch = 100 feet. If this scale is not appropriate for the development use a scale which, when multiplied by a whole number will equal 1 inch = 100 feet.

3. A title report for the development property shall be submitted with the plat. The report must be dated within 30 days prior to the submittal date.

4. All lettering, numbers, and drawings must be clear and distinct and of sufficient size to enable the City to have usable records when drawings are micofilmed. Design Standards and Policies manual, Section 1-100 – Improvement Plan Requirements, describes the minimum requirements for liens, lettering, and numbers which must be met.

5. The name of the development must be shown prominently.

6. Following the development name, state the quarter section(s) within which the proposed subdivision is to be located; for example: “A condominium development of Part of the SE quarter of Section 10, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian, Marcopa County, Arizona”. This statement should be followed by a complete legal description of the development boundaries tied to S.I.G.N.

7. Prepare the drawing of the plat so that the direction of north will either be toward the top of the sheet or toward the right side of the sheet. (The top of the sheet will have the 36- inch dimension.) All notations should be oriented to read with north pointed up. A north arrow shall be provided in a prominent manner with a notation indicating the scale of the drawing.

8. Provide a small vicinity map showing the relationship of the proposed development to the nearest arterial and major collector streets. The orientation of the vicinity map must agree with the orientation of the map drawing, but the vicinity map does not have to be drawn to a particular scale.

9. Provide a legend with appropriate abbreviation and drawing symbol explanations. See Design Standards and Policies manual, Section 1-100 – Improvement Plan Requirements, for specific requirements with regard to symbols.

10. Each development must have two survey ties to two separate existing monuments in Scottsdale's Integrated Geodetic Network (S.I.G.N.). The monuments in SIGN are to be used as the basis of Bearing. SIGN monument locations, descriptions, and state plan coordinate values are available through the City Survey office – 391-5782. These ties must be shown together with the bearings and distances, curve lengths, central angles, radii, etc. for all the development boundary lines. All corners must be identified and notes must indicate whether they were found or set.

11. The floor elevations for each residential unit must be tied to the City of Scottsdale's vertical control datum and the residential unit boundaries must be tied by appropriate dimensions to the development boundary lines.

12. Show and identify all abutting rights-of-way, easements, subdivisions, unsubdivided land, etc. on the property adjacent to the proposed development. The Maricopa County Recorder's office recording information for adjacent dedications, plats, etc. must be shown.

13. Identify each subdivided condominium space by number and all tracts of land for common use by letter. Provide bearings, distances, dimensions, and curve data necessary for the complete description of each subdivided space or tract. Since there are no dedications to the public on condominium plats covered under this section, all areas within the development that are not occupied by residential units are common areas and must be designated as tracts.

14. Since the streets in the development are to be private streets, the condominium plat must have a note stating the following:

    "The streets are private streets, to be owned and maintained by the property owners association. Normally, after this plat is recorded, the City of Scottsdale will not accept dedication of the streets to the public in order to relieve the property owners association of street maintenance responsibilities."

15. An assured water supply must be available for each condominium development; therefore, one of the following statements must appear on the plat:

    a. If the development is within the City of Scottsdale water service area, use the following:

       "This development is on the City of Scottsdale Water system, which has a certification of assured water supply."

    b. If the development is served by any water district other than the City of Scottsdale, the following must be used:

       "A certificate of assured water supply has been submitted to the City of Scottsdale for this development."

16. A certification must be provided by a land surveyor registered to practice in Arizona stating that the plat was made under his direction and meets the minimum standards for Arizona Land Boundary Surveys.

17. Provide in block form in the lower right-hand corner of the plat following information:

    a. Land surveyor's name and address.
    b. "Map for (name of development)."
    c. Date prepared and job numbers.
    d. Scale.
    e. "Sheet ___ of ___ sheets."

18. Each condominium plat must have a signature block for the Project Coordination Manager recommending approval, and for the Project Review Director's approval. Figure 6.1-5 has an example of this signature block.

18. At the time approval is to be given by the City, the original plat drawing and two photo mylar copies or three photo mylar copies of the original drawing must be submitted to the City for receipt of approval signatures of the Commercial Project Review Manager and the Project Review Director. Ammonia mylar copies of the plat are not acceptable. All signatures must be in black ink. The mylar film should be at least 3 mils thick.

Shaded areas or screening that is in a lighter shade than the entire map is prohibited as the map is not reproducible by County Recorder.

C. CONDOMINIUM PLATS THAT INCLUDE DEDICATIONS TO THE PUBLIC

If a condominium plat is used to dedicated land to the public or to grant easements for public purposed, the requirements described under paragraphs 6-102.B.1.-19 apply. In addition, the requirements under paragraph 6-103 which are not listed under 6-102.B. also apply.

6-103 MAPS OF DEDICATION

A. General Comments

The following requirements apply to the preparation of maps which are to be used to dedicate land to the public or to grant an easement to the public for roadway, drainage, flood control, utility line, emergency or service vehicle access, or other public uses. Some of these requirements may be waived by the Project Review Director if it is demonstrated that the requirements are not appropriate because of the size or nature of a development.

B. Map Requirements

1. One copy of the map must be submitted to the City on 24-inch by 36-inch paper for review.

2. Because of the need to update its quarter section maps, the City prefers maps to be drawn to a scale of 1 inch = 100 feet. If this scale is not appropriate for the

development, use a scale which, when multiplied by a whole number, will equal 1" = 100'.

3. A title report for the property to be dedicated shall be submitted with the map. The report must be dated within 30 days prior to the submittal date.

4. All lettering, numbers, and drawings must be clear and distinct and of sufficient size to enable the City to have usable records when drawings are microfilmed. Design Standards and Policies manual, Section 1-100 – Improvement Plan Requirements, describes the minimum requirements for lines, lettering, and numbers which must be met.

5. A map title must be shown prominently and if this dedication is related to a specific development, the identification of the development should be part of the title.

6. Following the map title, state the quarter section(s) within which the property to be dedicated lies; for example, "A parcel of land in the SE quarter of Section 10, Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona". This statement should be followed by a complete legal description.

7. Prepare the drawing of the map so that the direction of north will either be toward the top of the sheet or toward the right side of the sheet. (The top of the sheet will have the 36-inch dimension.) All notations should be oriented to read with north pointed up. A north arrow shall be provided in a prominent manner with a bar scale indicating the scale of the drawing.

8. Provide a small vicinity map showing the relationship of the dedicated property to the nearest arterial and major collector streets. The orientation of the vicinity map must agree with the orientation of the map drawing, but the vicinity map does not have to be drawn to a particular scale.

9. Provide a legend with appropriate abbreviation and drawing symbol explanations. See Design Standards and Policies Manual, Section 1-100 – Improvement Plan Requirements, for specific requirements with regard to symbols.

10. Each development must have two survey ties to two separate existing monuments in Scottsdale's Integrated Geodetic Network (S.I.G.N.). The monuments in SIGN are to be used as the basis of Bearing. SIGN monument locations, descriptions, and state plan coordinate values are available through the City Survey office – 391-5782. These ties must be shown together with the bearings and distances, survey lengths, central angles, radii, etc. for all the development boundary lines. All corners must be identified and notes must indicate whether they were found or set.

11. Show and identify all abutting rights-of-way, easements, subdivisions, unsubdivided land, etc. on the property adjacent to the property being dedicated. The Maricopa County Recorder's office recording information for adjacent dedications, plats, etc. must be shown.

12. All easements that are for drainage and flood control, landscaping, buffer zones, scenic corridors, etc. Must be provided with a statement indicating the agency responsible for their maintenance. See Figure 6.1-2.

13. Public utility easements shall provide the same utility easement rights to the approved City of Scottsdale Cable TV franchise as they do to any other public utility

14. If a common area for a condominium development will be used as a “blanket easement” for public utilities, the areas which will be used for swimming pools, saunas, or other permanent structures (other than dwelling units) should be shown as exceptions to the “blanket easement”.

15. A dedication statement is required for all road rights-of-way and easements to be dedicated to the public. The signature of the owner must be acknowledged by a notary public or other authorized offer, as set forth in Arizona Revised Statutes. See Figure 6.1-3 for examples of an acknowledgment.

16. If any property is encumbered by a Deed of Trust, Mortgage, and/or Agreement, the lender must ratify (consent to and approve) the map. The ratification must reference the date the lien was recorded and the docket and page in which the instrument was recorded by the Maricopa County Recorder’s office. See Figure 6.1-4 for examples.

    a. If the lender is a corporation, a certified copy of a resolution showing who is authorized to sign on behalf of the corporation shall accompany the plat when submitted to the City for recording.

    b. If a partnership and/or joint venture is involved, a copy of the partnership or joint venture agreement must be submitted to the City for review. If either agreement does not designate an individual to sign on behalf thereof, it should be accompanied by a resolution covering same.

    c. Lender’s signature must be acknowledged before a notary.

17. A certification must be provided by a land surveyor registered to practice in Arizona stating that the map was made under his/her direction and meets the minimum standards for Arizona Land Boundary Surveys. His/her seal must be placed on each sheet of the map. See Figure 6.1-6 for an example.

18. Provide in block form in the lower right-hand corner of the map the following information:

    a. Land surveyor’s name and address.
    b. Map for (name of development).
    c. Date prepared and job numbers.
    d. Scale.
    e. “Sheet ___ of ___ sheets.”

19. Each map of dedication must have a signature black for the Project Coordination Manager recommending approval, and an approval signature block for the Project Review Director. See Figure 6.1-5 for an example of the signature block.

20. Shaded areas or screening that is in a lighter shade than the entire map is prohibited as the map is not reproducible by County Recorder.

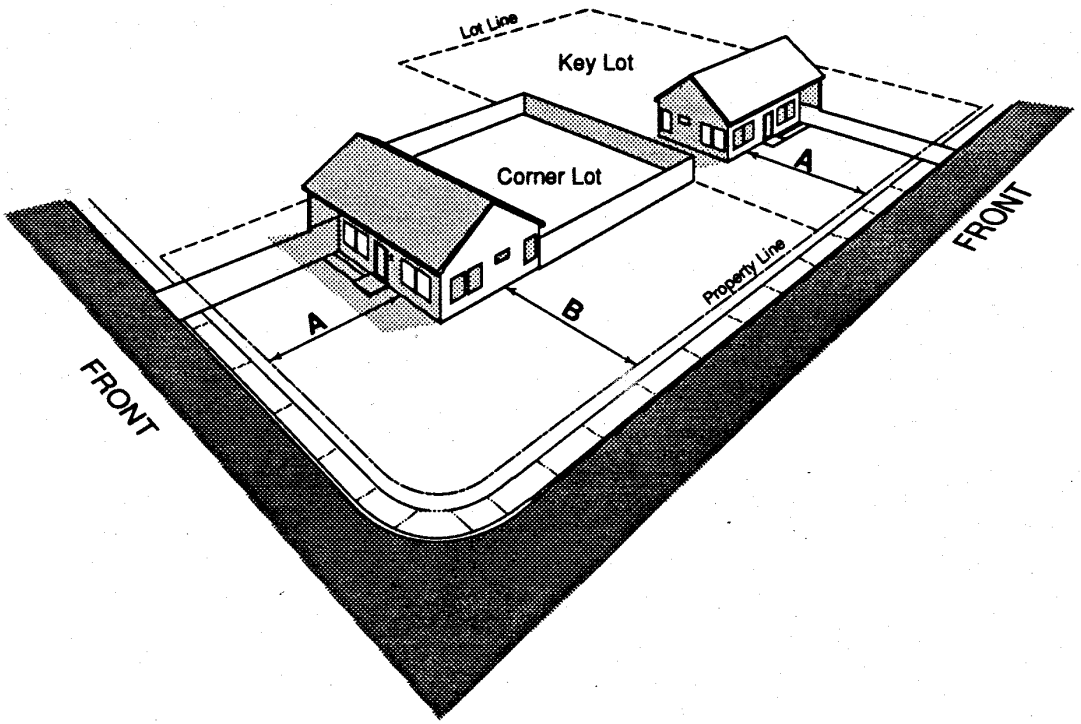
C. Maps to be Recorded

Each map which dedicates land or grants an easement for public use must be recorded in the Office of the Maricopa County Recorder. The original drawing and two photo mylar copies or three photo mylar copies of the original drawing must be submitted to the City for receipt of the signatures of the Project Coordinator Manager and the Project Review Director. Ammonia mylar copies of the map are not acceptable. The mylar film should be at least 4 mils thick.

Within sixty (60) days after the map has been approved and signed by the Project Coordinator and Project Review Director, the city will shall record the plat at Maricopa County Recorders' Office.

The fee for recording the final plat shall be as set forth in the current Fee Schedule adopted by the city.

Staff may approve recordation by a reputable title company. The name of the title company, name of the title officer, and the title company telephone number are required. When the approval signatures have been provided, the City will contact the title company to have the plat recording handled by the company. The mylar film should be at least 4 mils thick. All signatures on the plat must be in black ink. If the developer or engineer wishes, additional "originals" may be submitted for approval signatures and recording



The setback requirements listed below apply to the construction of all buildings and to the construction of walls and fences over three feet high on corner lots which abut key lots:

Zone	Front Yard Setback	Side Yard Setback on Street Side
R1-43	40'	40'
R1-35	40'	40'
R1-18	35'	35'
R1-10	30'	30'
R1-7	20'	See Zoning Ord.

Where a corner lot abuts a key lot, the height and location of walls or fences in the yard facing the side street must conform to the front yard requirements for walls and fences.

Where a corner lot does not abut a key lot, the height and location of walls and fences in the yard facing the side street need only conform to the side yard requirements for walls and fences.

FIGURE 6.1-1

Sideyard Setback Requirements for Corner Lots

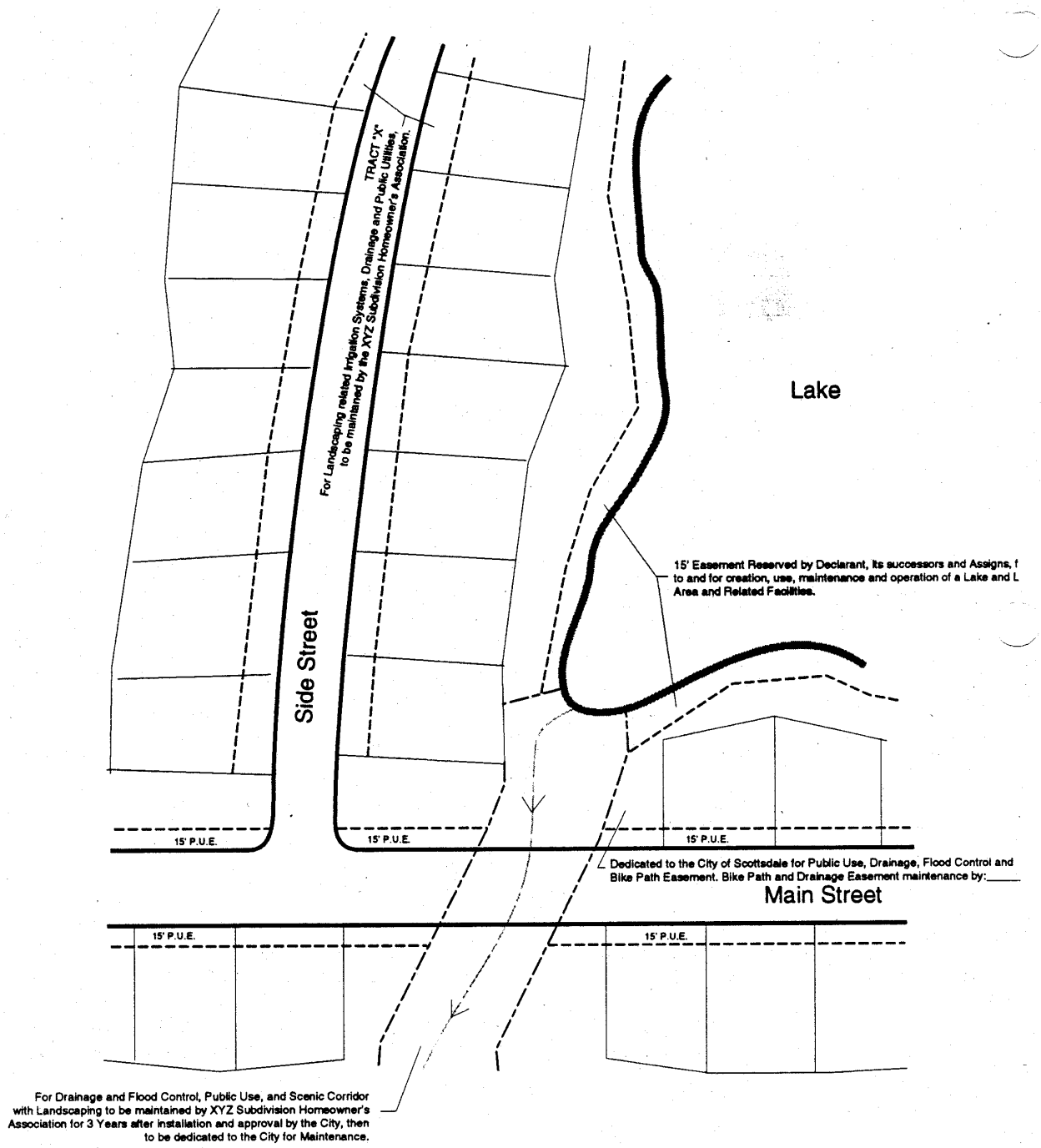


FIGURE 6.1-2

Typical Dedication/Easement Notes

BY INDIVIDUALS

DEDICATION

KNOW ALL MEN BY THESE PRESENTS:

That John Q. Doe and Jane D. Jones; as Free Simple owners, have subdivided under the name DOE ACRES, a portion of Section 13, T2N, R4E of the Gila & Salt River Base & Meridian, City of Scottsdale, County of Maricopa, Arizona, as shown hereon and hereby publishes this plat as and for the plat of said DOE ACRES, and hereby declare that said plat sets forth the location and gives the measurements and dimensions of the lots and streets constituting same, and that each lot and each street shall be known by the number or name that is given to each respectively on said plat, and John Q. Doe and Jane D. Jones, as Free Simple owners, hereby dedicate to the publish for use as such, the streets shown on said plat and included in the above described premises. Easements are reserved for the uses shown hereon.

IN WITNESS WHEREOF John Q. Doe and Jane D. Jones, as Free Simple owners, have hereunto caused their names to be signed this 12trh day of September 1999.

BY: _____ _____
Owner Signature Owner Signature

STATE OF ARIZONA)
) ss
County of Maricopa)

This instrument was acknowledged before me this 12th day of September, 19909, by JOHN Q. DOE and JANE D. JONES,

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

DEDICATION

KNOW ALL MEN BY THESE PRESENTS:

That DOE SISTERS HOME; a general partnership, as owners, have subdivided under the name DOE ACRES, a portion of Section 13, T2N, R4E of the Gila & Salt River Base & Meridian, City of Scottsdale, County of Maricopa, Arizona, as shown hereon and hereby publishes this plat as and for the plat of said DOE ACRES, and hereby declare that said plat sets forth the location and gives the measurements and dimensions of the lots and streets constituting same, and that each lot and each street shall be known by the number or name that is given to each respectively on said plat, and DOE SISTERS HOMES, a general partnership, as owners, hereby dedicate to the public for use as such, the streets shown on said plat and included in the above described premises. Easements are reserved for the uses shown hereon.

IN WITNESS WHEREOF DOE SISTERS HOMES, a general partnership, as owners, have hereunto caused their names be signed this 12trh day of September 1999.

BY: _____
Jane Q. Doe, Its President

STATE OF ARIZONA)
) ss
County of Maricopa)

This instrument was acknowledged before me this 12th day of September, 19909, by JANE Q. DOE, AS President of DOE SISTERS HOMES, an Arizona Corporation, which corporation is a general partnership, on behalf thereof.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission Expires _____

Figure 6.1.3
Sample Dedication Statements

DEDICATION

KNOW ALL MEN BY THESE PRESENTS:

That DOE SISTERS HOMES, an Arizona Corporation, as Owner, and LENDER'S NATIONAL FUNDING, an Arizona corporation, as lienholder; have subdivided under the name DOE ACRES, a portion of Sec 13, T2N, R4E of the G & S R B & M, City of Scottsdale, County of Maricopa, Arizona, as shown hereon and hereby publishes this plat as and for the pl said DOE ACRES, and hereby declare that said plat sets forth the location and gives the measurements and dimensions of the lots and streets constituting same, and that each lot and each street shall be known by the number or name that is given to each respectively on said plat, and Doe Sisters Homes, an Arizona Corporation, as owners, and Lender's National Funding, an Arizona Corporation, as lienholder, hereby dedicate to the public for use as such, the streets shown on said plat and included in the above described premises. Easements are reserved for the uses shown hereon.

IN WITNESS WHEREOF Doe Sisters Homes, an Arizona corporation, as owners, and Lender's National Funding, an Arizona Corporation, as lienholder, have hereunto caused their respective corporate seal to be affixed by the undersigned officer thereunto fully authorized, this 12th day of September, 1993.

Doe Sisters Homes, An Arizona Corporation

BY:_____
Jane Q. Doe, Its President

Lender's National Funding, An Arizona Corporation

_____
Rhonda L. Cash, Its President

STATE OF ARIZONA)
) ss.
County of Maricopa)

This instrument was acknowledged before me this 12th day of September, 1993, by Jane Q. Doe, as President of Doe Sisters Homes, an Arizona Corporation, on behalf thereof.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission Expires:_____.

_____
NOTARY PUBLIC

STATE OF ARIZONA)
) ss.
County of Maricopa)

This instrument was acknowledged before me this 12th day of September, 1993, by Rhonda L. Cash, as President of Lender's National Funding, an Arizona Corporation, on behalf thereof.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission Expires:_____.

_____
NOTARY PUBLIC

(Jointly by Owner & Lender)

RATIFICATION

Lender's National Funding, an Arizona Corporation, as Trustee under that certain Deed of Trust recorded June 13, 1979, in Docket 12998, Page 349 and acting pursuant to the terms thereof and the authority therein granted by the Trustors and beneficiaries hereby ratifies, approves, and acquieces in the dedication as stated in this plat.

STATE OF ARIZONA)
) ss.
County of Maricopa)

This instrument was acknowledged before me this 12th day of September, 1993, by RHONDA L. CASH, as President of Lender's National Funding, an Arizona Corporation, which corporation is a general partnership, on behalf thereof.

IN WITNESS WHEREOF, I hereunto set my hand and official seal.

My Commission Expires:_____.

_____
NOTARY PUBLIC

FIGURE 6.1-4

Sample Ratification Statements

APPROVAL BLOCK FOR SUBDIVISION PLATS

APPROVALS

Approved by the Council of the City of Scottsdale, Arizona this _____ day of _____, 19____, by _____, Mayor.

ATTEST By _____, City Clerk.

I hereby certify that this plat substantially conforms to the approved preliminary plat.

By _____ Date _____
Project Review Director

I hereby certify that all engineering conditions and requirements of the City Code have been complied with.

By _____ Date _____
Planning & Zoning Manager

APPROVAL BLOCK FOR CONDOMINIUM PLATS & MAPS OF DEDICATION

APPROVALS

I hereby certify that all engineering conditions and requirements of the City Code have been complied with.

By _____ Date _____
Project Review Director

By _____ Date _____
Planning & Zoning Manager

FIGURE 6.1-5
Sample Approval Blocks

CERTIFICATION

THIS IS TO CERTIFY that the survey and subdivision of the premises described and platted hereon was made under my direction during the month of August, 1993; that the survey is true and complete as shown; that the monuments shown actually exist or will be set as shown; that their positions are correctly shown; and that said monuments are sufficient to enable the survey to be referenced.

By _____ Date _____

Registered Land Surveyor

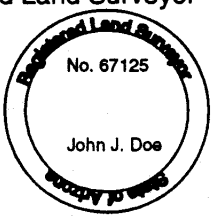


FIGURE 6.1-6

Sample Certification Block

Chapter 7

Landscaping
Design Standards and Policies
Revised December 1999

Chapter 7, Landscaping, describes the City's median design standards and outlines the design standards for the City's streetscapes. This chapter also addresses the planning, design, maintenance and construction of non-paved trails within the City of Scottsdale. Additionally, Chapter 7 contains guidelines to assist individuals and companies in compiling the necessary data required to submit for a native plant permit in accordance with Article 5, Chapter 46 of the Scottsdale Revised Code. This chapter also presents standards and policies to serve as a guide during the design phase of Park and Recreation facilities.

Section 7.1

Median Landscape

Design Standards and Policies
Revised December 1999

Chapter 7
Landscaping

SECTION 7.1
MEDIAN LANDSCAPING

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
7-101	Purpose	1
7-102	Median Character A. Downtown & Urban Character B. Suburban Character C. Transitional Arid Character D. Natural Character	1
7-103	Landscape Guidelines A. Maintenance Responsibility B. Median Widths C. Ends of a Median D. Placement of Trees & Shrubs E. Tree Quantities & Sizes F. Grading G. Decomposed Granite H. Boulders I. Plant Selection	2
7-104	Irrigation Guidelines A. Workmanship and Materials B. Approved Irrigation System Types C. Controllers D. Power Source E. Water Source F. Remote Control Electric Valves G. Back Flow Prevention Devices H. Approved Ball Valves I. Approved Emitters J. Approved Bubblers K. Approved Pressure Regulators L. Pipe M. General Irrigation Notes N. Final Plan Submittal	3
7-105	Sight Distance A. Sight Distance & Safety Triangle	6

B. Planting within Safety Triangle

7-106 Alterations & As-Builts 7

7-107 Non-Conformance 7

FIGURE LIST

FIGURE	DESCRIPTION
7.1-1	List of Recommended Plants
7.1-2	Planting Details for Saguaros
7.1-3	Saguaro Relocation Procedures
7.1-4	Security Enclosure for Backflow Prevention Devices
7.1-5	Irrigation Specificationsl
7.1-6	Landscape Specifications

SECTION 7.1
MEDIAN LANDSCAPING

7-101 PURPOSE

This section describes the City's Median Design Standards. It is intended to acquaint designers and developers with these standards; as well as to assist them in processing plans through the plan review process in an efficient and timely manner.

7-102 MEDIAN CHARACTER

There are four character areas with differing median design standards for each area. These are general designations. Contact the City of Scottsdale's Development Quality / Compliance Division office at (480) 312-7080 to determine which character area designation to use for each specific project.

Medians within Commercial Cores as identified in the General Plan will be allowed a higher percentage of plant coverage with the plant materials for the character area in which they are located.

A. Downtown and Urban Character

1. Balance the use of plant material with decorative paving (stamped concrete, exposed aggregate, pavers, etc.), to minimize the exposure of decomposed granite.

2. Landscaping of medians in the Downtown couplet system is to conform to specifications in the Downtown Infrastructure and Master Street Plan.

3. Plant palette and quantities shall conform to the Downtown Urban Design and Architectural Guidelines, Appendix A.

B. Suburban Character

1. Use decomposed granite, exposed aggregate, and grouted riprap in place of decorative paving.

2. Plant palette should begin to incorporate more arid-type materials (see Figure 7.1-1 of this Manual).

C. Transitional Arid Character

1. Handset riprap and decomposed granite are to be the primary inorganic materials.

2. Plant palette shall consist of indigenous and desert-compatible materials (see Figure 7.1-1).

D. Natural Character

1. Native stone and indigenous decomposed granite are to be the primary inorganic materials.

2. Plant palette is to consist of indigenous materials only, and shall conform to the native distribution patterns, densities, and maturity.

7-103 LANDSCAPE GUIDELINES – See Figure 7.1-6 of this Manual

A. Maintenance Responsibility

1. Maintenance of landscape medians will be the responsibility of the developer, property owner, or a homeowners association for a given period of time (usually 3 years). This period of responsibility will begin and end following inspections and acceptance of installation by a representative of the City's Planning Inspection unit. It is the developer's responsibility to set up the inspections by calling Inspection Services at (480) 312-5750.

2. The particulars for maintenance responsibility of medians are to be stated on the final landscape plans submittal, the final plat, and/or in a separate agreement with the city.

B. Median Widths

1. More detailed information is contained in the City of Scottsdale Design Standards and Policies Manual, Section 3.1 Geometrics, subsection 3-102.C. and Figures 3.1-2, 3.1-3, 3.1-4, and 3.1-8.

2. Median width is measured from back of median curb to back of median curb. The minimum width for a median is 3 feet. If the median is landscaped, a 4 foot minimum is generally required. Within the City's Hillside Area, 8 feet is the minimum requirement.

C. Ends of a Median

The first ten (10) feet and the last ten (10) feet of a median are to be decorative concrete (stamped concrete, exposed aggregate, etc. – be creative).

D. Placement of Trees and Shrubs

1. For planting details of trees, shrubs, and groundcovers see (City of Scottsdale Supplemental Standard Details for Public Work Construction" – Detail #2620. For saguaro planting details, see Figure 7.1-2 of this section.

2. Trees shall be located a minimum of five (5) feet from the back of median curb. Mature canopy size shall also be considered and may require a greater setback.

E. Tree Quantities and Sizes

Trees shall be provided at the rate of one tree per each thirty-five (35) lineal feet of median length. The minimum size is 15 gallon with fifty (50) percent to be provided as mature trees (as defined in Article III of the Zoning Ordinance) or larger.

F. Grading

1. Mounding should not be used in the area designated as Downtown or as Urban Character.

2. The maximum slope of any mounding shall be 4:1 (25%).

3. The finished grade shall be smooth, uniform, and a minimum of four (4) inches below the top of curb.

G. Decomposed Granite

1. Size is to be one half (1/2) inch minus.

2. For installation see (City of Scottsdale Supplemental Standard Details for Public Works Construction" – Detail #2620.

3. A sample shall be submitted to Inspection Services for approval prior to the contractor ordering and bringing onto the site.

4. Color to match what exists in the area. If none exists in the area contact a representative of the city's Planning Inspection unit at (480) 312-5750 to determine an acceptable color.

H. Boulders

1. One-third of any boulder is to be set in ground.

2. Maximum vertical exposure is eighteen (18) inches above grade.

I. Plant Selection

All plant materials used in a median are required to come from the Arizona Department of Water Resources low water use plant list for the Phoenix Active Management Area. See Figure 7.1-1 of this section. The selected plant materials are also to be consistent with the appropriate character areas described in Section 7-102 of this manual.

7-104 IRRIGATION GUIDELINES – See Figure 7.1-5 of the Manual

A. Workmanship and Materials

All materials and workmanship shall conform to the requirements and recommendations of the Irrigation Association Standards. All material specifications shall be based on ASTM standards. All work standards shall be in compliance with ANSI.

B. Approved Irrigation System Types

1. Drip system using rigid laterals.

2. Bubbler system using pressure-compensating bubblers. (Use only with written approval from City of Scottsdale Field Services.)

C. Controllers

1. Rainbird RCM-B (or approved equivalent) controllers are to be used. Contact a representative of the City's Planning Inspection unit at (480) 312-5750 for any substitution.

2. A security cabinet is to be provided for each controller. See "City of Scottsdale Supplemental Details for Public Works Construction" – Details #2630-1, -2, and –3.

3. Controllers are to be grounded. Show details on final irrigation plans.

4. Calculations for precipitation rate of each station are to be provided on the blue prints.

5. Station area coverage maps, sealed in plastic, are to be provided on each controller. This may be a reduced copy of the plans.

6. Controllers are to be placed in the center of the median a minimum of twenty (20) feet before the beginning of the turn bay.

D. Power Source

1. Contractor is responsible for initiating account and service connection.

2. Power source is to be located within the median or the right-of-way, or a utility easement must be provided. This location is to be indicated and noted on the final irrigation plans.

3. A power cut-off switch is to be provided to each controller.

4. All wiring (110 and 24 volt) is to be sleeved under pavement, sidewalks, etc.

E. Water Source

1. Water source and location of proposed tap is to be shown on final irrigation plans.

2. Contact C.O.S. Water and Wastewater at (480) 312-5650 for information on tapping into city waterlines.

3. The minimum source pressure required to operate the system shall be noted on plans.

F. Remote Control Electric Valves

1. Valves are to be of brass construction minimum size one (1) inch.

2. Approved valve is Rainbird series G.

3. Ball valves shall be installed in front of all control valves.

4. All direct buried control valve wiring shall be a minimum 14 gauge.

G. Back Flow Prevention Devices

1. Only reduced pressure assemblies will be used.

2. Acceptable back flow prevention devices are Febco 825-Y or Watts 909 assemblies with ball valve shut off. See "City of Scottsdale Supplemental Standard Details for Public works Construction" – Detail #2354.

3. All back flow prevention devices shall have a security enclosure. See Figure 7.1-4.

4. Union to be installed on back flow assembly.

5. Brass wye strainer shall be installed on back flow assembly.

6. Back flow prevention devices must be tested by a certified tester before the city accepts responsibility for maintenance of the system. Contact (480) 312-5650 for a list of approved certified testers.

H. Approved Ball Valves

Ball valves shall be manufactured by Febco or Watts. Approved equivalents may be substituted. Contact a representative of the City's Planning Inspection unit at (480) 312-5750 for substitute approval.

I. Approved Emitters

1. Bow Smith "SL" and "ML200" series or approved equivalent (for trees only). See "City of Scottsdale Supplemental Standard Details for Public Works Construction" – Detail #2641.

J. Approved Bubblers

1. Rainbird pressure compensating bubblers or approved equivalent.

K. Approved Pressure Regulators

1. Senninger preset pressure regulators or approved equivalent.

L. Pipe

1. All pipe shall be minimum Class 200 PVC.

2. All main lines, sleeves, and fittings shall be minimum Schedule 40 PVC.

3. Copper, or brass, shall be used between water meter and backflow prevention device. See “City of Scottsdale Supplemental Standard Details for Public Works Construction” – Detail #2355.

4. All risers shall be flexible vinyl PVC pipe. See “City of Scottsdale Supplemental Standard Details for Public Works Construction” – Detail #2641.

5. Compression couplings shall not be allowed on main lines.

M. General Irrigation Design Criteria

1. Main lines are to have a minimum backfill cover of eighteen (18) inches.

2. Lateral lines are to have a minimum backfill cover of twelve (12) inches.

3. Schedule 40 sleeving under roadways are to have a minimum horizontal separation of four (4) inches and a minimum backfill cover of twenty-four (24) inches.

4. Piping located in the same trench are to have a minimum horizontal separation of four (4) inches.

5. The irrigation system is to be located entirely within the median.

6. Valve boxes are to have a six (6) inch minimum pea gravel sump.

7. All solvent welded PVC pipe and joints are to be primed with pipe primer. The type of glue and primer shall be per the pipe manufacturer’s recommendations or directions.

8. Back fill material is to be free of rocks, boulders, and any other extraneous matter and debris.

9. Contractor is responsible for initiating account and having water meter set.

10. Trees and shrubs shall be valved separately.

11. The entire irrigation system must be independent of other users, i.e. landscape dedicated to the City of Scottsdale for maintenance is to have separate power and water meters from other irrigation systems.

12. All back fill material for trenches shall be free of rock and debris.

13. Plans shall indicate existing and design operating water pressure requirements.

N. Final Plan Submittal

Final submittal for irrigation plans shall show details for controller valves, pressure regulator, backflow prevention device, valve boxes, enclosures, flush caps, trenching, backfill, security cabinet, emitters, and/or bubblers.

7-105 SIGHT DISTANCE

A. Sight Distances & Safety Triangle

1. To determine sight distances, use the criteria set forth in Section 3.1,Geometrics, subsection 3-102.J.3., of the City of Scottsdale's "Design Standards and Policies Manual".

2. The sight line as shown in Chapter 3.1, figure 3.1-13, shall be clearly indicated and delineated on the final landscape plan submittal.

B. Planting within the sight triangle

1. Shrubs planted within the sight triangle are to have a mature height of not more than two (2) feet. Height shall be from edge of pavement, and total height shall include the height of any mounding.

2. Trees planted within the safety triangle are to have a canopy pruned to a height of seven (7) feet or greater upon installation. Height shall be from edge of pavement, and total height shall include the height of any mounding.

C. Any plant material installed in a questionable area (ie: safety triangles, sight lines) will be identified by traffic engineering and removed by the contractor.

7-106 ALTERATIONS AND AS-BUILTS

If field conditions require relocation of water meter, backflow prevention device, controller, valve, or any other major component of the irrigation system as shown on approved plans contact a representative of the City's Planning Inspection unit at (480) 312-5750 prior to any installation.

Contractor is to provide an accurate set of as-built mylar drawings to the Landscape Inspector prior to initial acceptance of a system.

7-107 NON CONFORMANCE

Designs which do not conform to the criteria set forth in this publication may be appealed in writing to the Development Review Board. The approval, with or without conditions, or denial by the Development Review Board of an application shall be final unless within twenty (20) days from the date of the board's decision the applicant shall appeal therefrom in writing to the City Council. Such appeal shall be submitted through the City Clerk and shall indicate where, in the opinion of the appellant, the Board was in error. The City Clerk shall schedule the appeal for a City Council agenda, and the City Council at its meeting, shall uphold, modify, or overrule the decision of the Board. The decision of the City Council shall be final.

FIGURE 7.1-1

List of Recommended Plants

A. SUBURBAN CHARACTER AREA

BOTANICAL NAME	COMMON NAME
TREES	
Acacia abyssinica	Abyssinian Acacia
Bauhinia congesta	Anacahuita
Dalbergia sissoo	Sissoo
Eucalyptus citiodora	Lemon Scented Gum
Eucalyptus erythrocorys	Red Cap Gum
Eucalyptus torquata	Coral Gum
Fraxinus uhdei	Shamel Ash
Geijera parviflora	Australian Willow
Pithecellobium flexicaule	Texas Ebony
Ulmus parvifolia	Evergreen Elm
SHRUBS	
Caesalpinia spp.	Bird of Paradise
Calliandra californica	Baja Fairy Duster
Dalea spp.	Daleas
Dasylirion spp.	
Leucophyllum spp.	Rangers/Sages
Ruellia peninsularis	Desert Ruellia
Sophora secundiflora	Texas Mountain Laurel
Yucca spp.	

B. TRANSITIONAL ARID CHARACTER

	TREES
Acacia aneura	Mulga
Acacia smallii	Sweet Acacia
Acacia stenophylla	Shoestring Acacia
Cercidium spp.	Palo Verdes
Chilopsis linearis	Desert Willow
Eucalyptus papuana	Ghost Gum
Eucalyptus spathulata	Narrow Leaf Gimlet
Eucalyptus woodwardii	Lemon Flowered Gum
Pithecellobium flexicaule	Texas Ebony
Prosopis spp.	Mesquites
SHRUBS	
Baccharis ‘Centennial’	
Calliandra eriophylla	Fairy Duster
Cordia parvifolia	Little Leaf Cordia
Dalea spp.	Daleas
Dasylirion spp.	

Page 1 of 2

FIGURE 7.1-1 (*Continued)*

List of Recommended Plants

SHRUBS *(Continued)*	
Hesperaloe spp.	
Leucophyllum spp.	Rangers/Sages
Nolina spp.	
Ruellia peninsularis	Desert Ruellia
Salvia clevelandii	Chaparral Sage
Yucca spp.	

Plants other than those listed will be considered on an individual basis.
For recommended plants in the Urban Character Area see the C.O.S. Downtown Guidelines.
For the Native Character Area use indigenous plants only.

FIGURE 7.1-3
Saguaro Relocation Procedures

1. Saguaros shall be replanted on site in a place where they will be safe from present and future construction activities.

2. A rootball of 24” minimum size shall be retained during transplanting, with root length a minimum of 6” on all sides. Dust all wounds and root cuts with soil sulphur.

3. Saguaros must be transplanted with the same north orientation as they originally grew. “NORTH” to be marked on a rib at a height approximately 5’-0” above grade.

4. Saguaros shall be transplanted to the original depth.

5. Saguaros must be watered thoroughly at the time of transplanting to remove air pockets and assure proper soil compaction. Backfill shall be free if injurious rock and debris.

6. Saguaros over 8’0” in height must have bracing as per Figure 7.1-2 of this manual.

7. Saguaros temporarily planted in a nursery must have individually prepared holes; trench planting is not acceptable.

8. Saguaros 6’-0” and smaller should be relocated to NAOS areas if possible.

9. A watering maintenance program must be submitted for approval prior to planting being started.

10. Any deviations from the above mentioned procedures must have written approval by a representative of the City of Scottsdale’s Planning Inspection unit.

FIGURE 7.1-5

IRRIGATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes piping, sprinklers, specialties, accessories for extending existing shrubbery irrigation systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section “Water Systems” for water supply.
2. Division 16 Sections for electrical power materials and installations.

1.3 DEFINITIONS

A. Pipe sizes used in this Section are nominal pipe size (NPS) in inches. Tube sizes are Standard size in inches.

B. Circuit Piping: Piping downstream from control valves to irrigation system sprinklers, emitters, devices, and drain valves. Piping is under pressure (less than pressure piping) during flow.

C. Pressure Piping: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes pressure regulators, water meters, and backflow preventers, when used.

D. Control Valve: Manual or automatic (electrically operated) valve for control water flow to irrigation system zone.

E. Drain Piping: Downstream from circuit piping drain valves. Piping is not under pressure.

F. Flush Valve: Per dirty water application.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. Location of Sprinklers and Devices: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards.

B. Minimum Water Coverage:

1. Turf Areas: 200%, Head to head coverage.

2. Other Planting Areas: 100 percent emitter coverage.

C. Components and Installation: Capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.

0. Circuit and Drain Piping: 125 psig.

1.5 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

1.6 SUBMITTALS

A. Material List

0. Furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the Owner's Representative from Community Maintenance and Recreation.
1. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.
2. Equipment or materials installed or furnished without Prior approval of the Owner's Representative from Community Maintenance and Recreation may be rejected and the Contractor required to remove such materials from the site at his own expense.
3. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.

B. Record Drawings

1. The Contractor shall dimension from two permanent points of reference, building corners, sidewalk or road intersections, etc., the location of the following items:

   a) connection to existing water lines.
   b) connection to existing electrical power.
   c) gate valves.
   d) routing of sprinkler pressure lines (dimension maximum 100' along routing).
   e) sprinkler control valves.
   f) routing of control wiring.
   g) quick-coupling valves.
   h) other related equipment as directed by the Owner's Representative.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handling of PVC Pipe and Fittings: THE CONTRACTOR shall store in covered areas – not exposed to outside elements, and is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has bee dented or damaged will be discarded and, if installed, shall be replaced with piping.

1.8 GUARANTEE

A. The guarantee for the sprinkler irrigation shall be made in accordance with the form shown below. A copy of the guarantee form shall be included in the operations and maintenance manual. The guarantee form shall be retyped onto the Contractor's letterhead and contain the following information:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse or neglect expected. We agree to repair or replace any defects in material or workmanship which may develop during the period of two years from conclusion of maintenance period and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 working days, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within specified time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: _____
LOCATION: _____
_____

SIGNED: _____
Contractor
ADDRESS: _____

PHONE:_____

DATE OF ACCEPTANCE:_____

1.9 QUALITY ASSURANCE

A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage.

B. Comply with requirements of authority with jurisdiction for irrigation systems.

C. Installer Qualifications: Engage an experienced Installer who has completed irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

D. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.

E. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

F. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Owner's Representative in Community Maintenance and Recreation. The burden of proof of product equality is on the Contractor. Refer to Division 1 Section "Product Substitutions."

1.10 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards.

B. Site Information: Reports on subsurface condition investigations made during design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). **Owner assumes no responsibility for interpretations or conclusions drawn from this information.**

1.11 SEQUENCING AND SCHEDULING

A. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shutoff with Owner.

B. Coordinate irrigation systems work with landscape work specified in Division 2 Section "Landscape Work."

1.12 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents.

1. Quick Couplers: Furnish one unit of each size installed.
2. Sprinklers: Furnish quantity of units equal to 10 percent of amount of each type installed.
3. Emitters, Drip Tube, and Devices: Furnish quantity of units equal to 10 percent of amount of each type installed.
4. Valve Keys: Furnish one unit of each type key-operated, control valve installed.
5. Quick-Coupler Hose Swivels: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.
6. Quick-Coupler Operating Keys: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Use only new materials of brands and types noted on drawings, specified herein, or approval equals.

B. PVC Pressure Main Line Pipe and Fittings:

1. Pressure mainline piping 4" and smaller shall be PVC Schedule 40. Above 4" shall be Class 200 (SDR21).

2. Pipe shall be made from NSF approved Type I, Grade I PVC compound confirming to ASTM specification D 2241. Piping 3” and under shall be SDR solvent weld. Piping over 3” shall be gasketed with ductal iron mechanical joints on ells and tees.
3. PVC solvent-weld fittings shall be Schedule 80, 1-2, II-I NSF approved conforming to ASTM test procedure D2467.
4. Solvent cement for PVC solvent-0weld pipe and fittings shall be as manufactured by “Oatey” or equal Type 721.
5. Solvent primer for PVC solvent weld pipes and fittings shall be “all purpose primer” (purple) for PVC and PVC pipe and fittings, equal Type P-70.
6. Installation methods of solvent cement and primer for PVC solvent-weld pipe and fittings shall be as prescribed by the manufacturer.
7. All PVC pipe shall bear the following markings:

    a) manufacturer’s name.
    b) nominal pipe size.
    c) schedule or class.
    d) pressure rating in psi.
    e) National Sanitation Foundation (NSF) approval.
    f) date of extrusion.

8. All fittings shall bear the manufacturer’s name or trademark, material designation, size, applicable IPS schedule and NSF seal of approval.

C. PVC Non-Pressure Lateral Line Piping (Including Emitter Lateral Piping)

1. Non-pressure buried lateral line piping shall be PVC Class 200 solvent-weld joints for sizes 3/4 and larger. Pipe size 1/2" shall be Class 315.
2. Pipe shall be made from NSF approved, Type I, Grade I PVC compound conforming to ASTM resin specification D2241. All pipe shall meet requirements set forth in Federal Specification PS-22-70, with an appropriate standard dimension ratio.
3. Except as noted in paragraphs 1 and 2 of Section 2.1.C, all requirements for non-pressure lateral-line pipe and fittings shall be the same as for solvent-weld pressure mainline pipe and fittings as set forth in Section 2.1.B of these specifications.

D. Brass Pipe and Fittings

1. Where indicated on the drawings, use red brass screwed pipe conforming to Federal Specification #WW-P-351.
2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.

E. Copper Pipe and Fittings (Any pipe exposed to element/above grade)

1. Where indicated on drawings, use copper pipe conforming to all requirements of ASTM B-88 Type K.
2. All copper pipe shall be new, seamless copper pipe designed for underground water service plumbing purposes, etc.

F. Isolation Gate Valves:

1. Gate Valves 3 in. and Larger:

    a) shall be iron body, rubber encapsulated resilient wedge and shall conform to specification of American Water Works Association Standard C509.
    b) shall have 2 in. square operating nut with arrow cast in metal indicating direction of opening.
    c) shall have ends compatible with pipe in which they are being installed.
    d) shall be similar to those manufactured by Waterous Valve Mfg. Co., or approved equal.

2. Other Isolation Valves (2-1/2" and smaller):

   a) isolation valves 2-1/2" and smaller shall be ball valves.
   b) approved valves will be 2 piece and constructed of forged brass body and end adapter.
   c) ball shall be full port, chrome plated brass
   d) seats and stem packing shall be virgin PTFE
   e) stem shall be brass with adjustable stem packing nut threaded to body to prevent stem leakage if lever is removed
   f) valves shall be rated 60psi WOG and 150psi WSP
   g) valves shall be equal to WATTS FBV-3

G. Quick-Coupling Valves: Quick-coupling valves shall have a brass two-piece body designed for working pressure of 150 psi operable with quick couples. Key size and type shall be 1" or #44.

H. Control Wiring:

1. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire AWG-UF 600 volt. Pilot wires shall be a different color wire for each automatic controller. Common wires shall be white with a different color stripe for each automatic controller. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14.
2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply wherever possible.
3. Where more than one wire is placed in a trench, the wiring shall be taped together in bundle at intervals of 10 feet.
4. An expansion curl shall be provided within three feet of each wire connection and each change direction of the main line. Expansion curl shall be of sufficient length at each splice connection at each electric control, so that in case of repair, the valve bonnet may be brought to the surface without disconnection of the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.
5. All splices shall be made with 2-piece Pentite with sealant. Grease filled splices are not allowed.
6. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the Owner's representative from Community Maintenance and Recreation.
7. All control wire under paving or structures shall be sleeved in Schedule 40 PVC Pipe. Size as required or as shown on the drawings. Minimum size shall be 2".
8. Sleeve wire and pipe separately during installation.

I. Automatic Controllers:

1. The controller(s) shall be housed in lockable, weather-resistant stainless steel Lamax (brand name) cases. The controller(s) shall be UL listed. The controller shall be pedestal or wall mounted. The controller shall be equipped with an internally mounted transformer.
2. Final location of automatic controllers shall be approved by the Owner's Representative from Community Maintenance and Recreation.
3. The 120-volt electrical power to the automatic controller location is shown on the drawings. The final electrical hookup shall be the responsibility of the irrigation contractor.

Controller manufacturer shall offer local authorized service for all components and electronics of the control equipment and make available an extended warranty package for a two year period covering all parts and labor for annual budgetary purposes.

J. Electric Control Valves:

1. All electric control valves shall be 3 way solenoid contamination resistant valves, as indicated on drawings.
2. All electric control valves shall be compatible with the automatic controllers and unless otherwise specified shall be of the same manufacture.
3. All electric control valves shall have a manual flow adjustment.
4. Provide and install one control valve box for each electric control valve.
5. One valve per main line tap.
6. All electrical control valves shall have approved ball valves (isolation valves) installed immediately upstream of control valve, same size as valve.

K. Control Valve Boxes:

1. Minimum size to be 16" x 12" x 12" outside dimension. Provide for all valves.
2. Provide extensions compatible with boxes as required to insure box rests on continuous soil base/fired brick. Provide valve box with red brick pavers at corner of each portion of the valve box..
3. Boxes shall be Carson T-type top or approved equal.
4. Provide 6” pea gravel sump below valve body.

L. Sprinkler Heads:

1. All sprinkler heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the plans and/or specified in these special provisions.
2. Riser units shall be fabricated in accordance with the details.
3. Swing joints for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.
4. All sprinkler heads of the same type shall be of the same manufacturer.
5. Pre-fabricated swing joints will not be allowed.

M. Detectable Tape:

1. Detectable tape shall consist of 0.35 mil thick solid foil core encased in a protective plastic jacket that is resistant to alkalis, acids and other destructive elements commonly found in soil. The lamination shall have sufficient strength that the layers cannot be separated by hand. The total composite thickness shall be 4.3 mils minimum. The foil core is to be visible to ensure continuity.
2. Detectable tape shall have a minimum tensile strength of 63 lbs. In the machine direction and 68 lbs. In the transverse direction per three inch strip.
3. A continuous warning message repeated every 16 to 36 inches shall be imprinted on the tape surface. The tape shall be colored: designating the code appropriate to the type of line which the tape is protecting with name brand facing up to indicate location.
4. The tape shall be applied to all pressurized main line – 4” above.

PART 3 - EXECUTION

3.1 INSPECTION

A. Site Conditions:

1. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive Owner's Representative from Community Maintenance and Recreation approval prior to proceeding with work under this Section.
2. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities which are caused by his operation or neglect. Check existing utilities drawings for existing utility locations.
3. Coordinate installation of sprinkler irrigation materials, including pipe, so there shall be no interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers.
4. That Contractor shall carefully check all grades to satisfy himself that he may safely proceed before starting work on the sprinkler irrigation system.
5. No irrigation will be installed unless final grade is (+-) 1/10" above final grade as indicated on the drawings.

3.2 PREPARATION

A. Physical Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.
2. All layout shall be approved by Owner's Representative from Community Maintenance and Recreation prior to installation. Call 480-312-2189.

B. Water Supply:

1. Sprinkler irrigation system shall be connected to water supply points or connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

C. Electrical Supply:

1. Electrical connections for automatic controller shall be made to electrical points of connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

3.3 INSTALLATION

A. Trenching. Before trenching, Contractor shall verify the final grade is at (+-) 1/10". Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted. If the bottom of a pipe trench excavation is found to consist of rock, caliche, or any other material that, by reason of its hardness, cannot be excavated to give a uniform bearing surface, said rock or other material shall be removed for at least three inches (3") below the specified trench depth, and be refilled to specified trench depth with sand or similar material thoroughly tamped into place. Trenches shall be of sufficient depth to provide <u>minimum</u> earth coverage from finish grade as follows:

1. Pressure mainline: 24 inches
2. Control wires: 24 inches
3. Lateral rotary sprinkler heads: 16 inches

4. Emitter, spray heads and bubbler laterals: 12 inches
5. Sleeves under vehicular paving: 24 inches
6. All other sleeves: 18 inches
7. Electrical conduit: 24 inches

B. Backfilling:

1. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled in 6" lifts with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, free from large clods of earth or stones. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.
2. A fine granular material backfill will be initially placed on all lines to a depth of 4" over the top and bottom of the pipe, per COS Detail 2642. No foreign matter larger than 1/2" in size will be permitted in the initial backfill on top pipe.
3. All trenches will be water settled. Flooding of trenches will be permitted only with approval of the Owner's Representative from Community Maintenance and Recreation.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

C. Trenching and Backfill Under Paving:

1. Trenches located under areas where paving, asphaltic concrete or concrete will be installed shall be backfilled with sand (a layer six inches below the pipe and three inches above the pipe) and compacted in layers using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The sprinkler irrigation Contractor shall set in place, cap and pressure test all piping under paving prior to the paving work.
2. Compaction percentage of backfill material shall be based on recommendations of the Soils Report. If Soils Report is not available, compaction shall be based on MAG Section 601.
3. Generally, piping under existing walks is done by jacking, boring or hydraulic driving, but where any cutting or breaking of existing sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the Owner’s Representative. Hydraulic driving will be permitted under concrete paving provided an 18" minimum depth is maintained.
4. Provide for a minimum cover of 24" between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.
5. Provide Schedule 40 PVC sleeves for all piping under paving. Sleeve shall be 2 times the diameter of the pipe being sleeved. Provide one sleeve per pipe.

D. Assemblies:

1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines and various assemblies to conform with the details shown on drawings and in accordance with the manufacturer’s recommendations.
2. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of Owner’s Representative from Community Maintenance and Recreation.
4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent-welding methods shall be as recommended by the pipe and fitting manufacturer. Primer shall be used on all solvent weld joints.
5. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon tape on all threaded PVC-to-metal joints. Light wrench pressure is all that is required.

Where threaded PVC connections are required, use threaded Schedule 80 toe with Schedule 40 coupling into which the pipe may be welded. PVC male adaptors will not be allowed.

6. Thrust Blocks: Concrete thrust blocks shall be installed at all end plugs, ells and tees in main lines.

E. Line clearance. All lines shall have a minimum clearance of 12 inches from lines of other trades. Parallel lines shall not be installed directly over one another and shall have enough distance to facilitate bedding and compaction.

F. Automatic controller. Install as per manufacturer's instructions. Remote control valves shall be connected to controller in numerical sequence as shown on the drawings. Controller station valve/schedule assignments shall be approved by the owners representative from Community Maintenance and Recreation. The controller shall be grounded with an 8' x 5/8" copper clad ground rod located as close as practical to the controller and connected with #10 wire minimum. Approved clamps shall be used. One ground rod per controller approved by Community Maintenance and Recreation.

G. High-voltage Wiring for Automatic Controller

1. 120 –volt power connection to the automatic controller shall be provided by the Irrigation Contractor.
2. All electrical work shall conform to local codes, ordinances, and governing authorities having jurisdiction.

H. Remote control valves. Install where shown on drawings and details. When grouped together, allow at least 12" between valves. Install each remote control valve in a separate valve box. Locate adjacent to walks or curbs where possible. Identify each valve with a permanent marker, tied to stem, with controller and station identification marked. Provide one mainline tap for each lateral line valve.

I. Flushing of System:

1. After all new sprinkler pipe lines and risers and emitters are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.
2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Owner's Representative from Community Maintenance and Recreation.

J. Sprinkler Heads:

1. Install the sprinkler heads as designated on the drawings. Sprinkler heads to be installed in this work shall be as shown on the drawings.
2. Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.
3. Ensure 200% coverage (head to head).

3.4 TEMPORARY REPAIRS

A. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

3.5 EXISTING TREES

A. Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where two-inch and larger roots occur shall be done by hand. All roots two inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than two inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts through. Roots one inch and larger in diameter shall be painted with two coats of Omni/Soil Sulfer or equal. Trenches adjacent to trees, should be closed within 24 hours, and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.

3.6 FIELD QUALITY CONTROL

A. Adjustment of the System:

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.
2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required. Such changes shall be approved in advance by the Owner’s Representative from Community Maintenance and Recreation.
3. Lowering raised sprinkler heads by the Contractor shall be accomplished within 10 days after notification by Owner Representative from Community Maintenance and Recreation.
4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans. On slopes, heads shall be angled for optimum coverage.
5. Owner's Representative from Community Maintenance and Recreation to approve all head locations and reserves the right to request Contractor to make minor adjustments to head or emitter placement or nozzle selection at no cost to the Owner.

B. Testing of Irrigation System:

1. The Contractor shall request the presence of the Owner's Representative from Community Maintenance and Recreation at least 48 hours in advance of testing. Call 480-312-2189.
2. Test all pressure lines under hydrostatic pressure of 150 lbs./sq. in. and prove watertight. **NOTE**: Testing of pressure main lines shall occur prior to installation of electric control valves.
3. All piping under paved areas shall be tested under hydrostatic pressure of 150 lbs./sq. in. and proved watertight prior to paving.
4. Sustain pressure in lines for not less than two hours. Pipe sections shall be center loaded and all couplings shall be exposed. Before testing, the line shall have been filled with water for at least four (4) hours and provisions made for thoroughly bleeding the line of air.

5. All hydrostatic tests shall be made only in the presence of the Owner's Representative from Community Maintenance and Recreation. No pipe shall be backfilled until it has been inspected, tested and approved in writing.
6. Contractor shall furnish necessary force pump and all other test equipment.
7. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Owner's Representative from Community Maintenance and Recreation to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate without bringing this to the attention of the Owner's Representative from Community Maintenance and Recreation. This test shall be accomplished before any ground cover is planted.
8. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements.

3.7 MAINTENANCE

A. The entire sprinkler irrigation system shall be under full automatic operation for a period of seven days with all malfunctions and leaks corrected prior to any planting.

B. The Owner's Representative from Community Maintenance and Recreation reserves the right to waive or shorten the operation period.

3.8 CLEANUP

A. Cleanup shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broomed or washed down, and any damage sustained on the work of others shall be repaired to the original conditions acceptable to the Owner's Representative from Community Maintenance and Recreation.

3.9 FINAL OBSERVATION PRIOR TO ACCEPTANCE

A. The Contractor shall operate each system in its entirety for the Owner's Representative from Community Maintenance and Recreation at the time of final observation. Any items deemed not acceptable shall be reworked to the complete satisfaction of the Owner's Representative.

B. The contractor shall show evidence to the Owner's Representative from Community Maintenance and Recreation that the Owner has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

3.10 OBSERVATION SCHEDULE

A. Contractor shall be responsible for notifying the Owner's Representative from Community Maintenance and Recreation in advance for the following observations according to the time indicated:

1. Pe-job conference – Seven (7) days.
2. Pressure supply line installation and testing – 48 hours.
3. Automatic controller installation – 48 hours.
4. Control wire installation – 48 hours.
5. Lateral line and sprinkler installation – 48 hours.
6. Coverage test – 48 hours.
7. Final observation – Seven (7) days.
8. Emitter lateral and extension line placement – 48 hours.
9. Emitter operation – 48 hours.

B. When inspections have been conducted by other than the Owner's Representative from Community Maintenance and Recreation, show evidence **in writing** of when and by whom these inspections were made.

END OF SECTION

FIGURE 7.1-6

LANDSCAPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Trees.
2. Shrubs.
3. Ground covers.
4. Plants.
5. Lawns
6. Topsoil and soil amendments.
5. Proper staking..
6. Landscape edgings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
2. Division 2 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.

1. Manufacturer's certified analysis for standard products.
2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
3. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.

C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and week seed content. Include the year of production and date of packaging.

D. Samples of each of the following:

1. 5 lb (2 kg) of granite stone mulch for each color and texture of stone required for Project, in labeled plastic bags.

E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.

F. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.

1. Analysis of imported topsoil (by certified soil laboratory).

G. Planting schedule indicating anticipated dates and locations for each type of planting.

H. Maintenance instructions recommending procedures to be established by Owner for maintenance of landscaping during an entire year. Submit before expiration of required maintenance periods.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.

B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.

C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."

D. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.

1. Report suitability of topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil.

E. Measurements: Measure trees and shrubs according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take caliper measurements 6 inches (150 mm) above ground for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above ground for larger sizes. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings." Prior to planting of trees and shrubs with City owners and contractor discuss the Community Maintenance and Recreation planting details.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.

B. Trees and Shrubs: Do not prune before delivery, except as approved by Community Maintenance and Recreation Representative. Protect bark, branches, and root systems from sunburn, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery of all plant material, this includes flatbed semi-trailer.

C. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist. Contractor is responsible for providing water to plant material on site.

1. Do not remove container-grown stock from containers before time of planting. Option of Community Maintenance and Recreation to sample 2% of lot material.
2. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 PROJECT CONDITIONS

A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

C. Clean backfill (native backfill) no rocks larger than ½” diameter.

1.7 COORDINATION AND SCHEDULING

A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

B. Schedling: Irrigation system shall be operational in both landscape and turf areas before being planted.

C. Turf: October-March–overseed bermuda sod
March-October 1–bermuda sod
June 1-July 26-selected bermuda seed type or hybrid stolens

1.8 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Warrant the following living planting materials for a period of one year after date of Final Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.

C. Remove and replace dead planting materials immediately. All plants to be replaced in-kind size specified in the original design.

D. Replace planting materials that are in an unhealthy condition at end of warranty period.

1.9 TREE AND SHRUB MAINTENANCE

A. Maintain trees and shrubs by cultivating, watering, weeding, fertilizing, following Community Maintenance and Recreation planting details, tightening and repairing stakes, and resetting to proper grades or vertical position. Spray as required to keep trees and shrubs free of insects and disease. Maintain trees and shrubs for the following period:

1. Maintenance Period: 3 months following final acceptance.

1.10 GROUND COVER AND PLANT MAINTENANCE

A. Maintain ground cover and plants by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings for the following period:

1. Maintenance Period: 3 months following final acceptance.

1.11 LAWN MAINTENANCE

A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is etablished, but for not less than the following periods:

1. Seeded Lawns: 60 days after date of final acceptance.

a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season. Lawns shall be substantially complete when entire area is covered with uniformly and mowed to a uniform height of 1 ½ inch.

B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.

C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches (100 mm).

D. Mow lawns as soon a there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting 1/3 height of the grass. Remove no more than 1/3 inch of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Never mow grass when wet. All mowing schedules will be confirmed by Community Maintenance and Recreation representative.

E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry, then schedule water cycle.

1. Use fertilizer that will provide actual nitrogen of at least 1 lb. Per 1,000 sq. ft. (0.5 kg per 100 sq. m) of lawn area.

PART 2 - PRODUCTS

2.1 TREE AND SHRUB MATERIAL

A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

D. Plants protected by federal trademark or patent must include the correct name with genus and species along with registered cultivar name and be attached to all plants delivered and planted on specific project.

2.2 GRASS MATERIALS

A. Grass Seed: Fresh, clean dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.

1. Seed Mixture: Provide Bermuda Triangle (mix of Sultan, Sidney and Yuma), 80% minimum germination, 85% minimum pure live seed, 0.5% maximum weed seed.

B. Sod: Hybrid Bermuda 328 overseeded perennial rye with winter grass variety approved by Community Maintenance and Recreation.

1. Sod shall be ¾ inch thick.
2. Size of sod pad shall be cut not less than 12 inches x 24 inches nor more than 42 inches x 96 inches. Torn or uneven ends are unacceptable.
3. Sod shall not break apart when handled and be moist and fresh upon arrival to site.
4. Sod shall be mowed prior to cutting.
5. Sod shall be scrim free during installation.

2.3 DESERT RESTORATION

A. Hydroseed: Seed mixture shall consist of the following varieties at the rates shown below. Seed mixture shall be applied with the wood fiber mulch slurry.

PLS#/ACRE	BOTANICAL NAME	COMMON NAME
2	ENCELIA FARINOSA	BRITTLEBUSH
1	VIGUERIA DELTOIDEA	SHRUBBY GOLDEN EYE
2	AMBROSIA DELTOIDEA	BURSAGE
4	PLANTAGO INSULARIS	INDIAN WHEAT
2	CASSIA COVESII	DESERT SENNA
1	LOTUS RIGIDA	ROCK PEA
1	GUITERREZIA MICROCEPHALA	SNAKEWEED
1	HALOPAPPUS ACRADENIUS	TURPENTINE BUSH

14 TOTAL PER ACRE

ALL SEED QUOTED IN PLS POUNDS PER ACRE.
PLS = PURE LIVE SEED = PURITY X GERMINATION SEED TO BE BROADCAST ACCORDING TO RECOMMENDED RATES. RAKE INTO SURFACE 1/4".

B. Application rates of seed as specified are for Pure Live Seed (PLS). PLS = (% germination + % hard or dormant) x % purity. Weed content of seed shall not exceed .05%.

C. Binder: Binder shall be a free flowing, non-corrosive powder produced from natural plant gum of Plantago Insulares (Indian Wheat) such as Muciloid Tac or approved equal. Binder shall be applied at 40 lbs. per acre on slopes less than 3:1 and 80 lbs per acre on slopes 3 to 1 and above.

D. Wood Fiber Mulch: Wood fiber mulch shall consist of a specially prepared virgin wood fiber processed to contain no growth or germination inhibiting factors. Further, the mulch shall be manufactured and processed so the wood cellulose fibers will remain in uniform suspension in water under agitation and will blend with seed, fertilizer, and other additives to form a homogeneous slurry. The processed mulch material shall have characteristics to form a blotter-like ground cover on application, with moisture and percolation properties and the ability to cover and hold seed in contact with the soil. Wood fiber mulch shall be applied at 2000 lbs per acre.

2.4 TOPSOIL

A. Topsoil: ASTM D 5268, pH range of 5.5 to 8, 4 percent organic material minimum, free of stones ½ inch (25mm) or larger in any dimension, and other extraneous materials harmful to plant growth.

1. Topsoil Source: Reuse surface soil stockpiled on the site for planter areas. Import topsoil for turf areas. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary.

2. Turf area topsoil shall be an organic material free of deleterious material with a pH of 5.5 to 8.0. Maximum soluble salts shall be 1500 ppm. Soil texture shall be as follows: sand 60%-90%, clay 10%-20%, silt 10%-20%. The soil shall be classified as loamy sand or sandy loam. Volume of stones, cinders, slag, or extraneous material shall not exceed five percent. Obtain topsoil from an offsite borrow area selected by the Contractor and approved by the Architect-Engineer. Onsite stockpiled topsoil may be used in planter areas if meeting the above specifications.

2.5 SOIL AMENDMENTS

A. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.

B. Pete Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed Daota peat (other than sphagnum), peat humus, or reed-sedge peat.

C. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, weed pathogens, stones, sticks, soil, or toxic materials.

1. When site treated, mix with at least 0.15 lb (2.4 kg) of ammonium nitrate or 0.25 lb (4 kg) of ammonium sulfate per cu. Ft. (cu. M) of loose sawdust or ground bark.

D. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed pathogens, and material harmful to plant growth.

E. Herbicides: EPA registered and approved, of type recommended by manufacturer.

F. Water: Potable.

2.6 FERTILIZER

A. Superphosphate: Homogenous commercial 0-45-0, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.

B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea-form, phosphorous, and potassium in the following composition:

1. Composition: 1 lb per 1000 sq. ft. (0.5 kg per 100 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

C. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in homogenous composition:

1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

D. Tree and shrub fertilizer shall be a complete, commercially available inorganic material. Fertilizer shall contain sulfur coated slow release components.

E. All fertilizers and application shall be as required by the soils analysis of the import soil.

2.7 MULCHES

A. Peat Mulch: Provide Dakota peat moss in natural, shredded, or granulated form, of fine texture, with a pH range of 4 to 6 and a water-absorbing capacity of 1100 to 2000 percent.

B. Fiber Mulch: Biodegradable dyed-wood cellulose-fiber mulch, nontoxic, free of plant growth- or germination-inhibitors, with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.

C. Asphalt Emulsion Tackifier: Asphalt emulsion, ASTM D 977, Grade SS-1, nontoxic and free of plant growth- or germination-inhibitors.

D. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, nontoxic and free of plant growth- or germination-inhibitors.

E. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:

1. Type: Decomposed granite.
2. Size Range: 1/2 inch (19 mm) maximum, 1/4 inch (6 mm) minimum.
3. Color: Readily available natural gravel color range, similar to naturally occurring onsite materials.

2.8 WEED-CONTROL BARRIERS

A. Pre-emergent type herbicide.

2.9 STAKES

A. Upright Stakes: Comply with Community Maintenance and Recreation Planting Detail. Dound, 2 inch, pressure-preservative-treated lodge poles, free of knots, holes and other defects.

B. Tie Wire: ASTM A 641 (ASTM A 641M), Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch (2.7 mm) in diameter.

C. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch (13 mm) in diameter, black, cut to lengths required to protect tree trunks from damage.

D. Flags: Standard surveyor's plastic flagging tape, white, 6 inches (150 mm) long.

2.10 SOIL STABILIZER

A. Stabilizer to be applied to desert pavement areas indicated on plans or approved equal by Community Maintenance and Recreation representative.

1. "Stabilizer" as manufactured by Stabilizer, 22nd Street & Magnolia, Phoenix, Arizona 85018, (602) 225-5900.

B. Ballfield infield mix shall consist of crushed Coral granite fines, as processed by Fort McDowell Sand and Gravel and Stabilizer organic binder. Stabilizer is to be mechanically blended with the fines in a pug mill type blender with a metered feeder unit which mechanically measures Stabilizer to the fines at a rate of 20 lbs. Of Stabilizer per 1-ton of fines.

To ensure that a proper blend has been attained, Chuck Dixon at Turf Diagnostic and Design Lab, 310-A North Winchester, Olathe, Kansas shall conduct a Stabilizer recovery test, at the contractor's expense.

Submit two 1-gallon samples of fines, one before treatment and one after treatment. A Stabilizer recovery test will also be required for mound and homeplate mixes and warning track mix.

The Coral fines must meet the USDA particle size analysis in the range as follows for the infield mix:

	ACCEPTABLE RANGE
GRAVEL	0 – 2.0%
COARSE	30 – 35%
MEDIUM FINE SAND	45 – 50%
SILT AND CLAY	15 – 20%
BULK DENSITY	1.5
STABILIZER BINDER ORGANIC MATTER	1.0%
TOTAL PORE SPACE	41
UNIFORMITY COEFFICIENT CU	5.0

C. Ballfield mound and homeplate mix will also be blended with Stabilizer, clay and Coral fines to the following specifications and must meet USDA particle size analysis as follows:

MOUND AND HOMEPLATE MIX

	RANGE
GRAVEL	0 – 2"
VERY COURSE	20 – 25%
COARSE	20 – 25%
MEDIUM AND FINE	25 – 30%
SILT AND CLAY	50 – 60%
STABILIZER CONTENT 12 LBS. PER TON	.6%

D. Ballfield warning track mix will consist of ¼" minus Coral granite and Stabilizer, which meet the following specifications:

WARNING TRACK MIX

¼”	100%
#4	99%
#8	74%
#10	68%
#16	51%
#30	34%
#40	27%
#50	21%
#100	12%
#200	6%
STABILIZER CONTENT 20 lbs. per ton	1.0%

2.11 GRANITE BOULDERS

A. Boulders shall be surface select, free of equipment marks and cracks. Size as indicated on the drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive landscaping for compliance with Community Maintenance and Recreation representative requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure City of Scottsdale’s Community Maintenance and Recreation representative for acceptance before the start of planting work.

3.3 PLANTING SOIL PREPARATION

A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

E. Mix soil amendments and fertilizers with topsoil at rates indicated for lawn areas. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.

F. Tree and shrub backfill shall be native soil per Community Maintenance and Recreation detail.

G. For lawns, mix imported topsoil with recommended amounts of fertilizer and 1/10 percent (by volume) Dakota peat mulch.

3.4 LAWN PLANTING PREPARATION

A. Limit subgrade preparation to areas that will be planted in the immediate future.

B. Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than ½ inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous materials.

C. Spread planting soil mixture to a minimum depth of 12 inches, after light rolling and natural settlement.

D. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and water settle, rake, remove ridges, and fill depressions to meet final grade. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than ½ inch (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.

E. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.5 EXCAVATION FOR TREES AND SHRUBS

A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.

1. Container-Grown Trees and Shrubs: Excavate to 1-1/2 time the container width. Follow Community Maintenance and Recreation planting detail.

B. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

1. Hardpan Layer: Increase planting pit.

C. Fill excavations with water and allow to percolate out, before placing setting layer and positioning trees and shrubs.

3.6 PLANTING TREES AND SHRUBS

A. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.

1. Carefully remove containers so as not to damage root balls.
2. Place stock on setting layer of compacted planting soil.

3. Place backfill around ball in layers, tamping to settle backfill. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.

B. Perform planting in accordance with City of Scottsdale Standard Details and Specifications.

3.7 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs according to ANZI standard A-300

3.8 TREE AND SHRUB STAKING

A. Upright Staking and Tying: Stake trees per Community Maintenance and Recreation planting detail of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1800 mm) above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.9 PLANTING GROUND COVER AND PLANTS

A. Space ground cover and plants as indicated.

B. Space ground cover and plants not more than 48 inches (600 mm) apart.

C. Dig holes large enough, 1 ½ times rootball size, to allow spreading of roots, and backfill with planting soil. Water thoroughly after planting.

3.10 MULCHING

A. No mulch in backfill of planted areas. Mulch on surface at final grade..

B. Granite: Apply the following average thickness of granite and finish level with adjacent finish grades. Do not place mulch against trunks or stems.

1. Thickness: >2 inches (50 mm).

C. Desert Pavement from stockpiles shall be spaced to a depth of 2 inches in all disturbed by grading and not receiving other ground treatment. The finished appearance shall be that of the surrounding natural desert. Pre-emergent shall not be applied in desert pavement areas.

3.11 HYDROSEEDING NEW LAWNS

A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.

1. Hydroseed mixture shall contain the following:

Material	Quantity
Seed	2 lbs./1,000 S.F.
Fertilizer	As indicated by Laboratory Analysis
Wood Fiber	1500 lbs./Acre

2. Mix slurry with nonasphaltic tackifier.

3. Apply slurry uniformly to all areas to be seeded in a 2-step process. Apply first slurry application at the minimum rate of 500 lb per acre (5.5 kg per 100 sq. m) dry weight but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 1000 lb per acre (11 kg per 100 sq. m).

3.12 SOD (ALTERNATE NO. 2)

A. Lay sod perpendicular to direction of slope and in a manner permitting end of pad joints to alternate. Lay sod tightly together. Do not stretch pad or overlap joints. Tamp, secure sod on slopes greater than one vertical to three horizontal. Netting scrim must be removed.

B. Water sod immediately after installation to a depth of 1 inch below sod. After a short drying period, roll sod and smooth minor surface irregularities.

3.13 HYDROSEEDING/RESTORATION AREAS

1. After the surface treatment is completed and accepted by the Architect, seed mix shall by hydroseeded.
2. The following materials shall be combined to form a seed mulch mixture for hydroseeded applications.

   a. Seed mix
   b. Binder
   c. Wood Fiber Mulch
   d. Sufficient water to form a homogenous mixture capable of being applied by commercial hydromulching equipment.

3. Hydroseeding which is deposited on adjacent trees and shrubs, roadways, in drain ditches, on structures, and upon any area where seeding is not specified or which is placed in excessive depths on seeding areas shall be removed.
4. Seeding areas flooded or eroded as a result of irrigation shall be repaired, reseeded, and refertilized by the Contractor at his expense.
5. Care During Construction: The Contractor shall be responsible for protecting and caring for seeded areas until final acceptance of the work and shall repair, at his expense, any damage to seeded areas caused by pedestrian or vehicular traffic or other causes. Provide temporary irrigation. Utilize quick coupling valves on main line. Contractor is responsible for design of the temporary irrigation system beyond the quick couplers. Temporary irrigation shall be provided by the Contractor to germinate and establish native seeding. The system utilized to water the Native Seed areas shall be as selected by the Contractor and shall be included in the price Bid for Native Seed.
6. Germination: Seed germination is dependent upon a variety of factors, many of which are interacting. Temperature, light time of year, internal seed dormancy, gas exchange, and moisture are involved in seed germination.

   a. Under favorable conditions, most non-dormant desert seeds will germinate in 7 to 10 days with constant available moisture. Watering should not be so much that it runs off or puddles. Frequent light applications of water are generally needed for good germination results. It will probably be necessary to irrigate several times per day if it is hot, windy, or the soil is well drained or sloped. Irrigation r to 6 times per day is not uncommon. Irrigation should be checked daily for run off and drying between cycles. Careful attention by the Contractor is required because too wet or too dry of conditions will affect germination.
   b. Following germination of approximately 80% of the Pure Live Seed, or as accepted by the Architect, the Contractor shall request start of the Native Seed establishment

period. The establishment period shall be for 90 days from the start date set by the Architect.

c. Establishment: Establishment is considered to be after germination and before plant maturity. Water during the establishment period shall be that of gradual decrease in water application. The intent is to provide water in soil profiles where it is retained and where root growth occurs. Decreasing the water frequency allows for natural characteristics of drought tolerance to develop.

d. The Contractor shall inspect the ground closely as soon as plants have emerged, as many seedlings are small and inconspicuous. Adjust water frequency accordingly. Inspection of plants and soil will determine the watering requirements during the establishment period. Wilting is an obvious sign of water stress. Overwatered plants may appear yellow due to nutrient deficiency or very lush with excess growth. Overwatered plants will not develop drought resistance.

e. Water after germination should be 1 to 3 times per week on average, however, this is a variable depending on many factors. Water should be allowed to soak the soil profile as deeply as possible to encourage deep rooting. As the plans mature and develop woody tissue, the water can be decreased dramatically and temporary irrigation suspended or removed.

f. The Contractor shall be responsible to re-apply hydromulch and seek until establishment is acceptable to the Architect based on 40% of the germinated plants surviving with no increase costs to the Contract. Maintenance of Native seed areas shall be concurrent with establishment of these areas.

3.14 CLEANUP AND PROTECTION

A. During landscaping, keep pavements clean and work area in an orderly condition.

B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

END OF SECTION

Section 7.2

Street Scapes
Design Standards and Policies
Revised December 1999

Chapter 7
Landscaping

Section 7.2
Streetscapes

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
7-201	GENERAL INFORMATION	1
7-202	STREETSCAPES	1
7-203	STREETSCAPE CHARACTER AREAS A. Downtown and Urban Character B. Suburban Character C. Transitional Arid Character D. Natural Character E. Blending of Abutting Character Areas	1
7-204	SPECIFIC AREA DESIGN GUIDELINES	2
7-205	SCOTTSDALE GATEWAYS	2
7-206	GENERAL PLANTING REQUIREMENTS A. Maintenance Responsibility B. Selection of plant species C. Placement of trees and shrubs D. Planting within sight distance triangles E. Grading F. Toppings and Mulches G. Boulders H. Hydroseeding and Natural Area Open Space Restoration I. Modifications to existing streetscapes	3
7-207	GENERAL IRRIGATION REQUIREMENTS	5
7-208	RELATED DOCUMENTS	5
7-209	SUMMARY	5
7-210	DEFINITIONS	5
7-211	SYSTEM PERFORMANCE REQUIREMENTS	6
7-212	SUBMITTALS	6
7-213	SUBMITTAL REQUIREMENTS	6
7-214	PRODUCT DELIVERY, STORAGE AND HANDLING	7

7-215	GUARANTEE	7
7-216	QUALITY ASSURANCE	7
7-217	PROJECT CONDITIONS	8
7-218	SEQUENCING AND SCHEDULING	8
7-219	EXTRA MATERIALS	8
7-220	IRRIGATION MATERIALS SELECTION	8
7-221	INSPECTION	11
7-222	PREPARATION	12
7-223	INSTALLATION	12
7-224	TEMPORARY REPAIRS	14
7-225	EXISTING TREES	14
7-226	FIELD QUALITY CONTROL	15
7-227	MAINTENANCE	16
7-228	CLEANUP	16
7-229	FINAL OBSERVATION PRIOR TO ACCEPTANCE	16
7-230	OBSERVATION SCHEDULE	16
7-231	NON CONFORMANCE	16

FIGURE LIST

FIGURE	DESCRIPTION	PAGE
7.2-1	LANDSCAPE & IRRIGATION MAINTENANCE BLOCK	3
7.2-2	SPRINKLER GUARANTEE	7

SECTION 7.2
STREETSCAPES

7-201 GENERAL INFORMATION

The purpose of this section is to outline the design standards for the City's streetscapes. Streetscapes are defined as the appearance of the corridor that exists along a street alignment between the buildings on each side of the street. This section is intended to aid designers in developing hardscape, landscape, irrigation and general aesthetic improvements for those spaces within the City's streetscape corridors.

7-202 STREETSCAPES

The City is divided into four main character areas for streetscapes. Refer to the "Streetscape Plan" which can be found within the City's General Plan – Environmental Design Element publication. This plan outlines the four character areas graphically. Each area has specific design standards that may not apply to other areas.

In addition to the character area design standards, additional requirements may be imposed through the Development Review process to meet certain ordinance and long term planning objectives. These additional requirements may be found in the zoning and development review cases and the general plan elements and specific design guidelines that are particular to the site.

7-203 STREETSCAPE CHARACTER AREAS

A. Downtown and Urban Character

This classification is given to the area of the city in which pedestrian comfort is a primary consideration. Design of these areas should concentrate on elements such as arcaded walkways, shade, decorative paving, and landscaping so that a comfortable setting can be created for this use-intensive area.

B. Suburban Character

The suburban character applies to areas of the city where compatibility should be achieved between pedestrians and transportation routes within a medium density

development pattern. Use of trees that are native and/or desert adapted and achieve a dense, broad canopy is encouraged for the main theme of the streetscape. Separation of pedestrians from vehicular traffic can be realized through the use of landscape areas and sidewalk alignment.

C. Transitional Arid Character

For areas of the city where the development pattern is medium to low, and the streetscape serves as a buffer between traffic and adjacent land uses, the transitional classification is applied. Landscape materials should include native plants or plants compatible with a desert environment. Special care should be given to the protection of existing vegetation and natural features that can be incorporated into the design.

D. Natural Character

Compatibility with the natural desert is typical of the natural streetscape designation. Plant selection should be native to the Upper Sonoran desert and densities should match the existing and adjacent natural character. The design elements for the Natural Character area are governed in part by the City's Environmentally Sensitive Lands Ordinance (ESLO). Refer to this ordinance for specific requirements on plant and materials selection.

E. Blending of Abutting Character Areas

Where two different character areas join, a blending of the two categories should occur to prevent a marked difference between opposing sides of streets. These guidelines apply to all landscaped areas within the public right-of-way. Areas between the right-of-way and building setback lines are encouraged to use the guidelines as well. Transitional areas which abut Environmentally Sensitive Lands (or the Natural Character) should use native plants as the primary selection in order to strengthen the tie to the natural desert and to prevent the spread of invasive, non-native species into the natural areas.

7-204 SPECIFIC AREA DESIGN GUIDELINES

In circumstances where a special theme is desired, the city may designate specific design standards to be implemented on select streets. There are certain streetscapes within the City of Scottsdale that have been addressed through the approval of these specific design guidelines. These include: 1st Avenue Streetscape, Downtown Design Guidelines, Via Linda Streetscape, Frank Lloyd Wright Boulevard Design Guidelines, Los Arcos Redevelopment Plan, Shea Boulevard Streetscape Guide and the Desert Foothills Character Plan. Refer to these publications for additional design requirements. Contact the One-Stop Shop at (480) 312-2500 for more information.

7-205 SCOTTSDALE GATEWAYS

Scottsdale shares common boundaries with several municipalities. When entering Scottsdale from a neighboring community, it is useful for residents and visitors to have a sense of arrival into the city. Through the use of a city limits identification system, those entering the city should be able to readily recognize their entrance into Scottsdale. The Gateways Map (refer to the City's General Plan Environmental Design Element) shows the locations of city entrance points.

7-206 GENERAL PLANTING REQUIREMENTS

All streetscape designs shall meet the following minimum requirements based upon the City's ordinances.

A. Maintenance Responsibility

1. Maintenance of the City's streetscapes will be the responsibility of the abutting development's property owner, developer or homeowner's association. This applies to all landscaping and irrigation within the defined streetscape. Maintenance responsibility of hardscape and other amenities is particular to each site and should be defined through the development review process.

2. The particulars for maintenance responsibility of streetscapes are to be stated on the final landscape plans submittal. The standard landscape maintenance block is shown in Figure 7.2-1. Any deviations from this standard require City approval and shall be defined in a separately recorded document.

ALL LANDSCAPE AREAS AND MATERIALS, INCLUDING THOSE LOCATED IN PUBLIC RIGHTS-OF-WAY, SHALL BE MAINTAINED IN A HEALTHY, NEAT, CLEAN AND WEED-FREE CONDITION. THIS SHALL BE THE RESPONSIBILITY OF THE _____

(Property Owner, Developer **or** *Homeowner's Association)*

FIGURE 7.2-1

3. Medians within each particular streetscape shall be maintained as outlined in the Design Standards and Policies Manual Section 7-103.A

B. Selection of plant species

Streetscapes require a xeriscape / desert adapted plant species selection in most cases. All plant material used in public rights-of-way must be listed on the Arizona Department of Water Resources (ADWR) most current Low Water Use Plant List, available from ADWR. Public rights-of-way that are located in the Environmentally Sensitive Lands (ESL) Upper Desert and Hillside landforms must be landscaped with plants from the City of Scottsdale's Indigenous Plants for Environmentally Sensitive Lands list. This list is available in the City's One-Stop Shop. Refer to the Scottsdale Revised Code Section 49-78 and 49-79, Scottsdale Landscape Ordinance and the ESLO for additional specific plant selection requirements.

C. Placement of Trees and Shrubs

1. For planting details of trees, cacti, shrubs and groundcovers see “City of Scottsdale Supplemental Standard Details for Public Works Construction.”

2. Trees shall be located so that the mature tree canopy does not extend into the street, unless a specific private maintenance program is established which would otherwise prevent a similar situation from occurring. Care should also be taken in locating trees so that there are no conflicts with public utilities.

D. Planting within sight distance triangles

Streetscape design must incorporate safety considerations through careful selection of plant material for planting within sight distance triangles. Areas must be maintained clear of planting and other streetscape improvements between the heights of two and seven feet as measured above the nearest street pavement elevation. Single trunk trees are permitted as long as their canopy is maintained above seven feet in height upon installation, as measured above the nearest street pavement elevation. Sight distance must be considered for vehicles entering and exiting the adjacent properties, as well as for vehicles using the abutting roadways. Refer to Section 3-101.J.3 for determining sight distance.

E. Grading

1. Mounding should not be used in the area designated as Downtown and Urban Character. Care should be taken when designing landscaped mounds within sight distance easements so that the plant canopy over the mounds does not exceed a height of twenty-four (24) inches as measured above the nearest street pavement elevation. All mounding should blend with the adjacent existing terrain.
2. The maximum slope of any mounding shall be 4:1 (25%).
3. The finished grade shall be smooth, uniform and a minimum of four (4) inches below the top of curb.

F. Toppings and Mulches
1. Decomposed granite may be used as a topping material in landscaped areas as defined in the landscape ordinance. In Environmentally Sensitive Lands, this should be replaced by raked, native soils.
2. Decomposed granite shall be one-half (1/2) inch minus in size.
3. Toppings shall be distributed to a depth of two (2) inches and coverage shall extend over all of the area served by irrigation to minimize the evaporation of irrigation water. Do not place mulch against plant trunks or stems.
4. Refer to “City of Scottsdale Supplemental Standard Details for Public Works Construction” for installation.
5. A sample shall be submitted to Inspection Services for approval prior to the contractor ordering and bringing onto the site.
6. Color of material shall match existing adjacent materials. If this cannot be readily determined, contact a representative of the City’s Planning Inspection Unit at (480) 312- 5750 to determine an acceptable color.

G. Boulders
1. One-third of any boulder is to be set in ground. Refer to “City of Scottsdale Supplemental Standard Details for Public Works Construction” for further details on boulder placement.
2. Care should be taken in placing boulders within or adjacent to sight distance easements so that the maximum height of the protruding boulder within the sight

distance easement is not more than two feet in height above the existing streetline elevation.

3. Boulders are considered fixed objects and shall not be placed within the roadside clear zone. Refer to Section 3-104.C.1 for placement criteria.

H. Hydroseeding and Natural Area Open Space Restoration

1. Streetscape areas of natural area open space as defined by the ESLO may be enhanced using a hydroseeding technique. Refer to the City of Scottsdale Community Maintenance and Recreation standards for hydroseeding (section 3.13 of the Standard Specifications and Details for Landscape and Irrigation.)
2. Seed mix shall be composed of native species as defined in the ESLO.

J. Modifications to Existing Streetscapes

1. Modifications and/or removal of existing landscaping, hardscaping and street-side amenities shall require approval from the Planning Systems Department.

7-207 GENERAL IRRIGATION REQUIREMENTS

7-208 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1 Specification Sections, apply to this Section.

7-209 SUMMARY

A. This Section includes piping, sprinklers, specialties, and accessories for extending existing shrubbery irrigation systems.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 2 Section “Water Systems” for water supply.
2. Division 16 Sections for electrical power materials and installations.

7-210 DEFINITIONS

A. Pipe sizes used in this Section are nominal pipe size (NPS) in inches. Tube sizes are Standard size in inches.

B. Circuit Piping: Piping downstream from control valves to irrigation system sprinklers, emitters, devices, and drain valves. Piping is under pressure (less than pressure piping) during flow.

B. Pressure Piping: Piping downstream from supply piping to and including control valves. Piping is under irrigation system pressure. Piping in this category includes pressure regulators, water meters, and backflow preventors, when used.

C. Control Valve: Manual or automatic (electrically operated) valve for control water flow to irrigation system zone.

D. Drain Piping: Downstream from circuit piping drain valves. Piping is not under pressure.

E. Flush Valve: Per dirty water application.

7-211 SYSTEM PERFORMANCE REQUIREMENTS

A. Location of Sprinklers and Devices: Design location is approximate. Make minor adjustments necessary to avoid plantings and obstructions such as signs and light standards.

B. Minimum Water Coverage: Not less than:

1. Other Planting Areas: 100 percent emitter coverage.

C. Components and Installation: Materials should be capable of producing piping systems with the following minimum working pressure ratings except where indicated otherwise.

1. Circuit and Drain Piping: 125 psig.

7-212 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

7-213 SUBMITTAL REQUIREMENTS

A. Material List

1. Furnish the articles, equipment, materials, or processes specified by name in the drawings and specifications. No substitution will be allowed without prior written approval by the Owner's Representative from City staff.
2. Complete material list shall be submitted prior to performing any work. Material list shall include the manufacturer, model number and description of all materials and equipment to be used.
3. Equipment or materials installed or furnished without Prior approval of the Owner's Representative from Community Maintenance and Recreation may be rejected and the Contractor required to remove such materials from the site at his own expense.
4. Approval of any item, alternate or substitute indicates only that the product or products apparently meet the requirements of the drawings and specifications on the basis of the information or samples submitted.

B. Record Drawings

1. The Contractor shall dimension from two permanent points of reference, building corners, sidewalk or road intersections, etc., the location of the following items:

a) connection to existing water lines.
b) connection to existing electrical power.
c) gate valves.
d) routing of sprinkler pressure lines (dimension maximum 100' along routing).
e) sprinkler control valves.
f) routing of control wiring.
g) quick-coupling valves.
h) other related equipment as directed by the Owner's Representative.

7-214 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Handling of PVC Pipe and Fittings: THE CONTRACTOR shall store in covered areas – not exposed to outside elements, and is cautioned to exercise care in handling, loading, unloading, and storing of PVC pipe and fittings. All PVC pipe shall be transported in a vehicle which allows the length of pipe to lie flat so as not to subject it to undue bending or concentrated external load at any point. Any section of pipe that has bee dented or damaged will be discarded and, if installed, shall be replaced with piping.

7-215 GUARANTEE

A. The guarantee for the sprinkler irrigation shall be made in accordance with FIGURE 7.2-2. A copy of the guarantee form shall be included in the operations and maintenance manual. The guarantee form shall be retyped onto the Contractor's letterhead and contain the following information:

GUARANTEE FOR SPRINKLER IRRIGATION SYSTEM

We hereby guarantee that the sprinkler irrigation system we have furnished and installed is free from defects in materials and workmanship, and the work has been completed in accordance with the drawings and specifications, ordinary wear and tear and unusual abuse or neglect expected. We agree to repair or replace any defects in material or workmanship which may develop during the period of two years from conclusion of maintenance period and also to repair or replace any damage resulting from the repairing or replacing of such defects at no additional cost to the Owner. We shall make such repairs or replacements within 10 working days, as determined by the Owner, after receipt of written notice. In the event of our failure to make such repairs or replacements within specified time after receipt of written notice from the Owner, we authorize the Owner to proceed to have said repairs or replacements made at our expense and we will pay the costs and charges therefore upon demand.

PROJECT: _____

LOCATION: _____

SIGNED: _____
Contractor

ADDRESS: _____

PHONE: _____

DATE OF ACCEPTANCE: _____

FIGURE 7.2-2

7-216 QUALITY ASSURANCE

A. Comply with requirements of utility supplying water for prevention of backflow and backsiphonage.

B. Comply with requirements of authority with jurisdiction for irrigation systems.

C. Installer Qualifications: Engage an experienced Installer who has completed irrigation systems similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

D. Listing/Approval Stamp, Label, or Other Marking: On equipment, specialties, and accessories made to specified standards.
E. Listing and Labeling: Equipment, specialties, and accessories that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in "National Electrical Code," Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

F. Product Options: Irrigation system piping, specialties, and accessories are based on specific types, manufacturers, and models indicated. Components with equal performance characteristics produced by other manufacturers may be considered, provided deviations in dimensions, operation, and other characteristics do not change design concept or intended performance as judged by the Owner's Representative in Community Maintenance and Recreation. The burden of proof of product equality is on the Contractor. Refer to Division 1 Section "Product Substitutions."

7-217 PROJECT CONDITIONS

A. Perform site survey, research public utility records, and verify existing utility locations. Verify that irrigation system piping may be installed in compliance with original design and referenced standards.

B. Site Information: Reports on subsurface condition investigations made during design of the Project are available for informational purposes only; data in reports are not intended as representations or warranties of accuracy or continuity of conditions (between soil borings). **Owner assumes no responsibility for interpretations or conclusions drawn from this information.**

7-218 SEQUENCING AND SCHEDULING

A. Maintain uninterrupted water service to building during normal working hours. Arrange for temporary water shutoff with Owner.

B. Coordinate irrigation systems work with landscape work specified in Division 2 Section "Landscape Work."

7-219 EXTRA MATERIALS

A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below. Package them with protective covering for storage and label clearly describing contents.

1. Quick Couplers: Furnish one unit of each size installed.
2. Sprinklers: Furnish quantity of units equal to 10 percent of amount of each type installed.
3. Emitters, Drip Tube, and Devices: Furnish quantity of units equal to 10 percent of amount of each type installed.
4. Valve Keys: Furnish one unit of each type key-operated, control valve installed.
5. Quick-Coupler Hose Swivels: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.
6. Quick-Coupler Operating Keys: Furnish quantity of units equal to 25 percent of amount of each type quick coupler installed.

7-220 IRRIGATION MATERIALS SELECTION

A. General: Use only new materials of brands and types noted on drawings, specified herein, or approval equals.

B. PVC Pressure Mainline Pipe and Fittings:

1. Pressure mainline piping shall be PVC Schedule 40.
2. Pipe shall be made from NSF approved Type I, Grade I PVC compound confirming to ASTM specification D 2241. Piping 3" and under shall be SDR solvent weld. Piping over 3" shall be gasketed with ductile iron mechanical joints on ells and tees.
3. PVC solvent-weld fittings shall be Schedule 80, 1-2, II-I NSF approved conforming to ASTM test procedure D2467.
4. Solvent cement for PVC solvent-0weld pipe and fittings shall be as manufactured by "Oatey" or equal Type 721.
5. Solvent primer for PVC solvent weld pipes and fittings shall be "all purpose primer" (purple) for PVC and PVC pipe and fittings.
6. Installation methods of solvent cement and primer for PVC solvent-weld pipe and fittings shall be as prescribed by the manufacturer.
7. All PVC pipe shall bear the following markings:

   a) manufacturer's name.
   b) nominal pipe size.
   c) schedule or class.
   d) pressure rating in psi.
   e) National Sanitation Foundation (NSF) approval.
   f) date of extrusion.

8. All fittings shall bear the manufacturer's name or trademark, material designation, size, applicable IPS schedule and NSF seal of approval.

C. PVC Non-Pressure Lateral Line Piping (Including Emitter Lateral Piping)

1. Non-pressure buried lateral line piping shall be PVC Class 200 solvent-weld joints for sizes 3/4 and larger. Pipe size 1/2" shall be Class 315.
2. Pipe shall be made from NSF approved, Type I, Grade II PVC compound conforming to ASTM resin specification D1784. All pipes shall meet requirements set forth in Federal Specification PS-22-70, with an appropriate standard dimension ratio.
3. Except as noted in paragraphs 1 and 2 of Section 2.1.C, all requirements for non-pressure lateral line pipe and fittings shall be the same as for solvent-weld pressure mainline pipe and fittings as set forth in Section 2.1.B of these specifications.

D. Brass Pipe and Fittings

1. Where indicated on the drawings, use red brass screwed pipe conforming to Federal Specification #WW-P-351.
2. Fittings shall be red brass conforming to Federal Specification #WW-P-460.

E. Copper Pipe and Fittings (Any pipe exposed to element/above grade)

1. Where indicated on drawings, use copper pipe conforming to all requirements of ASTM B-88 Type K.
2. All copper pipe shall be new, seamless copper pipe designed for underground water service plumbing purposes, etc.

F. Isolation Gate Valves:

1. Gate Valves 3 in. and Larger:

   a) shall be iron body, rubber encapsulated resilient wedge and shall conform to specification of American Water Works Association Standard C509.
   b) shall have two (2) inch square operating nut with arrow cast in metal indicating direction of opening.
   c) shall have ends compatible with pipe in which they are being installed.
   d) shall be similar to those manufactured by Waterous Valve Mfg. Co., or approved equal.

2. Other Gate Valves:

   a) gate valves 2-1/2" and smaller shall be 125-lb. SWP bronze gate valve with screw-in bonnet, non-rising stem and solid wedge disc.
   b) gate valves 2 ½" and smaller shall have threaded ends and shall be equipped with a bronze handwheel.
   c) gate valves 2 ½" and smaller shall be similar to those manufactured by Nibco or approved equal.
   d) all gate valves shall be installed per installation detail.

G. Quick-Coupling Valves: Quick-coupling valves shall have a brass two-piece body designed for working pressure of 150 psi operable with quick couples. Key size and type shall be 1" or #44.

H. Control Wiring:

1. Connections between the automatic controllers and the electric control valves shall be made with direct burial copper wire AWG-UF 600 volt. Pilot wires shall be a different color wire for each automatic controller. Common wires shall be white with a different color stripe for each automatic controller. Install in accordance with valve manufacturer's specifications and wire chart. In no case shall wire size be less than #14.
2. Wiring shall occupy the same trench and shall be installed along the same route as pressure supply or lateral lines wherever possible.
3. Where more than one wire is placed in a trench, the wiring shall be taped together in bundle at intervals of 10 feet.
4. An expansion curl shall be provided within three feet of each wire connection and each change direction of the main line. Expansion curl shall be of sufficient length at each splice connection at each electric control, so that in case of repair, the valve bonnet may be brought to the surface without disconnection of the control wires. Control wires shall be laid loosely in trench without stress or stretching of control wire conductors.
5. All splices shall be made with 2-piece Pentite with sealant. Grease filled splices are not allowed.
6. Field splices between the automatic controller and electrical control valves will not be allowed without prior approval of the Owner's representative from Community Maintenance and Recreation.
7. All control wire under paving or structures shall be sleeved in Schedule 40 PVC Pipe. Size as required or as shown on the drawings. Minimum size shall be 2".
8. Wire and pipe sleeve separately during installation.

I. Automatic Controllers:

1. The controller(s) shall be housed in lockable, weather-resistant case. The controller(s) shall be UL listed. The controller shall be pedestal mount.
2. Final location of automatic controllers shall be approved by the Owner's Representative from Community Maintenance and Recreation.

Controller manufacturer shall offer local authorized service for all components and electronics of the control equipment and make available an extended warranty package for a two-year period covering all parts and labor for annual budgetary purposes.

J. Electric Control Valves:

1. All electric control valves shall be 3 way solenoid contamination resistant valves, as indicated on drawings.
2. All electric control valves shall be compatible with the automatic controllers and unless otherwise specified shall be of the same manufacture.
3. All electric control valves shall have a manual flow adjustment.
4. Provide and install one control valve box for each electric control valve.
5. One valve per main line tap.

K. Control Valve Boxes:

1. Minimum size to be 16" x 12" x 12" outside dimension. Provide for all valves.
2. Provide extensions compatible with boxes as required to insure box rests on continuous soil base/fired brick. Provide valve box with red brick pavers at corner of each portion of the valve box.
3. Boxes shall be Carson T-type top or approved equal.
4. Provide 6” pea gravel sump below valve body.

L. Sprinkler Heads:

1. All sprinkler heads shall be of the same size, type, and deliver the same rate of precipitation with the diameter (or radius) of throw, pressure, and discharge as shown on the plans and/or specified in these special provisions.
2. Riser units shall be fabricated in accordance with the details.
3. Swing joints for all sprinkler heads shall be the same size as the riser opening in the sprinkler body.
4. All sprinkler heads of the same type shall be of the same manufacturer.
5. Pre-fabricated swing joints will not be allowed.

M. Detectable Tape:

1. Detectable tape shall consist of 0.35 mil thick solid foil core encased in a protective plastic jacket that is resistant to alkalis, acids and other destructive elements commonly found in soil. The lamination shall have sufficient strength that the layers cannot be separated by hand. The total composite thickness shall be 4.3 mils minimum. The foil core is to be visible to ensure continuity.
2. Detectable tape shall have a minimum tensile strength of 63 lbs. In the machine direction and 68 lbs. In the transverse direction per three inch strip.
3. A continuous warning message repeated every 16 to 36 inches should be imprinted on the tape surface. The tape shall be colored: designating the code appropriate to the type of line which the tape is protecting with name brand facing up to indicate location.
4. The tape shall be applied to all pressurized main lines – 4” above.

7-221 INSPECTION

A. Site Conditions:

1. All scaled dimensions are approximate. The Contractor shall check and verify all size dimensions and receive Owner’s Representative from Community Maintenance and Recreation approval prior to proceeding with work under this Section.
2. Exercise extreme care in excavating and working near existing utilities. Contractor shall be responsible for damages to utilities, which are caused by his operation or neglect. Check existing utility drawings for existing utility locations.

3. Coordinate installation of sprinkler irrigation materials, including pipe, so there shall be no interference with utilities or other construction or difficulty in planting trees, shrubs, and ground covers.
4. That Contractor shall carefully check all grades to satisfy him that he may safely proceed before starting work on the sprinkler irrigation system.
5. No irrigation will be installed unless final grade is (+-) 1/10" above final grade.

7-222 PREPARATION

A. Physical Layout:

1. Prior to installation, the Contractor shall stake out all pressure supply lines, routing and location of sprinkler heads.
2. All layouts shall be approved by Owner's Representative from Community Maintenance and Recreation prior to installation. Call (480) 312-2722.

B. Water Supply:

1. Sprinkler irrigation system shall be connected to water supply points or connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

C. Electrical Supply:

1. Electrical connections for automatic controller shall be made to electrical points of connection as indicated on the drawings.
2. Connections shall be made at approximate locations as shown on drawings. Contractor is responsible for minor changes caused by actual site conditions.

7-223 INSTALLATION

A. Trenching. Before trenching the final grade is at (+-) 1/10". Dig trenches straight and support pipe continuously on bottom of trench. Lay pipe to an even grade. Trenching excavation shall follow layout indicated on drawings and as noted. If the bottom of a pipe trench excavation is found to consist of rock, caliche, or any other material that, by reason of its hardness, cannot be excavated to give a uniform bearing surface, said rock or other material shall be removed for at least three inches (3") below the specified trench depth, and be refilled to specified trench depth with sand or similar material thoroughly tamped into place. Trenches shall be of sufficient depth to provide <u>minimum</u> earth coverage from finish grade as follows:

1. Pressure mainline: 24 inches
2. Control wires: 24 inches
3. Lateral rotary sprinkler heads: 16 inches
4. Emitter, spray heads and bubbler laterals: 12 inches
5. Sleeves under vehicular paving: 24 inches
6. All other sleeves: 18 inches
7. Electrical conduit: 24 inches

B. Backfilling:

1. The trenches shall not be backfilled until all required tests are performed. Trenches shall be carefully backfilled in 6" lifts with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, or other approved materials, <u>free</u> from <u>large clods of earth or stones</u>. Backfill shall be mechanically compacted in landscaped areas to a dry density equal to adjacent undisturbed soil in planting

areas. Backfill will conform to adjacent grades without dips, sunken areas, humps or other surface irregularities.

2. A fine granular material backfill will be initially placed on all lines to a depth of 3" over the top of the pipe. No foreign matter larger than 1/2" in size will be permitted in the initial backfill on top pipe.
3. All trenches will be water settled. Flooding of trenches will be permitted only with approval of the Owner's Representative from Community Maintenance and Recreation.
4. If settlement occurs and subsequent adjustments in pipe, valves, sprinkler heads, lawn or planting, or other construction are necessary, the Contractor shall make all required adjustments without cost to the Owner.

C. Trenching and Backfill Under Paving:

1. Trenches located under areas where paving, asphaltic concrete or concrete will be installed shall be backfilled with sand (a layer six inches below the pipe and three inches above the pipe) and compacted in layers using manual or mechanical tamping devices. Trenches for piping shall be compacted to equal the compaction of the existing adjacent undisturbed soil and shall be left in a firm unyielding condition. All trenches shall be left flush with the adjoining grade. The sprinkler irrigation Contractor shall set in place, cap and pressure test all piping under paving prior to the paving work.
2. Compaction percentage of backfill material shall be based on recommendations of the Soils Report. If Soils Report is not available, compaction shall be based on MAG Section 601.
3. Generally, piping under existing walks is done by jacking, boring or hydraulic driving, but where any cutting or breaking of existing sidewalks and/or concrete is necessary, it shall be done and replaced by the Contractor as part of the contract cost. Permission to cut or break sidewalks and/or concrete shall be obtained from the Owner’s Representative. Hydraulic driving will be permitted under concrete paving provided an 18" minimum depth is maintained.
4. Provide for a minimum cover of 24" between the top of the pipe and the bottom of the aggregate base for all pressure and non-pressure piping installed under asphaltic concrete paving.
5. Provide Schedule 40 PVC sleeves for all piping under paving. Sleeve shall be 2 times the diameter of the pipe being sleeved. Provide one sleeve per pipe.

D. Assemblies:

1. Routing of sprinkler irrigation lines as indicated on the drawings is diagrammatic. Install lines and various assemblies to conform to the details shown on drawings and in accordance with the manufacturer’s recommendations.
2. Install no multiple assemblies on plastic lines. Provide each assembly with its own outlet.
3. Install all assemblies specified herein in accordance with respective detail. In absence of detail drawings or specifications pertaining to specific items required to complete work, perform such work in accordance with best standard practice with prior approval of Owner’s Representative from Community Maintenance and Recreation.
4. PVC pipe and fittings shall be thoroughly cleaned of dirt, dust and moisture before installation. Installation and solvent-welding methods shall be as recommended by the pipe and fitting manufacturer. Primer shall be used on all solvent weld joints.
5. On PVC to metal connections, the Contractor shall work the metal connections first. Teflon tape on all threaded PVC-to-metal joints. Light wrench pressure is all that is required. Where threaded PVC connections are required, use threaded Schedule 80 toe with Schedule 40 coupling into which the pipe may be welded. PVC male adapters will not be allowed.
6. Thrust Blocks: Concrete thrust blocks shall be installed at all end plugs, ells and tees in main lines.

E. Line clearance. All lines shall have a minimum clearance of 12 inches from lines of other trades. Parallel lines shall not be installed directly over one another and shall have enough distance to facilitate bedding and compaction.

F. Automatic controller. Install as per manufacturer's instructions. Remote control valves shall be connected to controller in numerical sequence as shown on the drawings. Controller station valve/schedule assignments shall be approved by the owner's representative from Community Maintenance and Recreation. The controller shall be grounded with an 8' x 5/8" copper clad ground rod located as close as practical to the controller and connected with #10 wire minimum. Approved clamps shall be used. One ground rod per controller approved by Community Maintenance and Recreation.

G. High-voltage Wiring for Automatic Controller

1. 120 –volt power connection to the automatic controller shall be provided by the Irrigation Contractor.
2. All electrical work shall conform to local codes, ordinances, and governing authorities having jurisdiction.

H. Remote control valves. Install where shown on drawings and details. When grouped together, allow at least 12" between valves. Install each remote control valve in a separate valve box. Locate adjacent to walks or curbs where possible. Identify each valve with a permanent marker, tied to stem, with controller and station identification marked. Provide one mainline tap for each lateral line valve.

I. Flushing of System:

1. After all new sprinkler pipe lines and risers and emitters are in place and connected, all necessary diversion work has been completed, and prior to installation of sprinkler heads, the control valves shall be opened and a full head of water used to flush out the system.
2. Sprinkler heads shall be installed only after flushing of the system has been accomplished to the complete satisfaction of the Owner's Representative from Community Maintenance and Recreation.

J. Sprinkler Heads:

1. Install the sprinkler heads as designated on the drawings. Sprinkler heads to be installed in this work shall be as shown on the drawings.
2. Spacing of heads shall not exceed the maximum indicated on the drawings. In no case shall the spacing exceed the maximum recommended by the manufacturer.
3. Ensure 100% coverage.

7-224 TEMPORARY REPAIRS

A. The Owner reserves the right to make temporary repairs as necessary to keep the sprinkler system equipment in operating condition. The exercise of this right by the Owner shall not relieve the Contractor of his responsibilities under the terms of the guarantee as herein specified.

7-225 EXISTING TREES

A. Where it is necessary to excavate adjacent to existing trees, the Contractor shall use all possible care to avoid injury to trees and tree roots. Excavation in areas where two-inch and larger roots occur shall be done by hand. All roots two inches and larger in diameter, except directly in the path of pipe or conduit, shall be tunneled under and shall be heavily wrapped with burlap to prevent scarring or excessive drying. Where a ditching machine is run close to trees having roots smaller than two inches in diameter, the wall of the trench adjacent to the tree shall be hand trimmed, making clean cuts

through. Roots one inch and larger in diameter shall be painted with two coats of Omni/Soil Sulfer or equal. Trenches adjacent to trees should be closed within 24 hours, and where this is not possible, the side of the trench adjacent to the tree shall be kept shaded with burlap or canvas.

7-226 FIELD QUALITY CONTROL

A. Adjustment of the System:

1. The Contractor shall flush and adjust all sprinkler heads for optimum performance and to prevent overspray onto walks, roadways, and buildings as much as possible.
2. If it is determined that adjustments in the irrigation equipment will provide proper and more adequate coverage, the Contractor shall make such adjustments prior to planting. Adjustments may also include changes in nozzle sizes and degrees of arc as required. Such changes shall be approved in advance by the Owner's Representative from Community Maintenance and Recreation.
3. Lowering raised sprinkler heads by the Contractor shall be accomplished within 10 days after notification by Owner Representative from Community Maintenance and Recreation.
4. All sprinkler heads shall be set perpendicular to finished grades unless otherwise designated on the plans. On slopes, heads shall be angled for optimum coverage.
5. Owner's Representative from Community Maintenance and Recreation to approve all head locations and reserves the right to request Contractor to make minor adjustments to head or emitter placement or nozzle selection at no cost to the Owner.

B. Testing of Irrigation System:

1. The Contractor shall request the presence of the Owner's Representative from Community Maintenance and Recreation at least 48 hours in advance of testing. Call (480) 312-2722.
2. Test all pressure lines under hydrostatic pressure of 150 lbs./sq. in. and prove watertight. **NOTE**: Testing of pressure main lines shall occur prior to installation of electric control valves.
3. All piping under paved areas shall be tested under hydrostatic pressure of 150 lbs./sq. in. and proved watertight prior to paving.
4. Sustain pressure in lines for not less than two hours. Pipe sections shall be center loaded and all couplings shall be exposed. Before testing, the line shall have been filled with water for at least four (4) hours and provisions made for thoroughly bleeding the line of air.

5. All hydrostatic tests shall be made only in the presence of the Owner's Representative from Community Maintenance and Recreation. No pipe shall be backfilled until it has been inspected, tested and approved in writing.
6. Furnish necessary force pump and all other test equipment.
7. When the sprinkler irrigation system is completed, perform a coverage test in the presence of the Owner's Representative from Community Maintenance and Recreation to determine if the water coverage for planting areas is complete and adequate. Furnish all materials and perform all work required to correct any inadequacies of coverage due to deviations from plans or where the system has been willfully installed as indicated on the drawings when it is obviously inadequate without bringing this to the attention of the Owner's Representative from Community Maintenance and Recreation. This test shall be accomplished before any ground cover is planted.
8. Upon completion of each phase of work, the entire system shall be tested and adjusted to meet site requirements.

7-227 MAINTENANCE

A. The entire sprinkler irrigation system shall be under full automatic operation for a period of seven days with all malfunctions and leaks corrected prior to any planting.
B. The Owner's Representative from Community Maintenance and Recreation reserves the right to waive or shorten the operation period.

7-228 CLEANUP

A. Cleanup shall be made as each portion of work progresses. Refuse and excess dirt shall be removed from the site, all walks and paving shall be broom finished or washed down, and any damage sustained on the work of others shall be repaired to the original conditions acceptable to the Owner’s Representative from Community Maintenance and Recreation.

7-229 FINAL OBSERVATION PRIOR TO ACCEPTANCE

A. The Contractor shall operate each system in its entirety for the Owner's Representative from Community Maintenance and Recreation at the time of final observation. Any items deemed not acceptable shall be reworked to the complete satisfaction of the Owner's Representative.

B. The contractor shall show evidence to the Owner's Representative from Community Maintenance and Recreation that the Owner has received all accessories, charts, record drawings, and equipment as required before final observation can occur.

7-230 OBSERVATION SCHEDULE

A. Contractor shall be responsible for notifying the Owner's Representative from Community Maintenance and Recreation in advance for the following observations according to the time indicated:

1. Pre-job conference – Seven (7) days.
2. Pressure supply line installation and testing – 48 hours.
3. Automatic controller installation – 48 hours.
4. Control wire installation – 48 hours.
5. Lateral line and sprinkler installation – 48 hours.
6. Coverage test – 48 hours.
7. Final observation – Seven (7) days.
8. Emitter lateral and extension line placement – 48 hours.
9. Emitter operation – 48 hours.

B. When inspections have been conducted by other than the Owner's Representative from Community Maintenance and Recreation, show evidence **in writing** of when and by whom these inspections were made.

7-231 NON CONFORMANCE

Designs that do not conform to the criteria set forth in this publication may be appealed in writing to the Development Review Board. The approval, with or without conditions, or denial by the Development Review Board of an application shall be final unless within twenty (20) days from the date of the Board’s decision, the applicant shall appeal therefrom in writing to the Scottsdale City Council. Such appeal shall be submitted through the City Clerk and shall indicate where, in the opinion of the appellant, the Board was in error. The City Clerk shall schedule the appeal for a City Council agenda, and the City Council at its meeting, shall uphold, modify, or overrule the decision of the Board. The decision of the City Council shall be final.

Section 7.3

Non-Paved Trails

Design Standards and Policies
Revised December 1999

Chapter 7
Landscaping

SECTION 7.3
NON-PAVED TRAILS

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
7-301	Introduction A. Preface B. References C. Purpose of Design Standards and Policies D. City Goal E. City Trails Plans F. Trail Classifications G. Definitions	1
7-302	Trail Design A. Design Objectives B. Design Considerations C. Trail Location	5
7-303	Specifications for Trail Classifications A. Urban Trails B. Rural Trails C. Backcountry Primary Trails D. Backcountry Secondary Trails E. Interpretive Trails F. Barrier Free Trails	10
7-304	Trail Construction A. Tread Construction B. Vegetation Clearance C. Surface Water Control D. Special Structures E. Road Crossings F. Trail Access Facilities	17
7-305	Trail Signs and Markers A. Location B. City of Scottsdale Sign Standard C. Developer Provided Sign Standard	27
7-306	Trail Maintenance A. Slough and Berm Romoval B. Vegetation Clearance C. Tread Maintenance D. Drainage Maintenance E. Special Structure Maintenance F. Trail Sign Maintenance	29

FIGURE LIST

FIGURE	DESCRIPTION
7.3-1	Cross Slopes
7.3-2	Typical Trail Profile
7.3-3	Typical Trail Cross Sections
7.3-4	Vegetation Clearance
7.3-5	Grade Dips
7.3-6	Rock Waterbar
7.3-7	Log Waterbar
7.3-8	Rock Culvert
7.3-9	Pipe Culvert
7.3-10	Rock Retaining Wall
7.3-11	Rip Rap
7.3-12	Wash Crossing
7.3-13	Switchback and Climbing Turn Concept
7.3-14	Switchback Turn
7.3-15	Climbing Turn
7.3-16	Rock Steps
7.3-17	Safety Barriers
7.3-18	Trail Access Gates
7.3-19	Trail Junctions
7.3-20	Trail Overpass and Bridge
7.3-21	Trail Underpass
7.3-22	Trail Access Facility Concept
7.3-23	Trail Sign
7.3-24	Trail Signs
7.3-25	Trail Sign Installation
7.3-26	Slough and Berm Removal

SECTION 7.3
NON-PAVED TRAILS

7-301 INTRODUCTION

A. Preface

This manual addresses the planning, design, maintenance, and construction of trails within the City of Scottsdale. The "trails" addressed in this manual are non-paved, non-motorized, shared-use trails, which are legally accessible by the general public.

B. References

The following publications were referenced during the preparation of this Manual:

Conflict on Multiple Use Trails, Roger L. Moore, North Carolina State University, 1994.

DRAFT Trail Design, Construction, and Maintenance Guidelines, Arizona State Parks, State Trails Program, 1993.

NPS Trails Management Handbook, U.S.D.I. National Park Service, 1983.

Trail Construction and Maintenance Notebook, U.S.D.A. Forest Service, 1996.

Trails for the 21st Century, Rails to Trails Conservancy, 1993.

Trails Management Manual, Maricopa County Recreation Services Department, 1995.

C. Purpose of Design Standards and Policies

The information in this manual will provide direction for the planning, design, maintenance, and construction of trails within the City of Scottsdale. Any divergence from these design standards and policies is subject to approval by the City of Scottsdale Trails Coordinator and other appropriate City representatives.

D. City's Goal

The City of Scottsdale's goal is to develop and maintain a city-wide interconnecting network of trails to provide valuable recreation and transportation opportunities for City residents and visitors. Trails function as transportation links between schools, residential areas, parks, places of employment, shopping areas, and other areas of

interest. Trails also provide hikers, walkers, joggers, equestrians, mountain bicyclists, and people with disabilities opportunities to improve health and fitness, spend time with family and friends, enjoy the natural environment, and escape the stress of everyday life.

E. City Trails Plans

There are multiple trails plans that must be consulted for the identification of trail alignments within the City. The "Circulation Element" of the City's General Plan provides a basis for the identification of trail locations City-wide. More detailed plans also exist that provide guidance for the development of trails specifically within the McDowell Sonoran Preserve. The planning of trails within the Preserve is the responsibility of the City's Preserve Division, the Preserve Planning Committee, and the Preserve Commission. The planning of trails outside of the Preserve is the responsibility of the City's Community Maintenance and Recreation Division and the Parks and Recreation Commission. It is understood that these various entities shall coordinate together to create the most functional City-wide trail system possible.

F. Trail Classifications (See Section 7-303 for specifications on each trail classification)

1. Urban Trails

The management objective for Urban trails is to provide both transportation and recreation links between residential areas, schools, businesses, parks, places of employment, and other areas of significant community activity. User groups include hikers, equestrians, and bicyclists. Motorized vehicles are only permitted for maintenance and emergency purposes. The trail surface may be comprised of either native soil or decomposed granite. Urban trails have the greatest width of all trail classifications thus accommodate leisurely side-by-side travel and easy passing for multiple user types. These trails are typically located within areas of relatively level topography.

2. Rural Trails

The management objective for Rural trails is to provide secondary transportation and recreation links through areas such as washes, scenic and vista corridors, and other desert open space areas. Secondary networks of neighborhood trails, such as those dedicated to the City but not shown on the General Plan, are classified as Rural trails. User groups include hikers, equestrians, and bicyclists. Motorized vehicles are only permitted for maintenance and emergency purposes, and where trail widths allow. Rural trails are more narrow than Urban trails, therefore occasional single file travel by users may be required. These trails are typically located within areas of level to moderate topography.

3. Backcountry Primary Trails

The management objective for Backcountry Primary trails is to provide safe and enjoyable trail recreation opportunities within preserved open space areas of the City, while having a minimum impact on the surrounding environment. These trails typically provide connections between major trail access points and Backcountry Secondary trails. User groups include hikers, equestrians, and bicyclists. Certain user groups may be prohibited if deemed appropriate (see section 7-302.B.8S). Motorized vehicles with a wheel base of less than 48" may be used for

maintenance and emergency purposes only. These trails are typically located within areas of moderate to slightly more rugged topography. The installation of erosion control structures may be necessary along trail sections with steeper longitudinal slopes. Trail widths may occasionally be too narrow to allow side-by-side travel by users.

4. Backcountry Secondary Trails

The management objective for Backcountry Secondary trails is to provide safe and enjoyable trail recreation opportunities within preserved open space areas of the City, while having a minimum impact on the surrounding environment. These trails typically serve as secondary routes emanating as spurs from Backcountry Primary trails. User groups are all non-motorized, including hikers, equestrians, and bicyclists. Certain user groups may be prohibited if deemed appropriate (see section 7-302.B.8). Motorized vehicles may not be used for maintenance or emergency purposes due to the narrow tread width. Backcountry Secondary trails traverse areas with rugged topography, therefore longitudinal grades are steeper, more difficult, and require erosion control structures. The trail tread is more narrow than Backcountry Primary trails, thus requiring single file travel by users.

5. Interpretive Trails

The management objective for Interpretive trails is to provide educational opportunities along a common theme. Education and interpretation can occur in a variety of forms including, but not limited to, signage and brochures. Use by equestrians and bicyclists is prohibited. Motorized vehicles are only permitted for maintenance and emergency purposes, and where trail widths allow. These trails generally occur in areas of gentle topography, therefore longitudinal grades are easy to moderate. The trail tread should be wide enough to accommodate some side-by-side travel and two-way traffic. Barrier-Free standards may be achieved with additional improvements.

6. Barrier-Free Trails

The management objective of Barrier-Free trails is to provide trail opportunities for persons with physical disabilities including mobility, visual, and hearing impairments. The design of Barrier-Free trails should provide access to viewpoints, activity areas, and other points of interest, and should meet the standards of the Americans with Disabilities Act (ADA). Equestrians and bicyclists are not permitted on Barrier-Free trails. Motorized vehicles (excluding electric wheelchairs and other types of mobility aids) are permitted only for maintenance and emergency purposes. Caution must be exercised when using vehicles to avoid damaging hardened surfaces. These trails generally occur in areas that are flat with very gentle topography and level longitudinal grades. The trail tread is wide enough to accommodate side-by-side travel and two-way traffic, and is composed of a hardened or stabilized surface.

G. Definitions

1. Backslope - The cut bank formed by the excavation of material on the uphill side of the trail tread.

2. Batter - The amount that a retaining wall leans into a hillside, usually expressed by ratio.

3. Bench - The terrace formed when a hillside is excavated for the purpose of constructing a trail.

4. Berm - A ridge of material formed on the outer edge of the trail tread that is greater in height than the center of the trail tread.

5. Cairn - Constructed mound of rock located adjacent to a trail. Used where the trail tread is indistinct.

6. Climbing Turn - A section of trail which reverses the direction of travel while gaining elevation. The longitudinal slope of the trail is maintained through the turn.

7. Clinometer - Instrument used for measuring angles of elevation or inclination.

8. Cross Slope – The slope of the trail surface perpendicular to the center line, expressed as a percent or a ratio.

9. Culvert - Drainage structure constructed of rock or pipe that allows water to flow under the trail without causing erosion.

10. Fillslope - Material added to the downhill edge of the trail tread. This material is often removed as part of the backslope or is derived from nearby borrow pits.

11. Grade, Maximum - The steepest grade permitted on any segment of the trail, not to exceed a distance specified for the particular trail classification.

12. Grade, Sustained - The steepest grade permitted over the majority of the trail length.

13. Grade Dip (also known as “Drain Dip”) - Short segment of trail with a grade opposite of the prevailing grade designed to route surface water off the trail. The lowest point of the dip is outsloped to assure the surface water is routed off the side of the trail.

14. Header Stone - A long uniform stone laid with its end towards the face of a retaining wall or crib used intermittently to structurally tie in the other rocks laid in the wall.

15. Inslope - Where the trail surface slopes downward from the outside (downhill) to the inside (uphill) edge of the trail. Insloping must be accompanied by a rock-lined swale between the inside edge of the trail and the backslope.

16. Longitudinal Slope - The slope of a trail along the centerline, expressed as a percentage or a ratio.

17. Outslope - Where the trail surface slopes downward from the inside (uphill) to the outside (downhill) edge of the trail.

18. Shared-Use Trail – A natural surfaced trail which is collectively shared by a range of users including, but not limited to, equestrians, walkers, bicyclists, hikers, and joggers.

19. Sideslope - The natural slope of the ground measured at right angles to the centerline of the trail.

20. Slough (pronounced “sluff”) - Material that has moved downhill from the backslope onto the inside (uphill) edge of the trail.

21. Swale - A constructed watercourse that channels water away from the trail. Typically lined with rocks to reduce erosion.

22. Switchback - A sharp short radius curve in a trail that is used on hillsides to reverse the direction of travel and to gain elevation. Switchbacks have relatively level turning platforms.

23. Trailhead - The beginning or ending access point to a trail, often accompanied by various trail support facilities such as horse trailer and regular vehicle parking spaces, hitching rails, corrals, bike racks, shade ramadas, picnic tables, drinking fountains, water troughs, restrooms, directional and informational signing, and entrance gates.

24. Tread - The surface of the trail upon which trail users travel.

25. Turnout - Short section of widened trail that provides safer passage of trail users. Helpful when visibility along the trail is limited.

26. Wash - A natural watercourse, wet or dry.

27. Waterbar - Drainage structures constructed of rock or logs embedded in the trail surface at a 45 degree angle to the direction of travel for the purpose of directing surface water off the trail.

7-302 TRAIL DESIGN

A. Design Objectives

The City’s objective is to design, construct, and maintain trails that:

- provide safe non-motorized transportation links and/or close-to-home recreation opportunities,
- provide legal public access to destination points and other areas of interest,
- blend with the surrounding environment,
- minimize impacts on the natural environment,
- minimize impacts on adjacent landowners, and
- require minimum levels of maintenance.

B. Design Considerations

1. Human Factors

Trails must be planned and constructed with the needs of the trail user in mind. Trail users tend to desire routes that access and connect areas of significant community activity such as schools, businesses, shopping areas, and parks, as well as other areas of interest such as viewpoints, water sources, natural areas, desert preserves, scenic and vista corridors, and interesting geologic features. Visual qualities are important to trail users, therefore, trails should be designed to blend with the surrounding environment. Views from the trail to the surrounding environment should also be considered. Trail users enjoy changes in scenery, thus increasing the demand for loop trails and trail networks that allow the user to return to the starting point without traveling the same trail twice. Loop trails also provide the comfort of knowing that the trail will bring them back to the starting point, thus reducing the chance of becoming lost. Trail users tend to favor the easiest, most obvious route. If the designated trail is not the easiest, most obvious route, trail users will begin to create new, unauthorized trails.

2. Coinciding Easements

Trails are frequently located within common tracts and easements dedicated for other purposes such as drainage, flood control, public utility, natural area open space, and scenic and vista corridors. In situations where these common tracts and easements are wider than that needed for a trail easement, it may be advantageous to dedicate the same area of these coinciding common tracts and easements for the purposes of public trail use. This will increase the flexibility to properly lay out, design, and construct public trails, and will allow the trail to be positioned away from undesirable areas such as low-flow wash channels, areas of extreme topography, dense vegetation, critical animal habitats, and adjacent properties. This will also allow future realignment of the trail, should such a realignment become necessary. In cases where a separate trail easement is delineated within other easements or common tracts, it is extremely important that the alignment of the trail easement be reviewed on the ground to assure suitability.

3. Adjacent Landowner Privacy

The privacy of landowners adjacent to trails and trail access facilities is an important design concern. Privacy can be maintained or improved by modifying the trail alignment, planting landscape buffers, installing walls, allowing grade separations, or using a combination of these methods.

4. Trail Viewshed

The line of sight from a trail to the surrounding landscape, and from the surrounding landscape to a trail are important design considerations. Views from the trail to the surrounding landscape improve the quality of the trail users' experience, therefore, trails should be designed to provide users varying views of the surrounding area. Obscuring views of the trail from the surrounding landscape is important to adjacent landowners who may not want to view of the trail from their property.

5. Native Plants

The design, construction, and maintenance of trails within the City of Scottsdale shall take into account the City of Scottsdale Native Plant Ordinance (Section 7.500 of the City's Zoning Ordinance). Trails shall be aligned to avoid disturbance of, and have a minimum effect on the following plant species: whitethorn acacia, catclaw acacia, crucifixion thorn, hackberry, blue palo verde, foothill palo verde, desert willow, juniper, ironwood, cottonwood, mesquite, scrub oak, sugar sumac, arizona rosewood, saguaro, barrel cacti, ocotillo, and soaptree yucca.

6. Sensitive Wildlife Habitat

Trail design and construction within natural desert park and preserve areas should be evaluated in terms of the effect that the trail will have on sensitive wildlife habitats. The Arizona Game and Fish Department should be consulted during the trail design process to assure that the trail will not have a negative impact on such resources. The best means of preventing negative impacts on wildlife is to simply avoid sensitive areas. Seasonal trail closures may be necessary in some situations.

7. Archaeological and Cultural Resources

Trail design and construction should be evaluated in terms of the effect the trail will have on archaeological and cultural resources. Such activities shall be done in accordance with the City of Scottsdale Archeological Ordinance.

Potential options to prevent and mitigate damage to these resources include:

- Altering the trail alignment to avoid archaeological and cultural resources.
- Protecting the resources by utilizing methods to obscure them from view.
- Mitigating the cultural resource which involves removal and thorough documentation of the items by a professional archaeologist. The documentation of the resource may then be interpreted as part of the trail opportunity.

8. Design for Shared-Use

Trails within the City of Scottsdale are open to all non-motorized uses unless otherwise stated. Decisions to prohibit any non-motorized use from City of Scottsdale trails must be based on coordinated planning efforts involving appropriate user groups and City staff. Characteristics that should be considered as part of this process include, but are not limited to, longitudinal and cross slopes, surface materials, line of sight, amount of use, sensitivity of surrounding environment, soil types, and native plant and animal habitats.

The following means of preventing potential user conflicts are based on methods identified in "Conflict on Multiple Use Trails" (Moore, 1994), and should be considered when planning, designing, constructing, and maintaining shared-use trails:

- Separate user types at trailheads and along the first, most crowded, stretches of trail.

- Provide adequate sight distances.

- Build trails wide enough to accommodate expected levels and types of use.

- Build and maintain trails wide enough for safe passing and/or provide periodic turnouts

- Design trails to control speeds where necessary by varying the trail surface and avoiding long, straight downhill stretches.

- Provide adequate trailhead facilities for all user types.

C. Trail Location

The following process identified in the "Trails Management Manual" (Maricopa County Recreation Services Department, 1995) has been proven effective, and shall serve as a guide for trail design and layout within the City of Scottsdale.

Location work must begin early in the trail design process and be completed prior to construction. The amount and level of work that is required varies depending on the type of trail being designed and the terrain on which the trail is being constructed. The necessary steps to properly layout the trail do not change. They are as follows:

1. Reconnaissance

The reconnaissance process includes the identification and evaluation of alternative routes and leads to final selection of the best possible route to meet the established objectives. Application of sound principles of trail location, alignment, and grade will minimize future operation and maintenance problems.

The first step is to examine the most recent topographic maps and aerial photos of the area to identify significant landforms, drainage patterns, and vegetation. The next step, for which there is no substitute, is to walk the area and examine potential routes. Conduct a systematic study of the area by walking various routes and viewing the area from different vantage points. Control points, which are features that are favorable for or inhibit trail construction, should be identified through this process. The control points will help to identify the best possible route, with the understanding that situations may exist where trails must pass through negative control points.

Control points which are favorable for trail construction are:

- Existing road crossings such as underpasses, overpasses, and intersections with traffic lights or stop signs
- Natural wash crossings
- Ridgelines
- Hillside benches
- Areas of light vegetation
- Scenic vistas

- Areas of well drained soils
- Good trailhead access

Control points which inhibit trail construction and should be avoided are:

- Wet areas and poorly drained flat areas
- Sensitive wildlife habitats
- Wash bottoms
- Areas adjacent to sources of excessive noise such as airports
- Areas adjacent to plants that are poisonous to horses such as oleanders
- Steep rocky slopes
- Unstable or fragile soils
- Abrupt elevation changes
- Bluffs, ledges, and cliffs except where featured as scenic resources
- Frequent wash crossings
- Locations requiring bridges or culverts
- Areas of heavy or fragile vegetation
- Areas requiring switchbacks
- Excessively long, straight sections
- Areas of archeological/cultural sensitivity
- Lightning-prone areas
- Unsafe or uncontrolled road crossings
- Known habitats of threatened or endangered plant or animal species

2. Grade

The degree to which a trail rises or falls over a linear distance is an important factor in determining the length of the trail, level of difficulty, appropriate user types, and drainage and maintenance requirements. Occasional fluctuations in the trail grade should be considered to provide variation for trail users and to facilitate proper drainage. Frequent or drastic changes in grade should be avoided. The grade line between control points can be plotted on paper to determine if switchbacks or other special features will be needed to sustain a certain grade. On moderate to steep side slopes a periodic reverse in the grade should be included to create dips for drainage purposes. When grade dips are included in initial trail construction, the need for waterbars is eliminated.

3. Drainage

Proper drainage of surface water is the most important factor in design, construction, and maintenance of trails. Surface erosion resulting from improper drainage will have a detrimental impact on the trail surface, causing damage to the natural environment and increasing maintenance requirements. The potential for erosion depends on three factors: soil type, velocity of water on the trail, and the distance water travels down the trail. Alteration of any of these factors can reduce the potential for erosion. Proper outsloping of the trail tread and the installation of grade dips or water bars will help decrease the potential for erosion of the trail surface. If distances allow, grade dips are preferred over waterbars. Existing drainage patterns of the surrounding area, such as concentrated drainage channels, must be maintained. Attempts to alter the existing drainage patterns will have a negative effect on the natural environment, and will most likely result in severe damage to the trail.

4. Staking/Flagging

Stakes or flags act as a guide so that the alignment, grade, and distances can be easily followed during construction. A clinometer, topographic map, compass, measuring tape, and notebook are all necessary tools. Proper location of the flag line is easily accomplished with three people acting as surveyor, rod holder, and recorder. Stakes or flags should be located along the trail centerline with the location of dips, walls, and other special structures indicated with color coded flagging. The trail alignment should pass through control points which are favorable for trail construction, and avoid control points which will inhibit trail construction. Normally, trail alignments follow the contours of the land and consists of a series of gently sweeping curves. Long straight segments with sharp angular turns should be avoided.

7-303 SPECIFICATIONS FOR TRAIL CLASSIFICATIONS

A. Urban Trails

1. Grade

Maximum sustained grade shall not exceed 8%. A maximum grade of 10% may be used for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 50 linear feet.

2. Tread

Urban Primary trail widths must be 8'. The trail tread should be comprised of native soils in undisturbed desert areas, and decomposed granite in areas that have been graded, landscaped, or will otherwise remain significantly unnatural. Compaction of a native soil tread surface may be necessary to prevent damage from use and to increase resistance to erosion. If decomposed granite is used, it must be ¼" minus Madison Gold (or similar), wetted and compacted to a 4" depth. A soil stabilizer may be added to the decomposed granite according to manufacturers' specifications. The trail tread must be smooth and free of all obstacles. The trail tread must be delineated from the surrounding terrain. For example, utilizing decomposed granite of a different size or color in the surrounding landscape will help distinguish the trail tread. The location of landscape plants, fences, and other physical barriers can also be used to delineate the trail.

3. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 10' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore

are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. In areas where new landscaping is to be installed, trees, cacti, and other spiny plants must be planted at least 5' from the trail tread.

4. Drainage

The trail surface must have a cross slope of 3 to 5%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures such as water bars or grade dips may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off both sides of the trail and prevent pooling.

5. Easement Width and Setback from Street

Urban trails must be contained in a minimum 15' wide trail easement. In situations where a trail easement overlaps with common tracts or easements dedicated for other purposes, it may be beneficial to dedicate the entire width for public trail purposes (see Section 7-302.B.2 for more detail). For trails along streets, the minimum distance from back of curb to the edge of the trail is 25' along expressways and parkways, 15' along arterials, 10' along collectors, and the maximum distance feasible in all other locations.

B. Rural Trails

1. Grade

Maximum sustained grade shall not exceed 10%. A maximum grade of 15% may be used for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 100 linear feet.

2. Tread

Rural trail widths must be 6'. The trail tread should be comprised of native soils in undisturbed desert areas, and decomposed granite in areas that have been graded, landscaped, or will otherwise remain significantly unnatural. Compaction of a native soil tread surface may be necessary to prevent damage from use and to increase resistance to erosion. If decomposed granite is used, it must be ¼" minus Madison Gold (or similar), wetted and compacted to a 4" depth. A soil stabilizer may also be added to the decomposed granite according to manufacturers' specifications. The trail tread must be smooth and free of all obstacles. The trail tread must be delineated from the surrounding terrain. For example, utilizing decomposed granite of a different size or color in the surrounding landscape will help distinguish the trail tread. The location of

landscape plants, fences, and other physical barriers can also be used to delineate the trail.

3. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 10' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. In areas where new landscaping is to be installed, trees, cacti, and other spiny plants must be planted at least 5' from the trail tread.

4. Drainage

The trail surface must have a cross slope of 6 to 10%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures such as water bars or grade dips may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off the trail and prevent pooling.

5. Easement Width and Setback from Street

Rural trails must be contained in a minimum 25' wide trail easement. In situations where a trail easement overlaps with common tracts or easements dedicated for other purposes, it may be beneficial to dedicate the entire width for public trail purposes (see Section 7-302.B.2 for more detail). Rural trails must be located the maximum distance feasible from the edge of the street.

C. Backcountry Primary Trails

1. Grade

Maximum sustained grade shall not exceed 10%. A maximum grade of 15% is allowed for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 100 linear feet. Switchbacks may

be utilized when surrounding terrain has a side slope of 20 to 45%. Switchbacks supported by retaining walls may be utilized when surrounding terrain has a side slope up to 55%.

2. Tread

Backcountry Primary trail widths must be 4'. The trail surface should be native soil and must be smooth and free of major obstacles. Compaction of the surface may be necessary to prevent damage from use and to increase resistance to erosion.

3. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 10' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. This distance may need to be increased on the uphill side of trails that traverse steep hillsides. This will prevent pieces of cacti from falling onto the trail tread and creating a safety hazard.

4. Drainage

The trail surface must have a cross slope of 6 to 10%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off the trail and prevent pooling.

5. Easement Width

Backcountry Primary trails are typically located within large open space areas controlled by the City. In situations where these trails must be located within easements, the easement width must be a minimum of 50'.

D. Backcountry Secondary Trails

1. Grade

Maximum sustained grade shall not exceed 15%. A maximum grade of 20% is allowed for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 25 linear feet. Switchbacks may be utilized when surrounding terrain has a side slope of 20 to 45%. Switchbacks supported by retaining walls may be utilized when surrounding terrain has a side slope up to 55%.

2. Tread

Backcountry Secondary trail widths must be 2'. The trail surface should be native soil and must be smooth and free of major obstacles. Compaction of the surface may be necessary to prevent damage from use and to increase resistance to erosion.

3. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 10' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. This distance may need to be increased on the uphill side of trails that traverse steep hillsides. This will prevent pieces of cacti from falling onto the trail tread and creating a safety hazard.

4. Drainage

The trail surface must have a cross slope of no less than 10%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off the trail and prevent pooling.

5. Easement Width

Backcountry Secondary trails are typically located within large open space areas controlled by the City. In situations where these trails must be located within easements, the easement must be a minimum of 50' wide.

E. Interpretive

1. Special Note

Interpretive trails differ from other trails because their primary function is to provide educational opportunities for trail users. Education and interpretation can occur in a variety of forms including signage and/or brochures. This manual contains only general guidelines for the design and construction of Interpretive trails. The planning, design, and construction of interpretive trails within the City of Scottsdale requires the involvement and oversight of the City Trails Coordinator**.**

2. Grade

Maximum sustained grade shall not exceed 10%. A maximum grade of 15% is allowed for wash crossings, grade dips, and other trail segments to avoid impassable areas for a distance not to exceed 100 linear feet. Switchbacks may be utilized when surrounding terrain has a side slope of 20 to 45%. Switchbacks supported by retaining walls may be utilized when surrounding terrain has a side slope up to 55%.

3. Tread

Interpretive trail widths must be 4' to 6'. The trail tread should be comprised of native soils in undisturbed desert areas, and decomposed granite in areas that have been graded, landscaped, or will otherwise remain significantly unnatural. Compaction of a native soil tread surface may be necessary to prevent damage from use and to increase resistance to erosion. If decomposed granite is used, it must be ¼" minus Madison Gold (or similar), wetted and compacted to a 4" depth. A soil stabilizer may also be added to the decomposed granite according to manufacturers' specifications. The trail tread must be smooth and free of all obstacles. The trail tread must be delineated from the surrounding terrain. For example, utilizing decomposed granite of a different size or color in the surrounding landscape will help distinguish the trail tread. The location of landscape plants, fences, and other physical barriers can also be used to delineate the trail.

4. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 8' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. This distance may need to be increased on the uphill side of trails that traverse steep hillsides. This will prevent pieces of cacti from falling onto the trail tread and creating a safety hazard.

5. Drainage

The trail surface must have a cross slope of 3 to 5%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The installation of erosion control structures may be required. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, as opposed to the side slope of a hill, the trail surface should be crowned to drain water off the trail and prevent pooling.

F. Barrier-Free

1. Special Note

Barrier-free trails are designed to provide opportunities for persons with physical disabilities including mobility, visual, and hearing impairments, and shall meet the standards of the Americans with Disabilities Act Guidelines (ADA). This manual contains only general guidelines for the design and construction of barrier-free trails. The planning, design, and construction of barrier-free trails within the City of Scottsdale requires the involvement and subsequent approval of appropriate City representatives including the City Trails Coordinator.

2. Grade

Barrier-free trails must be designed with the least possible longitudinal slope. The maximum sustained grade shall not exceed 5%. Trail segments that exceed the maximum sustained grade limit must be constructed according to handicapped accessible ramp standards. Barrier-free trails must not be constructed on side slopes greater than 40%. Total trail distance should not exceed 1.5 miles.

3. Tread

Barrier-free trail widths must be 7' for two-directional travel, and 5' for one-way travel. There are many varieties of accessible surface materials available. Materials should be selected to achieve the maximum level of accessibility practicable according to the desired recreation experience and the natural setting.

The chosen surface must be stable, firm, and slip resistant. The material must match the surrounding environment.

4. Vegetation Clearance

Trails should be designed to have a minimum impact on plants identified for protection in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). Trail alignments that avoid and have the least impact on surrounding vegetation are preferred. If the trail must pass within an unacceptable distance to any plants, the preference is to relocate the plants rather than destroy them.

Vegetation may not exceed a mature height of 3' within a 3' distance of the trail tread. Vertical clearance must be at least 8' above the trail tread. This in no way implies that the trail corridor should be devoid of plants. Low growing desert shrubs such as bursage and brittle bush present no hazard to trail users, therefore are acceptable to have within the clearing limits. The purpose of the vegetation clearing limits is to keep taller, potentially more dangerous plants such as thorny trees and larger cacti a safe distance from the trail. All remaining roots and stumps must be grubbed out of the trail surface to provide a smooth tread. No teddy bear cholla may be located within 3' of the trail tread. This distance may need to be increased on the uphill side of trails that traverse steep hillsides. This will prevent pieces of cacti from falling onto the trail tread and creating a safety hazard.

5. Drainage

The trail surface must have a cross slope of 1 to 3%. This is critical in preventing water from pooling on and channeling down the trail. If the trail traverses the side slope of a hill, the cross slope of the trail surface must be downward from the uphill to the downhill edge of the trail (outslope). This will allow surface water to drain off the edge of the trail rather than running down the length of the trail. The cross slope of such a trail tread must NOT be downward from the downhill to the uphill edge of the trail (inslope). Such a scenario will result in water channeling down the length of the trail causing extreme levels of erosion. If the trail is located on level ground, the trail surface should be crowned to drain water off the trail and prevent pooling. The longitudinal slope of barrier-free trails must be kept to the minimum standard, therefore the installation of erosion control structures is not necessary.

6. Additional Specifications

Support facilities for barrier-free trails, such as signage, restrooms, benches, and parking areas must be constructed to meet accessibility standards.

7-304 TRAIL CONSTRUCTION

A. Tread Construction (Figure 7.3-1)

1. Surface Materials

Trail surface materials must correspond to the specification for the appropriate trail classification under Section 7-303.A.

2. Cross Slope (Figure 7.3-1)

The cross slope, which is the slope of the tread surface perpendicular to the longitudinal slope, is a critical factor in the design, construction, and maintenance of trails. The cross slope allows surface water to drain off the side of the trail rather than along the longitudinal slope. The three primary types of cross slopes are outslope, inslope, and crowned. Outsloped and insloped trail surfaces typically occur on trails which traverse the side slope of a hill, and a crowned trail surface is typically found on trails which travel across relatively level ground.

a. Outslope (Figure 7.3-1)

Outslope is the most common type of cross slope used on trails that traverse the side slopes of hills, and occurs when the trail surface slopes downward from the uphill to the downhill edge of the trail. Standard outslopes range from 1 to 10%, depending on the trail classification.

b. Inslope (Figure 7.3-1)

Inslope is the most infrequent variety of cross slope used on trails that traverse the side slopes of hills, and occurs when the trail surface slopes downward from the downhill to the uphill edge of the trail. Insloped trails are discouraged and not recommended except when used as a component of switchback turns. Inslopes must be used in conjunction with rock lined swales that collect the water and channel it away from the trail. The improper use of an insloped trail surface will cause extreme erosion to the trail surface and the surrounding environment, therefore should not be built without consulting the City Trails Coordinator.

c. Crowned (Figure 7.3-1)

A crowned surface is most commonly used on trails that traverse relatively level ground. A crowned trail surface slopes downward from the center line to each outside edge for the purpose of preventing surface water from pooling on the trail surface. The slopes from the centerline to each edge should be 5%.

3. Backslope (Figure 7.3-2)

The backslope is the area from which material is excavated on the uphill side of the trail tread. Backslopes range from steep to gentle depending on the side slope of the hill and the characteristics of the soil. As a general rule, the backslope cannot be steeper than the soil's ability to remain in place under typical climatic conditions. Rip-rap on moderate backslopes and retaining walls on steeper backslopes may be needed to stabilize the backslope in areas with steep side slopes or unstable soils. The use of retaining walls to support the backslope will require excavating less material.

4. Fillslope (Figure 7.3-2)

The fillslope is created by adding material to build up and support the downhill edge of the trail tread. The material removed as part of the backslope or from nearby borrow pits is often used in the fillslope. Rip-rap on moderate fillslopes and retaining walls on steeper fillslopes may be needed to support the fillslope in areas

with steep side slopes or loose soils. The fillslope should be revegetated following construction to regain the natural appearance and to reduce the potential for erosion.

5. Typical Trail Cross-sections (Figure 7.3-3)

a. Full Bench

Full bench trail construction involves the greatest amount of soil removal, but provides the most stable trail surface. In this type of construction, soil is removed from the backslope and cast down the hill. The excavated material is not used as fill to support the trail tread. Instead, the entire trail tread is supported by solid mineral soil. Full bench construction is best suited for trails on steep side slopes greater than 50% because fill will erode easily.

b. ¾ Bench

This type of trail construction should be used on side slopes of 30 to 50%. The soil excavated from the backslope should be used for the fillslope. The fillslope should represent the downhill ¼ of the trail width. The fillslope should be revegetated to restore the natural condition and reduce the potential for erosion.

c. Balanced Section

Balanced section trail construction should be utilized on side slopes of 10 to 30%. The soil excavated from the backslope should be used for the fillslope. The fillslope should represent the downhill ½ of the trail width. The fillslope should be revegetated to restore the natural condition and reduce the potential for erosion.

d. Natural Slope

This type of trail construction is to be used when side slopes are less than 10%. Natural slope trail construction involves no cutting or filling, therefore there is no backslope or fillslope.

B. Vegetation Clearance (Figure 7.3-4)

This process involves the removal of vegetation from within the specified clearing limits. See Section 7-303.A for the vegetation clearance limit specifications for each trail classification. The primary goal of this process is to provide the specified clearance, while maintaining the maximum amount of vegetation and the natural characteristics of the area. Trails shall be aligned to prevent disturbance to the plants identified in the City of Scottsdale Native Plant Ordinance (see Section 7.500 of the City's Zoning Ordinance). The trail should also be aligned to avoid large scale removal of native plants not covered by the Native Plant Ordinance whenever possible. When branches must be removed, they should be cut as close to the main trunk as possible, without cutting into the branch collar. Proper branch removal should be done by making three cuts with a handsaw: one partial cut from the underside of the branch approximately 6 to 8 inches from the trunk; a second cut from the top of the branch above the first cut which will remove the branch; and the final cut to remove the stub. Be sure not to cut into the branch collar, as this will damage the tree and

slow the healing process. Chemical sealents should not be applied to native trees. Cholla and prickly pear cacti should be trimmed at the segment joints. Plants which must be completely removed should be cut as close to the ground surface as possible. All removed vegetation should be dispersed in areas not clearly visible from the trail.

C. Surface Water Control

The proper control of surface water is a crucial element in trail design, construction, and maintenance. Improper control will most likely have a negative effect on the surrounding environment, and will result in damage to the trail which can be very expensive to repair. The need for surface water control structures depends on many different factors including, but not limited to soil type, longitudinal and cross slopes, and existing drainage patterns. The most effective time to address surface water control issues is during initial trail design and construction.

1. Grade Dips (Figure 7.3-5)

Grade dips are short segments of trail with a grade opposite to the prevailing grade designed to route surface water off the trail. They are most effective when installed during new trail construction. The low point of the dip must be outsloped at the maximum percentage permitted for the given trail classification to assure that water will flow off and away from the trail. A rock apron must be constructed where the water flows out of the dip to prevent excessive erosion and damage to the surrounding environment. Grade dips are generally more effective than waterbars, require less maintenance, and are more suitable for equestrians and mountain bicyclists.

2. Waterbars

Waterbars are native rocks or logs embedded in the trail surface at a 45 degree angle to the longitudinal slope for the purpose of directing surface water off the trail. Waterbars should extend at least 1' beyond each edge of the trail tread to ensure that water is diverted completely. Use fill material to build up the downhill side of the waterbar. Construct a drain ditch leading off the edge of the trail to ensure that runoff flows away from the trail. The drain should be at least 1' wide and 8" deep. Rocks should be placed in the bottom of the drain ditch to lessen the amount of erosion. Place additional rocks, logs, brush, or other debris in locations that will prevent trail users from detouring around the waterbar. Waterbars are not the preferred drainage structures on trails with large amounts of equestrian and mountain bicycle use. Grade dips are more appropriate in such situations.

a. Rock Waterbar (Figure 7.3-6)

This type of waterbar is constructed by embedding large rectangular shaped rocks into the trail tread at a 45 degree angle to a depth roughly half their height. Rocks must be large enough not to be knocked out by trail users and to effectively channel water off the trail. Rocks must be arranged in a shingle fashion, tightly overlapping each other towards the downhill side. Compact small rocks and fill around the base to ensure solid placement.

b. Log Waterbar (Figure 7.3-7)

This type of waterbar is constructed by embedding solid, bark-free, rot-resistant timber into the trail surface at a 45 degree angle. Creosote-treated railroad ties or telephone poles are not acceptable for use as waterbars. Logs must have a minimum of an 8" diameter and be embedded half-way into the trail surface. Log waterbars must be secured with two 18" long ½" diameter pieces of rebar. Drill a 7/16" hole through the log 8" from each end. Place the log in the desired location and drive the rebar through the holes into the trail surface until flush with the log surface. The use of log waterbars must be approved by the City Trails Coordinator.

3. Culverts

In desert environments, most watercourses flow only seasonally, therefore, culverts are usually not necessary. Culverts tend to be maintenance intensive and can detract from the aesthetics of the natural environment. Culverts should only be constructed where a gentle grade must be maintained such as with a barrier-free trail or where there is permanently flowing water. In all other situations a wash crossing (see Section 7-303.E.3 of this manual) should be used. Rock or pipe culverts must match the downstream gradient and have a diameter of at least 12" to accommodate necessary cleaning. Improperly constructed culverts will clog with debris causing water to flow over and damage the trail tread. All rock used in the construction of culverts must be native.

a. Rock Culvert (Figure 7.3-8)

The proper construction of rock culverts depends greatly on the proper selection and placement of rocks of sufficient size and shape. The bottom surface of the drainage must be armored with rocks to prevent erosion. Stone headwalls must be placed to armor the outside faces of the crossing. All rocks must be firmly placed similar to the construction of a retaining wall.

b. Pipe Culvert (Figure 7.3-9)

Pipe diameter must be at least 12". Embed the pipe in a stable foundation of gravel and soil, and backfill with compacted gravel and soil. Construct a headwall of firmly placed native stone to protect the outside faces of the tread crossing and cover the pipe so it cannot be viewed from the trail. The trail tread should be at least 6" higher than the top of the pipe.

D. Special Structures

1. Retaining Walls (Figure 7.3-10)

Retaining walls are stone structures used to stabilize trails on steep side slopes. Retaining walls are more solid than rip-rap, as they must support the full weight of the trail tread. A solid foundation is key to the strength and durability of a retaining wall. The foundation should be set in solid earth or rock, with the base sloped inward towards the hillside. Rock used in construction should be derived from the surrounding area. Ideal rocks are durable, weather resistant, and free of structural defects. Large rocks should be used in the foundation, smaller rocks in the middle tiers, and large rocks again for the upper tiers. Approximately 25% of the rocks

used in the wall must be header stones. A header stone is a rock placed with its longest dimension extending into the hillside, perpendicular to the face of the wall. All other rocks should be placed with their longest dimension parallel to the face of the wall. Thickness of the wall should be at least one-half its height, or 2' thick if the height is less than 5'. The outer face of the wall should slope inward towards the hillside at a rate of 3" per every 12" in height. Joints should be staggered at least 6" horizontally. Each rock should contact the rock below in at least 3 places. Shims must not be used because they are prone to shifting. If cement is used to provide additional stability, it must be colored to match the native rock. Backfill the wall with small stones and cover with soil until the proper tread surface is established.

2. Rip-Rap (Figure 7.3-11)

Unlike a retaining wall, rip-rap does not support the weight of the trail tread. Instead, rip-rap is used to stabilize steep slopes above and below the trail tread (backslope and fillslope, respectively). Begin by clearing a firm foundation at the downhill edge of the rip-rap. Set the largest rocks in the foundation. Place smaller rocks on the surface of the slope continuing up the slope to the desired location. Be sure that the rip-rap does not impede the flow of surface water off the trail tread. Rip-rap can also be used to protect drainage and lead-off ditches from heavy erosion, and to stabilize switchback turns. Rip-rap should be constructed of native rock. If cement is used to provide additional stability, it must be colored to match the native rock.

3. Wash Crossings (Figure 7.3-12)

When trails cross washes the greatest concern is protecting the trail from flowing water. The trail segments approaching the crossing, and the location where the trail meets each edge of the wash must be stabilized with securely placed rocks. Trail segments approaching the wash should range from 8 to 15% for all trail classifications, and cross at a 90 degree angle to the wash to prevent water from leaving the primary channel and flowing along the trail surface. The slopes adjacent to the trail may need to be stabilized with rip-rap. A row of large rocks should be embedded along the wash banks at the point of contact with the trail. Be sure that the flowing water will not undercut these rocks.

4. Switchback and Climbing Turns (Figure 7.3-13)

These two trail design elements are both used to change the direction of travel on a hillside and to gain elevation in a short distance. The difference between the two is that climbing turns maintain a consistent longitudinal slope through the turn, while switchbacks have a near level landing at the turning point. These structures can be very difficult to construct, therefore careful planning should be conducted to avoid using them. The City Trails Coordinator should be consulted in situations where switchbacks may be necessary.

Avoid "stacking" a set of many short switchbacks and/or climbing turns on a hillside. Longer trail segments between switchbacks and/or climbing turns are less visible and reduce shortcutting by trail users. Understanding the psychology of the trail user is important in the design of these structures. The layout must convince the user that the established trail is the easiest, most convenient route to ascend the slope. If they feel it is not, they will create short cuts.

a. Switchback Turn (Figure 7.3-14)

Switchback turns are typically used on side slopes of 20 to 45%, but can be used on slopes up to 55% with the use of retaining walls. These structures are extremely difficult and expensive to construct. Trail routes should be planned carefully to avoid areas of steep, impassible terrain that would require switchbacks.

The key to a good switchback is proper placement on the terrain. Naturally occurring level areas or platforms are prime locations. Survey the hillside that the trail must ascend, locate the natural platforms, then connect the trail to these points. Trail segments leading to and away from the switchback must maintain the maximum longitudinal slope permitted for that trail classification. Locating switchbacks in areas where there are obstructions such as rock outcroppings or trees that will prevent shortcutting is also desirable. Obstructions such as rocks, logs, or other debris may also be strategically placed to keep users from leaving the trail.

A switchback consists of two approaches, a landing or turn platform, a drain for the upper approach and platform, and guide structures. The upper approach and the upper half of the turn platform are excavated from the hillside. The lower approach and the lower half of the turn platform are constructed on fill. The construction of switchbacks on a full bench can be very labor intensive and expensive. The last 65' feet of each approach before reaching the turn platform should be as steep as the trail classification will allow. The last 10' of the approaches should be smoothly transitioned into the grade of the turn platform. A flat grade approaching the turn platform must be avoided because it will cause trail users to short cut the switchback.

As the upper approach descends toward the turn, a drain dip should be installed. Below this point, the tread and the upper half of the turn platform must be insloped towards a drain ditch. The ditch must be 1' deep and 1' wide and have a rock apron at the spill point.

The turn platform must not exceed a slope of 5%. The upper side is excavated from the hillside. The removed soil is then used to fill in the lower portion. Rip-rap or retaining walls may be required to provide stability to the backslope and fillslope. The turning radius must be no less than 8' to provide adequate turning area for equestrians and mountain bicyclists.

The lower portion of the turn platform and the lower approach should be outsloped. Rip-rap or a retaining wall may be needed along the inner portion of the switchback to maintain the backslope of the lower approach.

b. Climbing Turns (Figure 7.3-15)

Climbing turns are similar to switchbacks because they are also used to reverse the direction of travel and gain elevation. Climbing turns differ however because they maintain a uniform longitudinal slope through the turn. There is no level turning platform. A climbing turn is built on the same slope as the hillside. Where the slope of the hillside turns, the climbing turn ascends at the same rate. Climbing turns must not be constructed on side slopes greater

than 20% because they are prone to erosion. Climbing turns in appropriate terrain require very little work to construct. The approaches to the turn should be full bench construction. As the trail approaches the turn, the amount of excavation decreases. The turn itself requires no excavation other than the removal of the surface layer of leaf litter.

5. Steps (Figure 7.3-16)

The use of steps should be avoided due to unsuitability for equestrians and mountain bicyclists, and excessive maintenance requirements. Steps should only be used on hiker-only trails when elevation must be gained rapidly over a short distance and there is no other option. Steps must not be used on trails intended for use by equestrians or mountain bicyclists. Steps should be constructed of rock collected from the surrounding area. Rocks should be rectangular in shape, large enough to maintain their position (50 to 100 pounds each), and wide enough to span the width of the trail. Choose a location that will prevent trail users from traveling around the steps. Construction should begin with the lower steps and continue up the slope. Each step must be placed in an excavated seat and backfilled with small rocks and soil to assure stability.

6. Safety Barriers (Figure 7.3-17)

a. Location

The location of safety barriers shall not restrict sight distances for roadway traffic or trail users. Refer to Chapter 3, Figure 3.1-8 of the City Design Standards and Policies Manual for roadway sight distance requirements. Special attention to the design and construction of barriers is particularly important near intersections. Safety barriers must be installed between a trail and a roadway if the trail is located within an unsafe distance to the roadway, or if the trail shares an underpass or overpass with a roadway. Safety barriers must also be installed if the trail is elevated above an adjacent roadway and the side slope is greater than 6:1, or where trails are in close proximity to other steep drop-offs. All safety barriers must be at least 3’ from the edge of the trail.

b. Design Criteria

Appropriate safety barriers include fences, railings, or suitably thick vegetation. Other types of materials may be suitable subsequent to approval of the City Trails Coordinator. The materials and character of the barrier must be compatible with adjacent development, landscaping, and topography. The minimum height shall be 4’ for structural barriers, and 5’ for vegetation barriers.

7. Trail Access Gates (Figure 7.3-18)

These gates are designed to restrict motorized access to trails except as permitted for maintenance and emergency purposes. The gate design must permit equestrian passage without requiring the rider to dismount. These gates should be located at trailheads, where trails cross major roads, and at other points where motorized vehicles are likely to attempt to access a trail. These gates must be constructed of heavy gauge metal or other durable low-maintenance materials.

8. Trail Junctions (Figure 7.3-19)

A trail junction occurs when two or more trails intersect. The majority of trail junctions will be "T-shaped." The joining trails shall maintain the width specified for that trail classification. However, the corners of the intersection may be recessed up to 1'. The intersection corners must be protected with large rocks, trees, transplanted vegetation, or other physical barriers to prevent trail users from short cutting the trail junction. Triangular shaped intersections with sweeping paths at the corners are NOT acceptable.

E. Road Crossings

1. Overpasses (Figure 7.3-20)

An overpass is a structure spanning a roadway, canal, wash, etc. that functions exclusively as a crossing for a shared-use trail. There are many different varieties of overpasses that may be acceptable. The City Trails Coordinator must be involved in the planning and design process, and must approve all overpasses prior to construction.

The minimum trail width on an overpass is 8'. The outside edges of an overpass must be lined with minimum 4.5' tall solid concrete barriers. Structures passing over streets must have a chain link fence or similar type material mounted along the upper surface of the concrete barrier extending to a height of 10'. The upper few feet of the fence should curve inward at a 2' radius. The fence may completely enclose the overpass depending on the nature of the obstacle below. A 10' height clearance must be permitted for equestrians. A minimum 4.5' tall concrete barrier must also separate the trail from the roadway. Non-paved surfaces should be decomposed granite. Paved surfaces must be chip-sealed asphalt or broom-finished concrete to provide slip resistance. The grade of the overpass and approaches must not exceed 10%. Drains must be provided if the cross slope is less than 2%. Drains must be flush with the concrete surface and slip resistant. Approaches to the overpass cannot be helical and must comply with the specifications established for that trail classification. Railings should line the approaches for 12' leading up to each end of the overpass.

2. Bridges (Figure 7.3-20)

A bridge is a structure spanning a roadway, canal, wash, or other obstacle that serves as a crossing for a roadway as well as a shared-use trail. The City Trails Coordinator must be involved in the planning and design process, and must approve all bridge crossings prior to construction.

The minimum width of a trail crossing a bridge is 8'. The outside edge of the bridge must be lined with minimum 4.5' tall solid concrete barrier. Bridges passing over streets must have a chain link fence or similar type material mounted along the upper surface of the concrete barrier extending to a height of 10'. The upper few feet of the fence should curve inward at a 2' radius. A 10' height clearance must be permitted for equestrians. A minimum 4.5' tall concrete barrier must also separate the trail from the roadway. The grade of the bridge crossing and approaches must not exceed 10%. Non-paved bridge surfaces should be decomposed granite. Paved bridge surfaces must be broom-finished concrete or chip-sealed asphalt to provide slip resistance. Drains must be provided if the

cross slope is less than 2%. Drains must be flush with the concrete surface and slip resistant.

3. Underpasses (Figure 7.3-21)

These structures, used to provide passage for trail users under roadways, are typically constructed of pre-cast concrete box culverts. Other varieties of culverts are acceptable provided they meet the required dimensions, and allow footing that is appropriate for all types of trail users. The width of a trail traveling through an underpass should not be less than 12'. Vertical clearance is an important concern, particularly for equestrian trail users. The minimum vertical clearance is 9' at a distance of 4' from the centerline, and 11' at a distance of 3' from the centerline. Natural or vandal-resistant electric lighting should be installed for safety. Sight distances approaching and exiting the underpass must be adequate as to not create a safety hazard. Underpass design shall not allow for the accumulation of nuisance water on the trail. If water does not drain from the underpass by gravity flow, a pump system must be provided to remove the water. The surface of the underpass should be slip resistant.

4. At-Grade Crossings

An at-grade crossing occurs where a trail passes across the surface of a roadway. Safety of trail users is the primary concern when planning at-grade trail crossings. Ideal locations for such crossings are at roadway intersections with light amounts of traffic that have existing stop signs, traffic lights, or designated pedestrian crossings. Motorists expect to see pedestrians crossing roads at intersections as opposed to along stretches of road with no intersections. Crossings should be on level grades where both trail users and motorists have long sight distances. Sight distances vary depending on the roadway classification. See Chapter 3.1, Figure 3.1-8 of the City Design Standards and Policies Manual for more details. Additional safety precautions include installing pedestrian activated traffic signals, signs warning motorists of the trail crossing, and signs warning the trail users of the road crossing. Equestrians and mountain bicyclists may be encouraged to dismount before crossing. Trails should cross driveways at a distance far enough from the main road to provide motorists turning into the driveway, and trail users crossing the driveway adequate sight distances.

F. Trail Access Facilities (Figure 7.3-22)

The design criteria for trail access facilities addressed in this manual are conceptual. The planning, design, and construction of such facilities will be conducted on a case-by-case basis and will require various levels of City review and approval beyond the scope of this manual.

The location and design of trail access facilities shall be done in accordance with existing City plans and should meet established management objectives. Design variations include size, layout, and amenities. These variations are based primarily on topography, planned levels and types of use, and the character of the surrounding area.

The design of trail access facilities ranges from neighborhood access points with little or no amenities, up to larger destination-type facilities which provide a wider variety of amenities. Potential trailhead amenities include, but are not limited to, pull-through

horse trailer parking spaces, regular vehicle parking spaces, potable drinking water, water troughs for horses, hitching posts or corrals, year-round natural shade areas, bike racks, informational, interpretive and directional signage, entrance gates, restrooms, shade ramadas, and picnic tables.

7-305 TRAIL SIGNS AND MARKERS

A. Locations

The proper location of signage is important in maintaining the safety of trail users, preserving the natural environment, and promoting the presence of the trail. The number and location of signs should be carefully considered, as a lack of signage or poorly located signs can create hazardous situations for trail users. An overabundance of signs can also detract from the aesthetics of the trail and decrease the quality of the trail users' experience.

Trail signs are typically located at trail intersections, locations where trails cross roadways, and any other areas where it may be difficult to follow the route of the trail. Trail signs should be placed 1.5' to 3' from the edge of the trail.

B. City of Scottsdale Standard (Figure 7.3-23 & 24)

NOTE: This standard applies specifically to trails classified as Urban or Rural. Additional standards may be developed for Backcountry Primary and Secondary trails pending review and approval of the City's Preserve Division.

1. Sign Specifications

a. Blanks

Sign blanks must be 0.080 gauge aluminum. Blanks must be covered with reflective sheeting of street transportation quality vinyl. There must be 2 pre-drilled 3/8" holes. The holes must be centered horizontally with the center of each hole being ½ " from the top and bottom edges. Corners must be rounded with a 1" to 1½ " radius, depending on the size of the sign.

b. Lettering

Font must be Garamond (or similar style). Point size should be relative to the size of the sign.

c. Colors

Background must be dark brown with reflective white lettering and symbols. There must be a ¼" - ½" white reflective border.

d. Sign Mounting Hardware

3/8" vandal resistant steel drive rivets.

2. Sign Post/Anchor Specifications

a. Posts

Posts shall be constructed of 1 ¾" x 1 ¾" 12-gauge square steel tubing with 7/16" pre-punched knockouts on 1" centers. Post lengths must be 5' or 8'. All steel posts shall be sandblasted with 100 grit sand and chemically treated to provide a natural looking "rust" finish. The application of rust-colored paint is not acceptable.

b. Anchors

Anchors shall be 2" x 2" x 30", 12-gauge galvanized square tubing with 7/16" pre-punched knockouts on 1" centers.

c. Sleeves

Sleeves shall be 2 ¼" x 2 ¼" x 12", 12-gauge galvanized square tubing with 7/16" pre-punched knockouts on 1" centers.

d. Anchor Assembly Hardware

3/8" vandal resistant steel drive rivets.

e. Telescoping Properties

The finish post, anchor, and sleeve must be straight with a smooth uniform finish to allow each component to telescope with each consecutive larger or smaller piece.

C. Installation (Figure 7.3-25)

Sign posts are to be installed according to City of Scottsdale Standard Detail 2131. The final height of the post should be either 3' or 6'. The height depends on the location of the post and the signs to be placed on it. The 3' posts should be placed at trail intersections or areas where it may be difficult to follow the route of the trail. The 3' posts are intended for combinations of signs shown in Figure 7.3-24. These signs shall not exceed two per post. The 6' posts should be placed in more prominent locations such as trail access points or major trail junctions. The 6' posts are intended for the larger sign shown in Figure 7.3-23. The triangular sign from Figure 7.3-24 or regulatory signs such as "no motorized vehicles" signs may be placed on the 6' post below the larger trail sign. All signs are to be mounted to the posts with 3/8" vandal resistant steel drive rivets.

D. Developer-Provided Sign Standard

Developers may provide their own signage consistent in color and theme with the surrounding development. At a minimum, these signs must accommodate the triangular "Trail Courtesy" graphic, the "City of Scottsdale Trail System" logo, and the standard hiker, equestrian, and mountain bicycle icons. These required signs may be installed on the same post as developer-provided signs, or the graphics may be incorporated directly into the developer-provided sign. The graphics for the signs may be obtained by contacting the City Trails Coordinator.

7-306 TRAIL MAINTENANCE

A. Slough and Berm Removal (Figure 7.3-26)

Slough (pronounced “sluff”) is material that has moved downhill from the backslope and been deposited along the uphill edge of the tread. This process causes trail users to travel along the outside edge of the trail. The tread eventually narrows and moves downhill from its original location resulting in an unsafe situation. The slough must be removed to re-establish the proper backslope. The excess material may be used to fill holes in the trail tread and re-establish the outslope, or to build up the downhill side of waterbars. Berm is soil that has built up on the downhill edge of the trail tread. Berm prevents water from flowing off the side of the trail and allows water to channel down the trail causing erosion. A berm may also cause nuisance water to pool on the trail surface resulting in soil saturation. Saturated soil is damaged easily and forces trail users to detour around the area causing the trail to widen. Berms should never be constructed intentionally, and should be eliminated whenever present.

B. Vegetation Clearance Maintenance

All plants encroaching on the vegetation clearance limits for the particular trail classification must be cut back. Branches should be cut close to the main stem without cutting into the branch collar. Plants being removed must be cut flush with the ground and stumps must be removed to prevent safety hazards. All plants growing within the trail tread must be grubbed-out. Trails within landscaped areas may be sprayed with herbicide. All removed plant material must be scattered in a location not visible from the trail.

C. Tread Maintenance

In addition to slough and berm removal, the remaining trail tread should be restored to its original design condition. All loose rocks, rock points, stumps, and roots protruding from the trail surface should be removed. All holes should be filled to create a smooth, obstacle-free trail tread. Maintaining a proper outslope is critical to the long-term condition of the trail.

D. Drainage Maintenance

Special attention should be directed to the maintenance of drainage structures. These structures are extremely important in protecting the trail from erosion. If they are not maintained properly, the trail will be prone to erosion, and may become unsafe for public use and require extensive amounts of labor to repair. All repairs to drainage structures must restore them to their original standard construction specifications.

E. Special Structure Maintenance

Structures such as waterbars, culverts, switchbacks, retaining walls, wash crossings, overpasses, bridges, etc. are rather expensive and labor intensive to construct. Proper maintenance will prolong the life of the structures and help prevent safety hazards. Structures should be inspected annually and maintenance performed as needed. All repairs to special structures must restore them to their original standard construction specifications.

F. Sign Maintenance

Sign maintenance includes replacing missing or damaged signs and assuring the accuracy of the information on the signs, as conditions may change over time. All signs that are damaged, weathered, or for any other reason do not serve their intended purpose should be repaired or replaced according to the sign standards described in this manual.

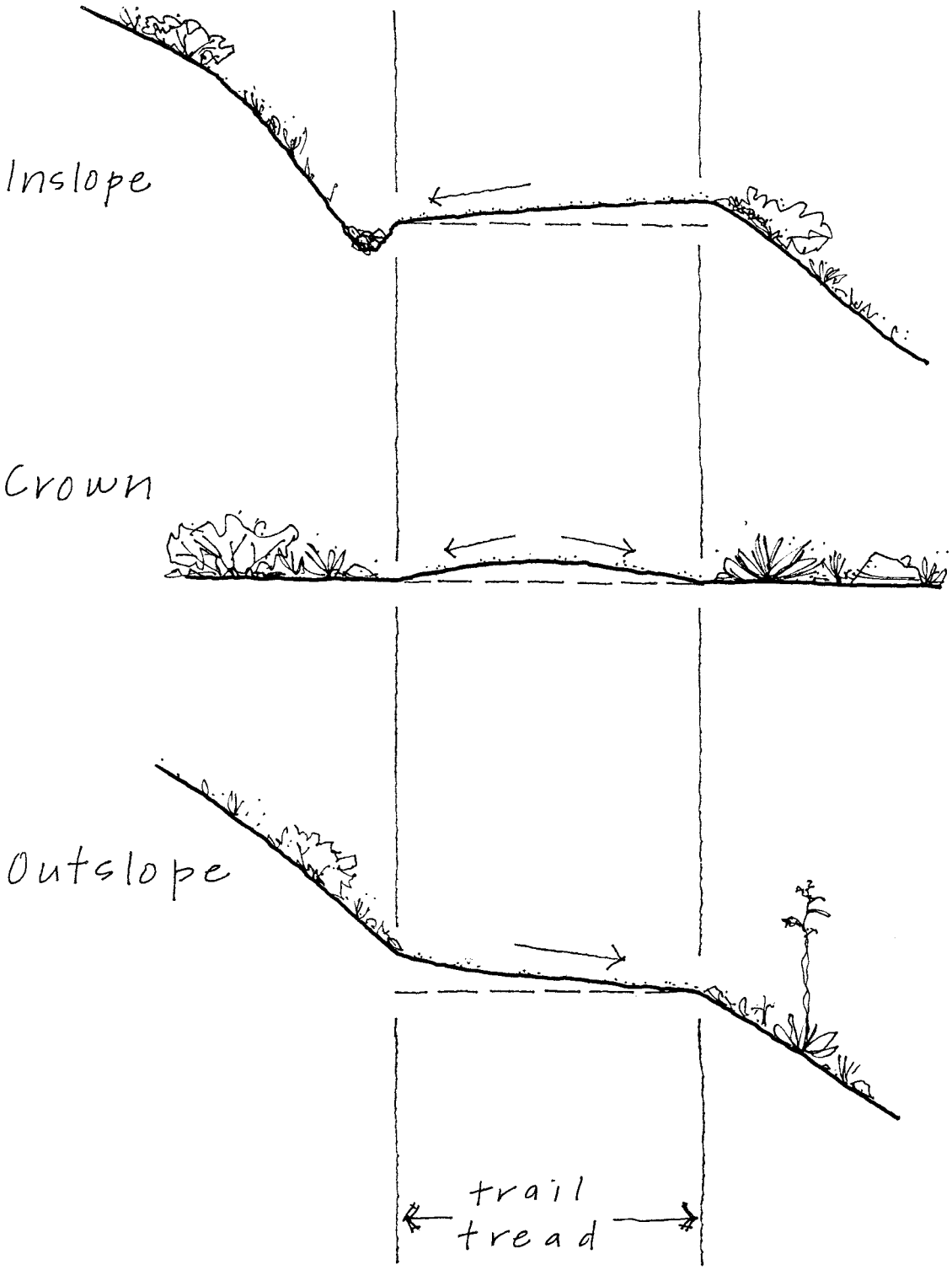


FIGURE 7.3-1

Cross Slopes

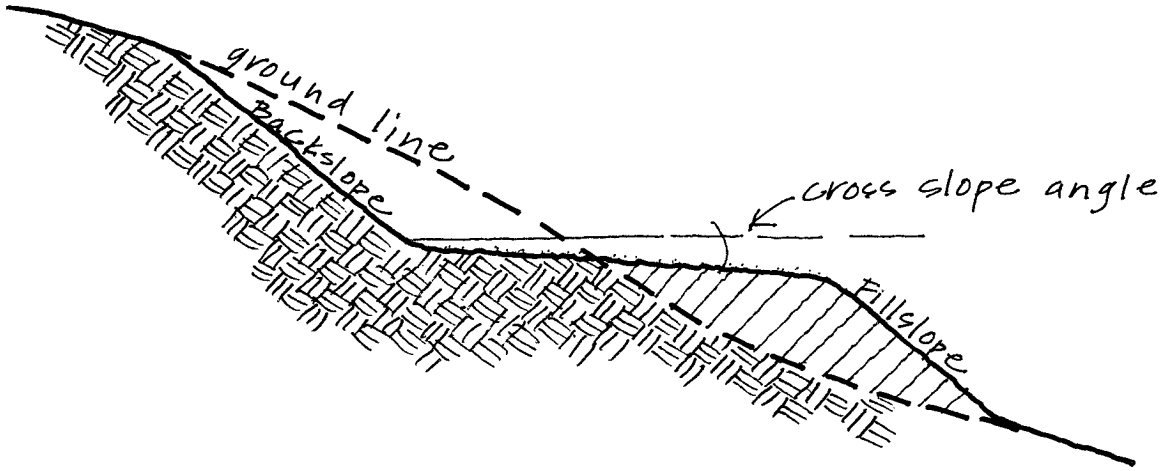


FIGURE 7.3-2

Typical Trail Profile

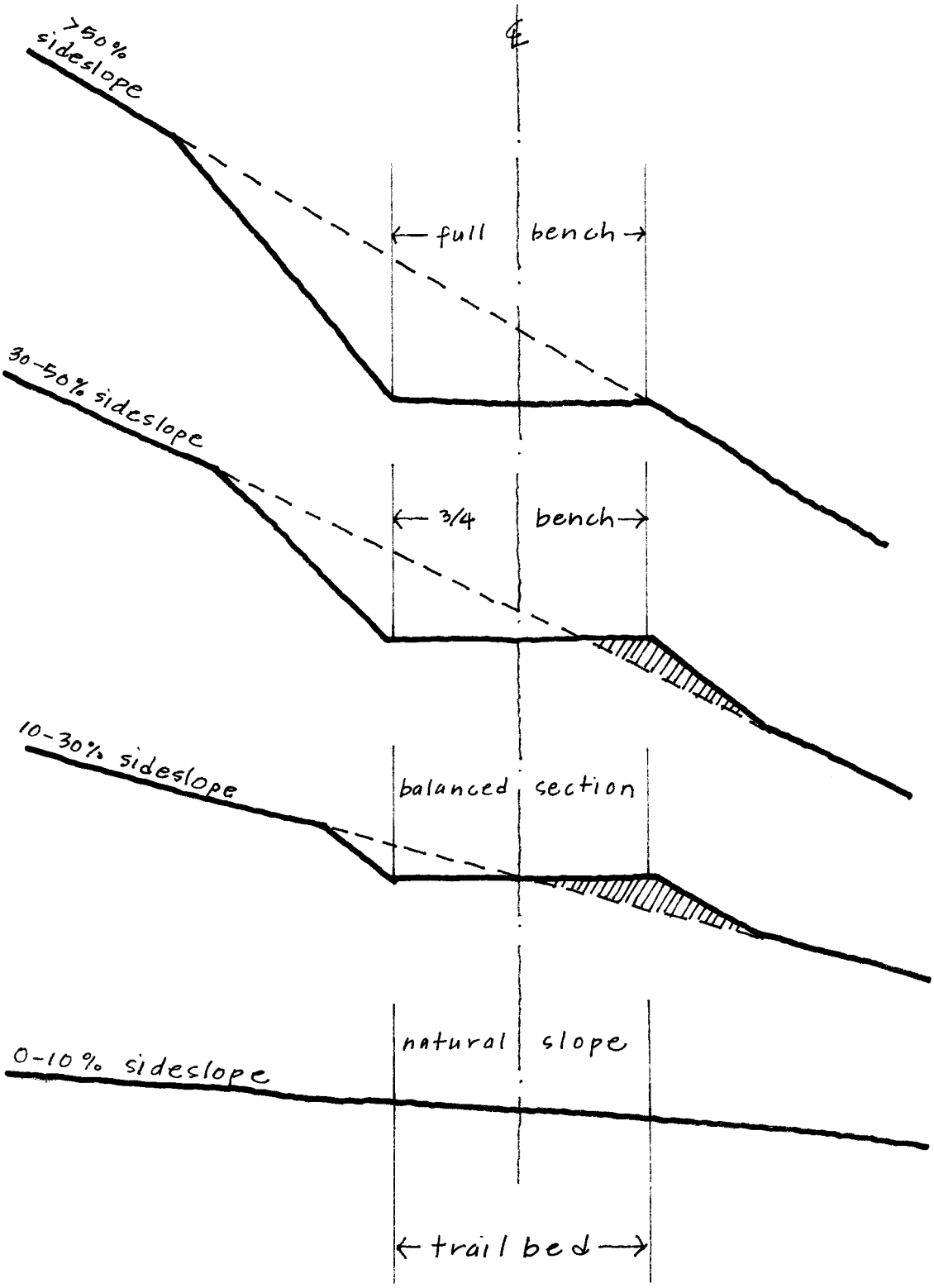


FIGURE 7.3-3

Typical Trail Cross Sections

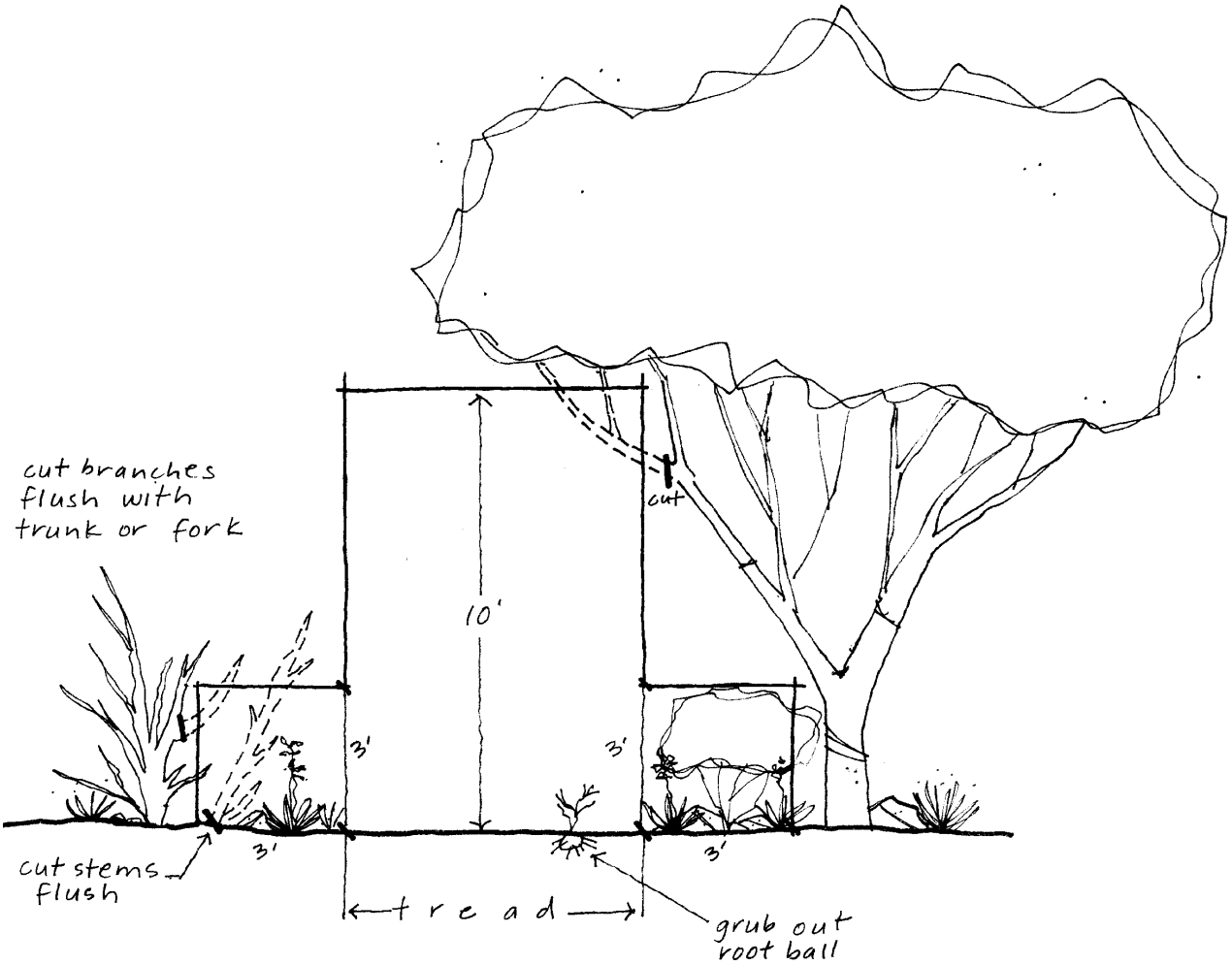


FIGURE 7.3-4

Vegetation Clearance

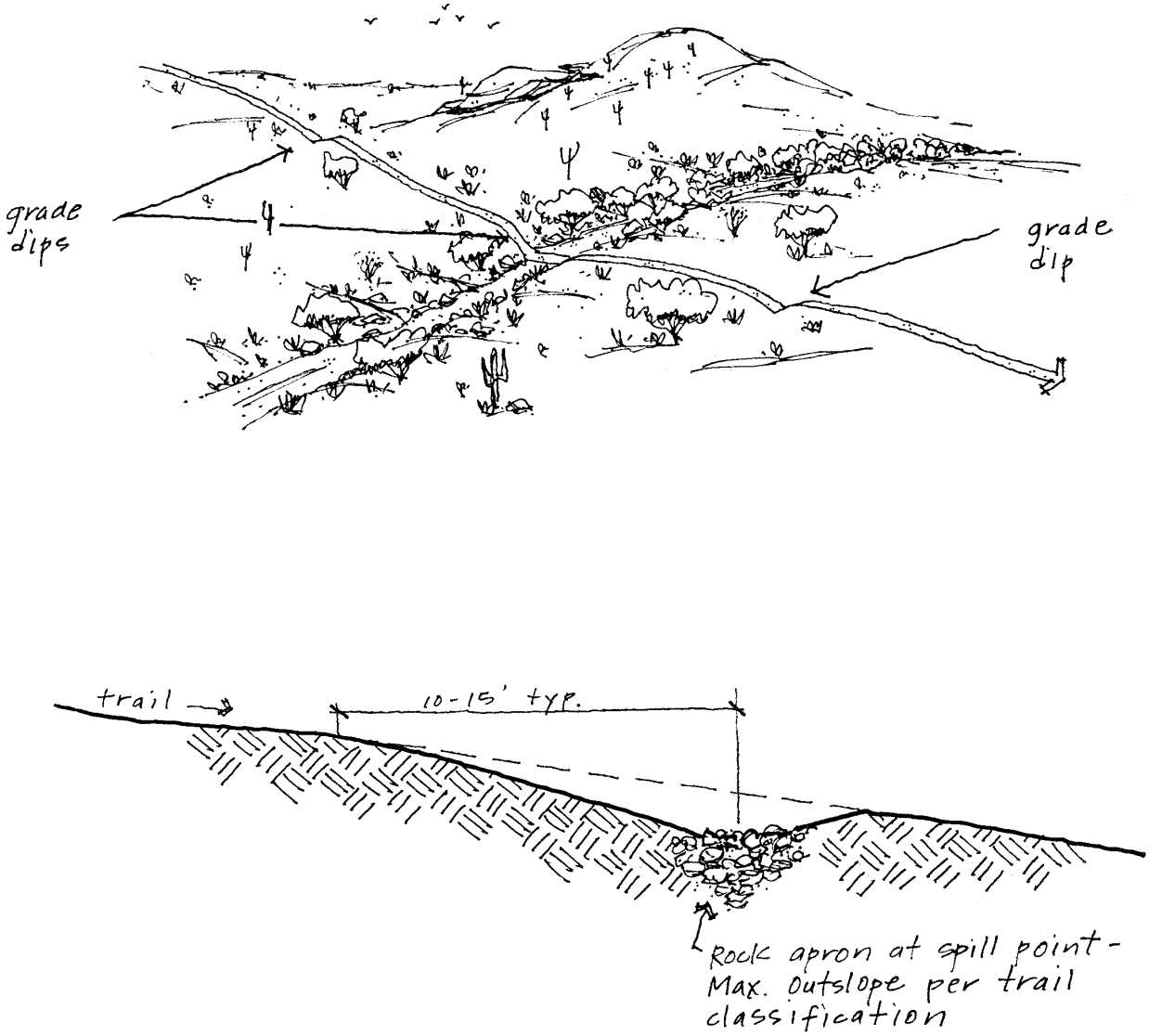
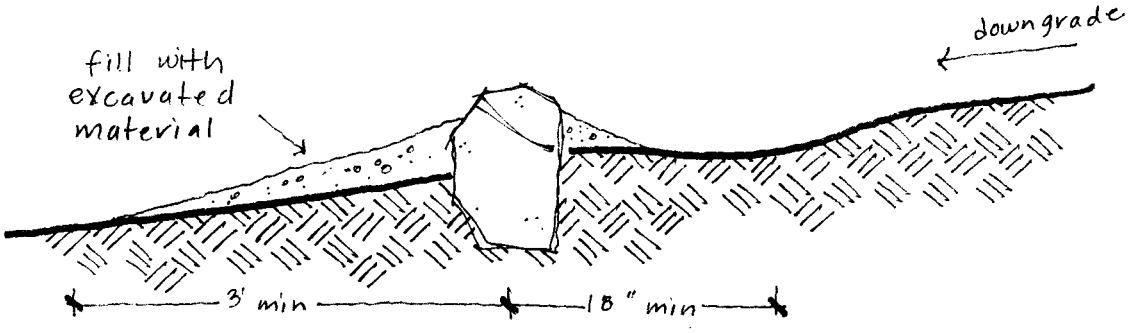


FIGURE 7.3-5

Grade Dips



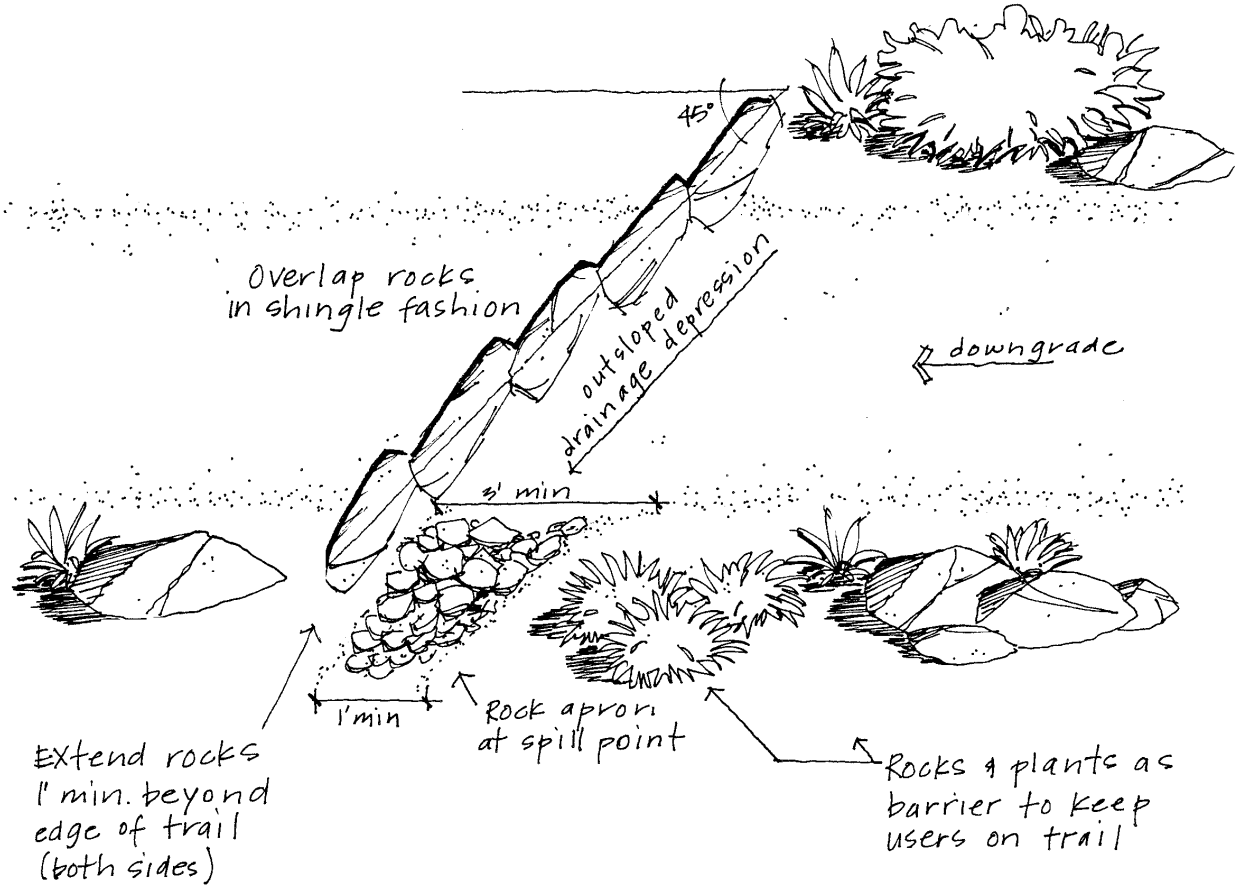
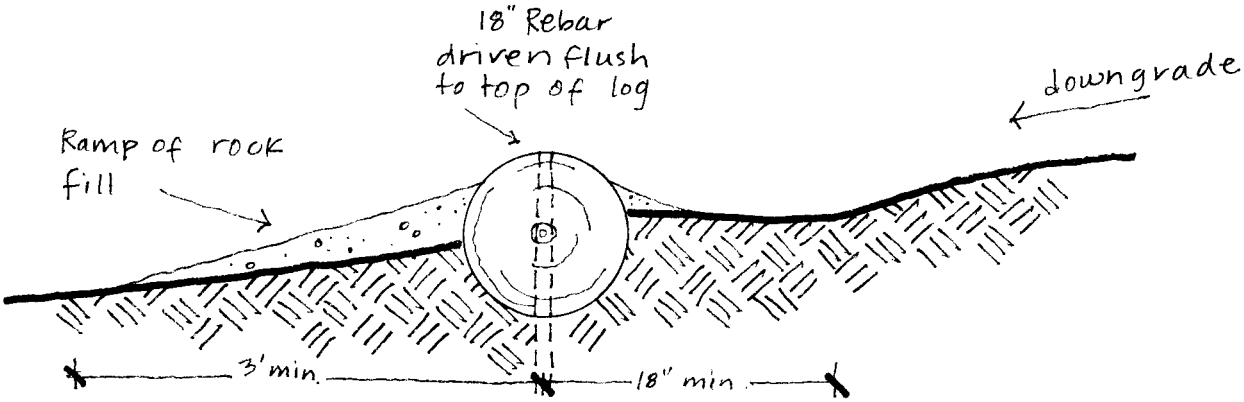


FIGURE 7.3-6

Rock Waterbar



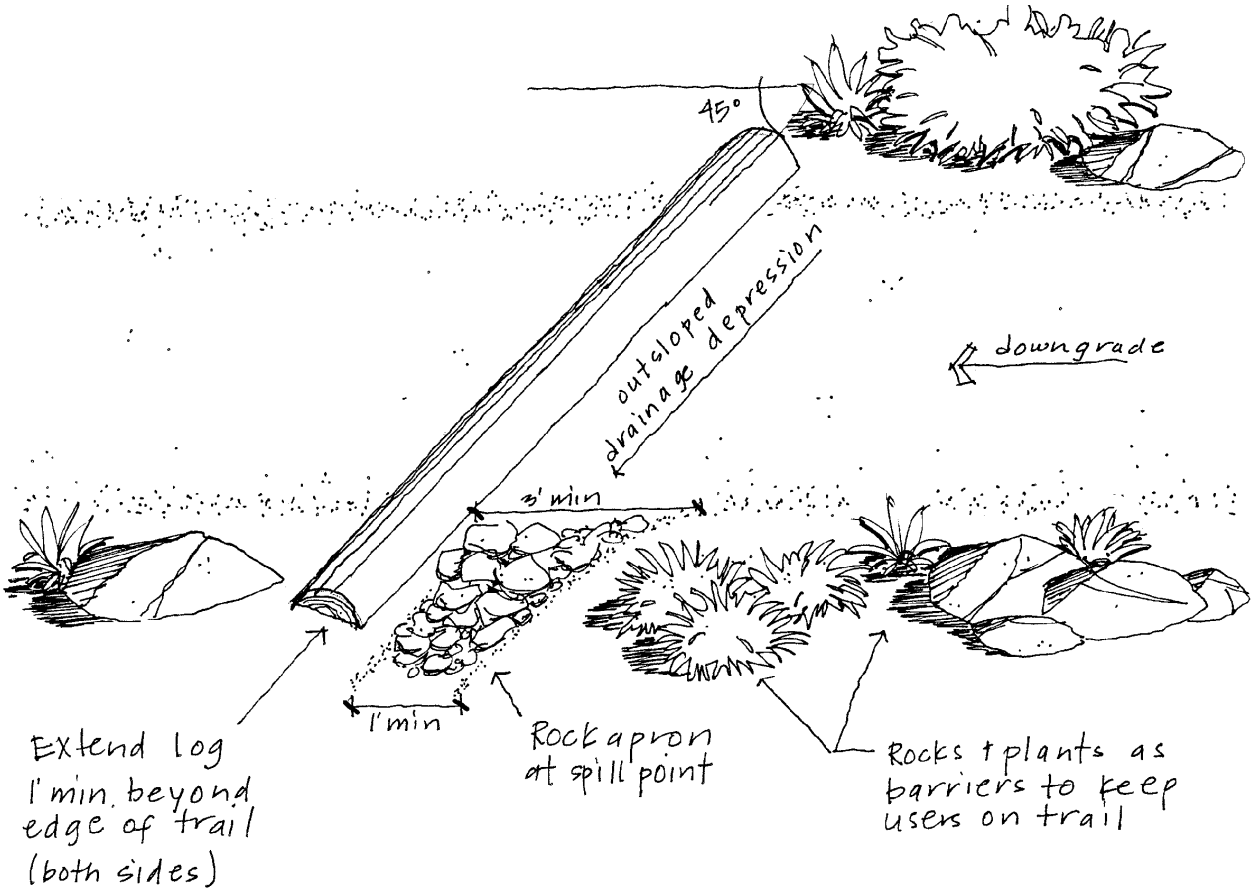
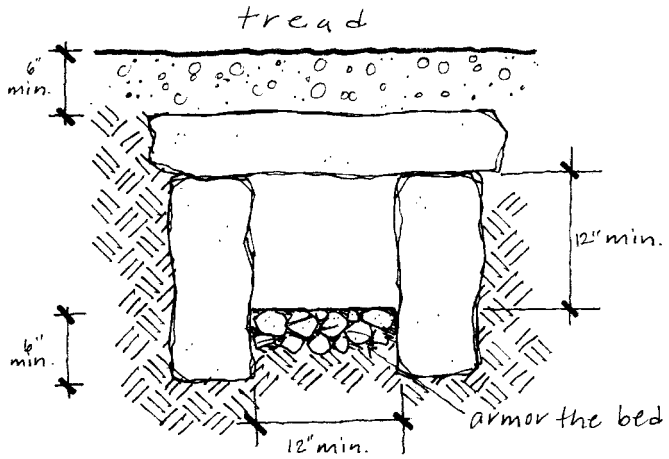


FIGURE 7.3-7

Log Waterbar



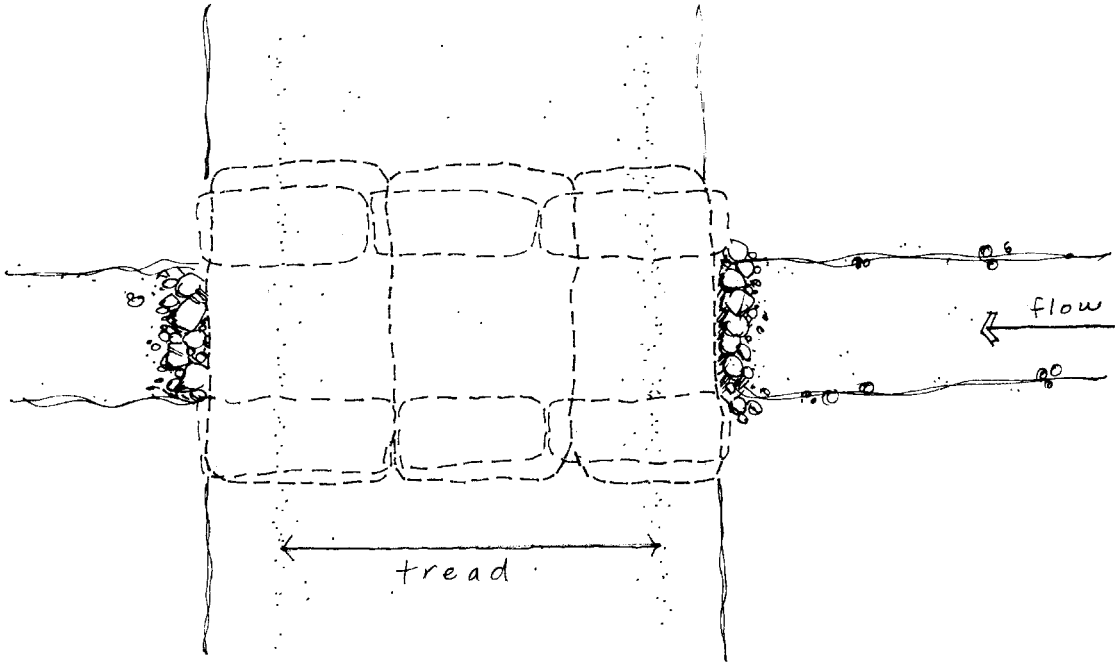
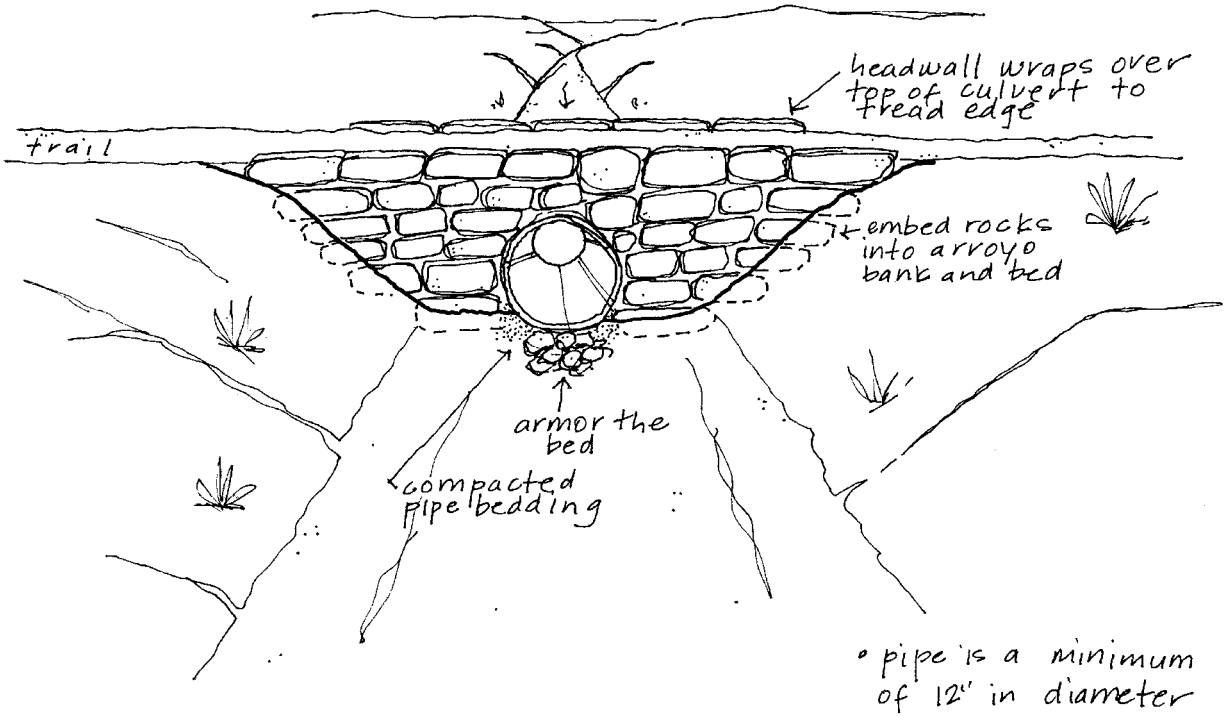


FIGURE 7.3-8

Rock Culvert



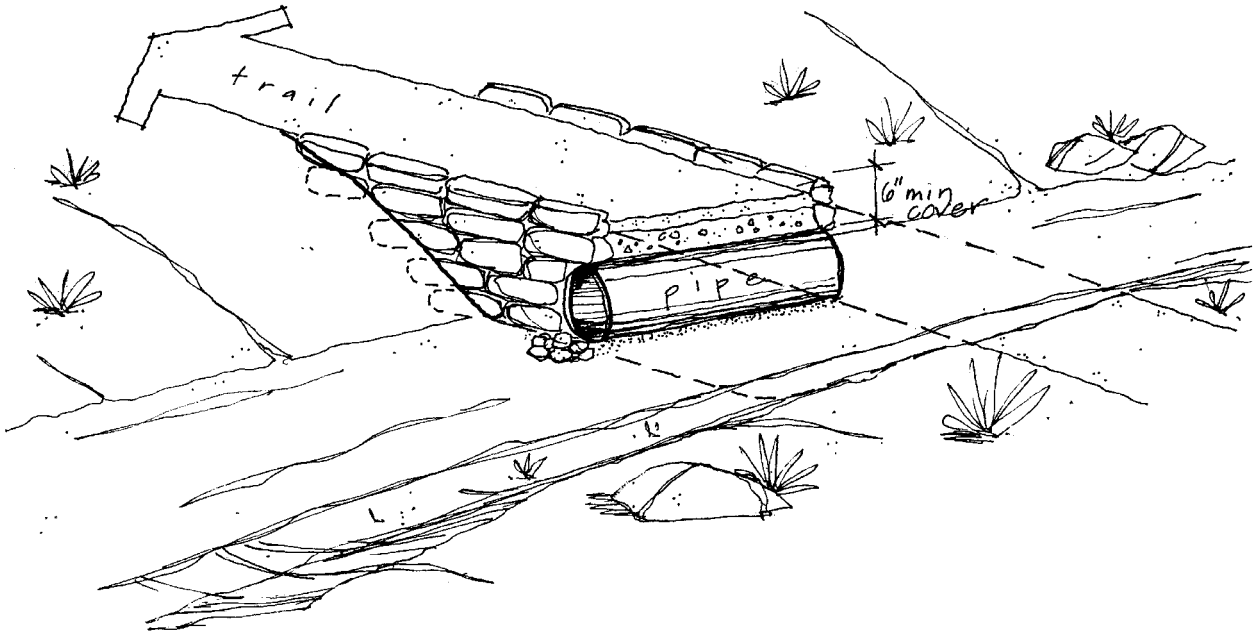
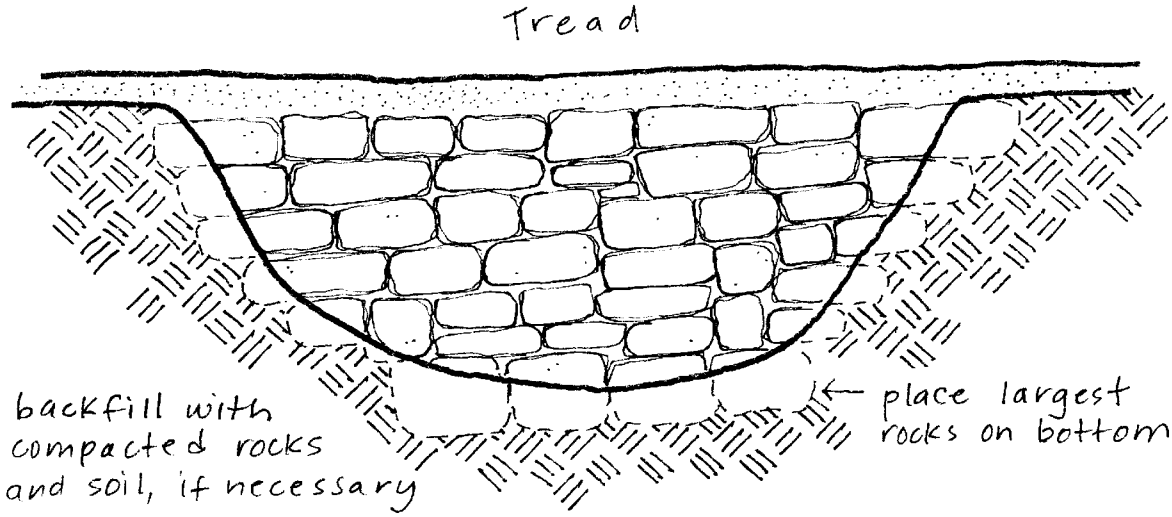


FIGURE 7.3-9

Pipe Culvert



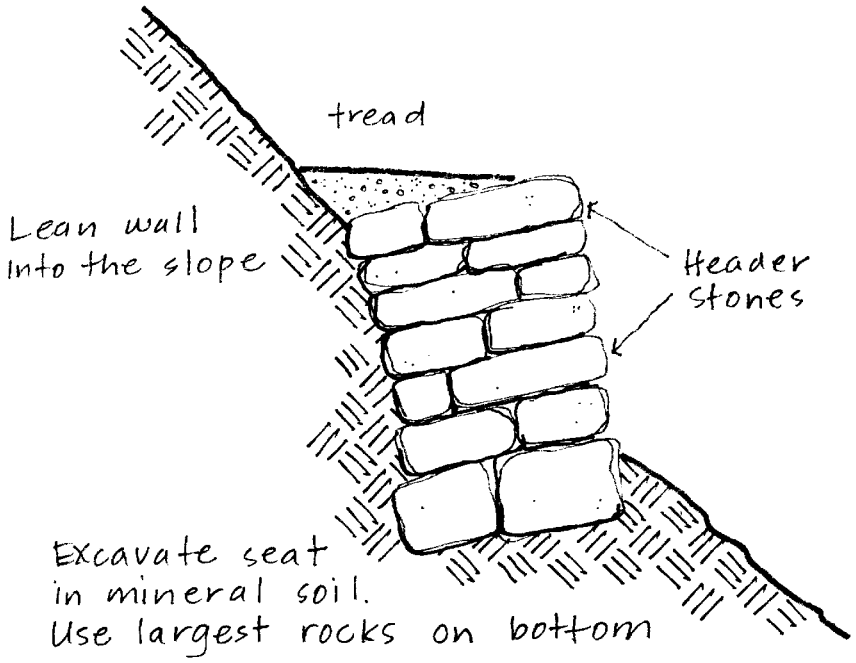
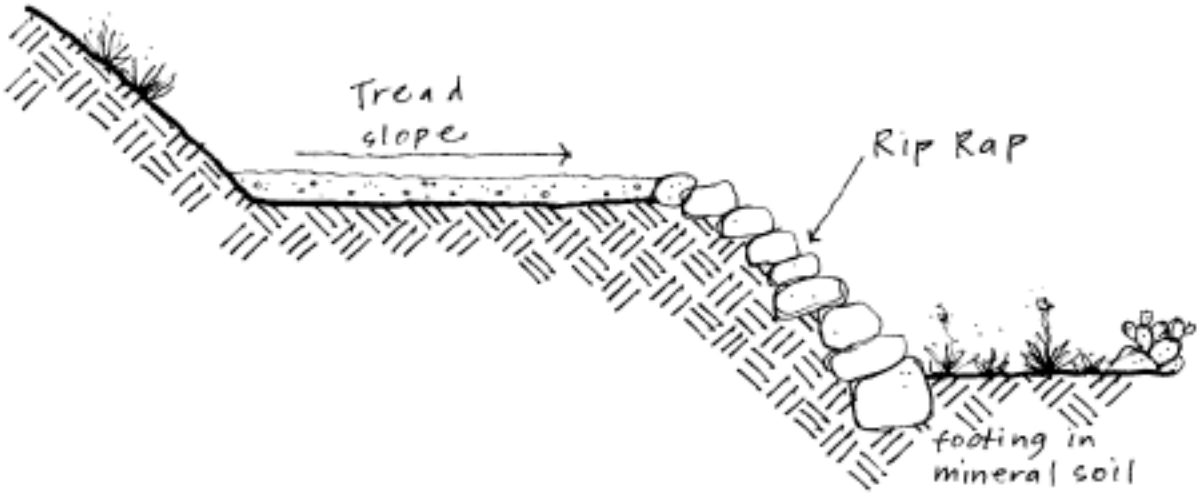


FIGURE 7.3-10

Rock Retaining Wall



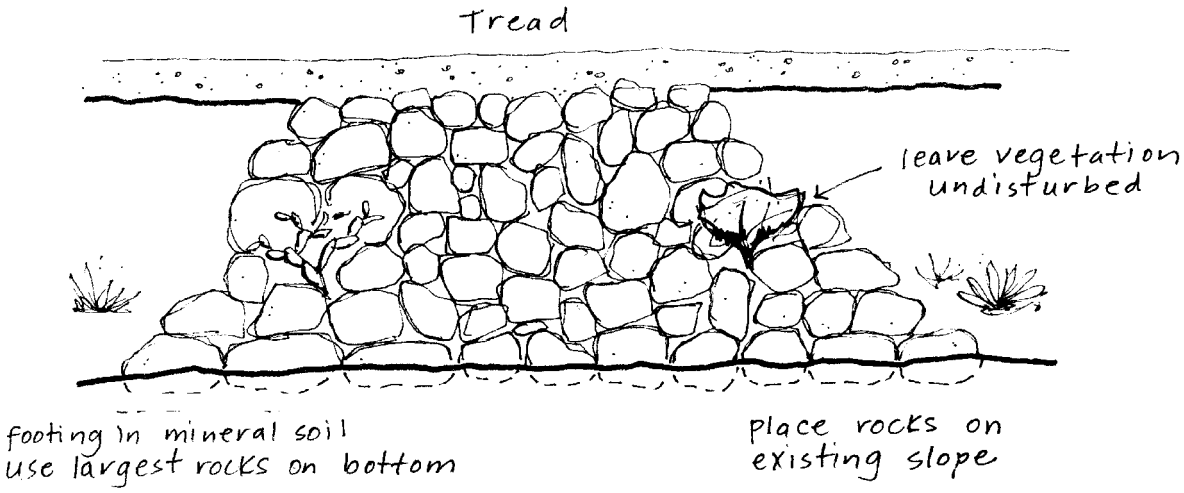
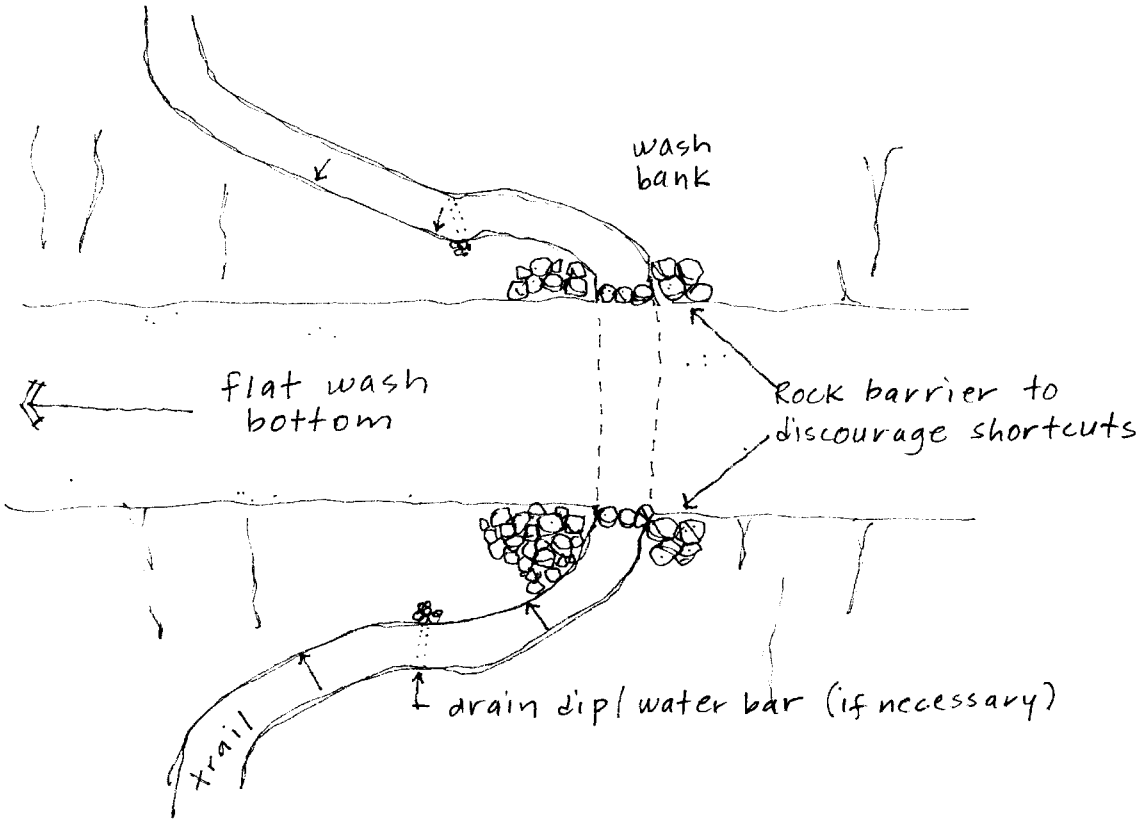


FIGURE 7.3-11

Rip Rap



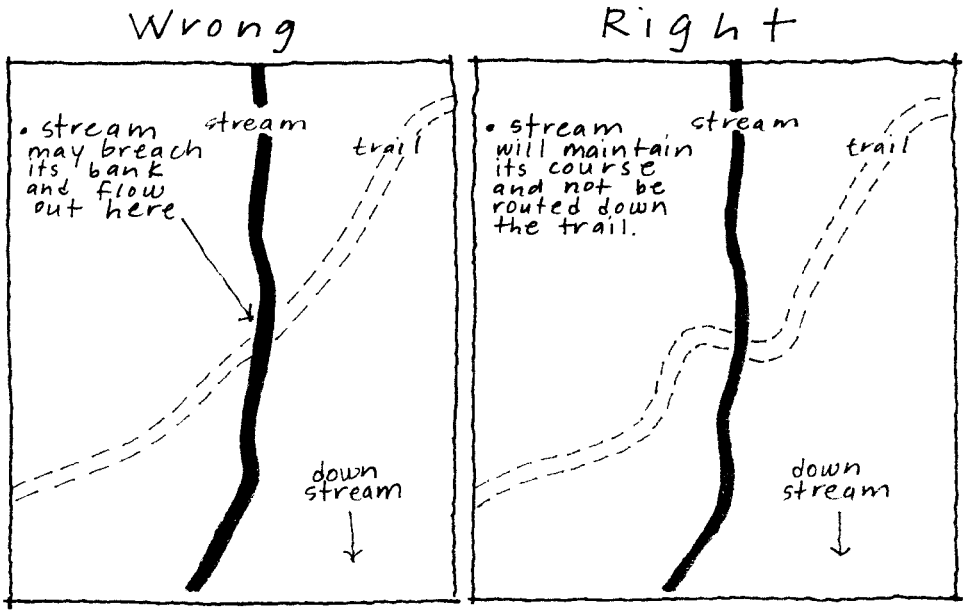


FIGURE 7.3-12

Wash Crossing

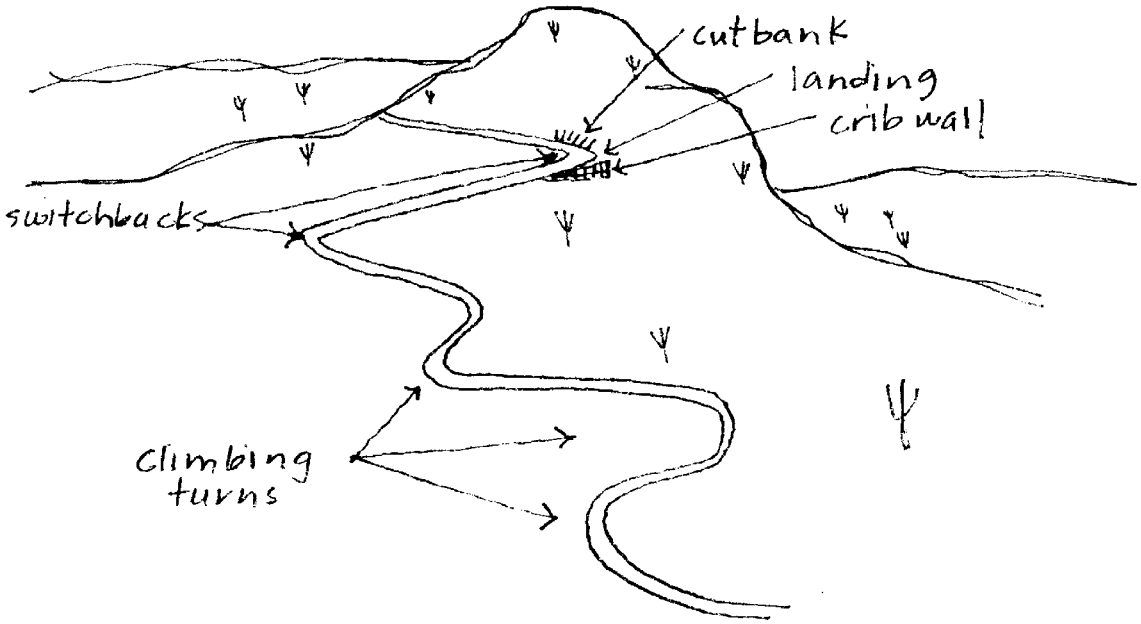
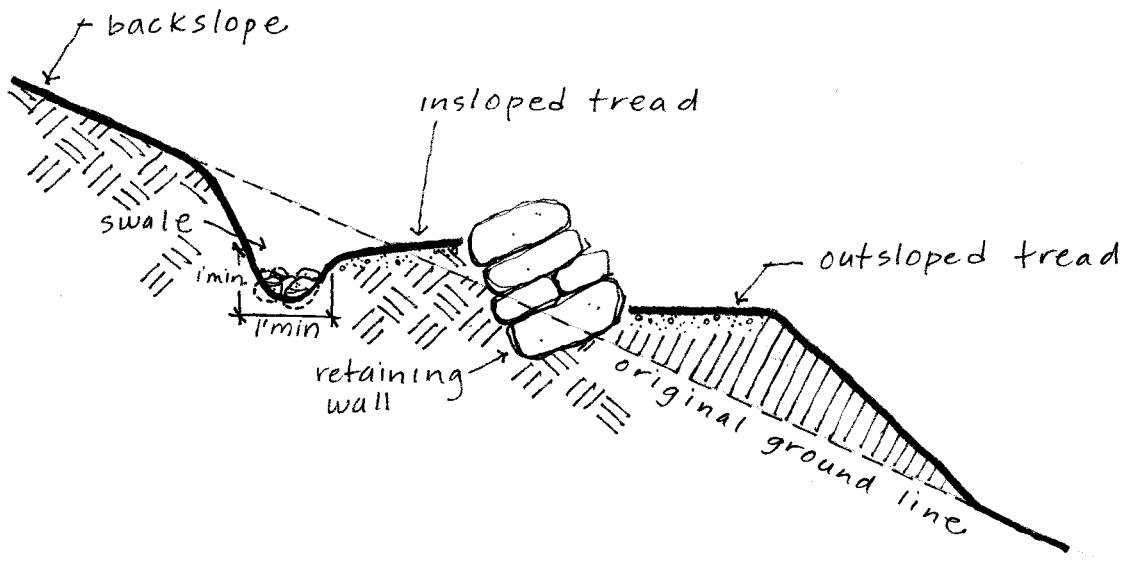


FIGURE 7.3-13

Switchbacks and Climbing Turns Concept



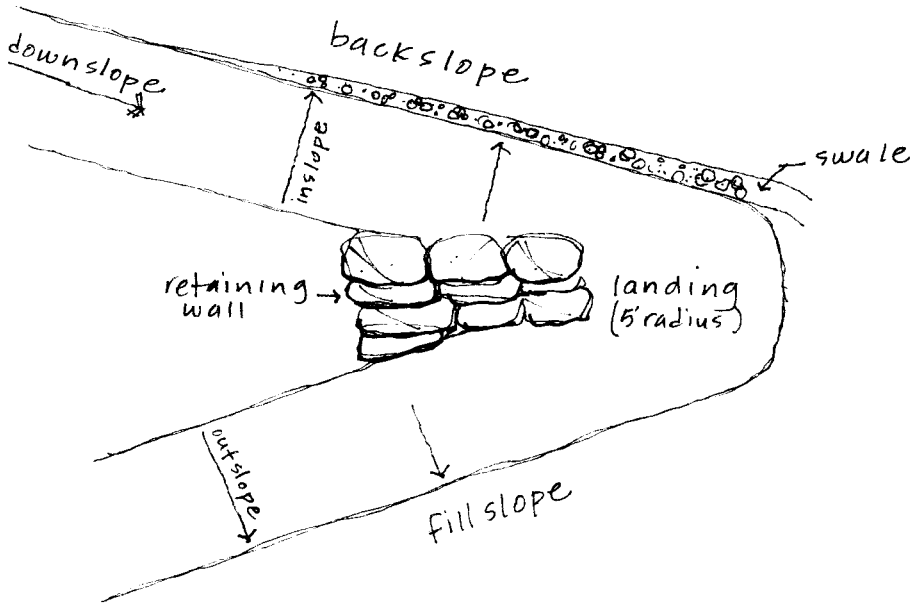


FIGURE 7.3-14

Switchback Turn

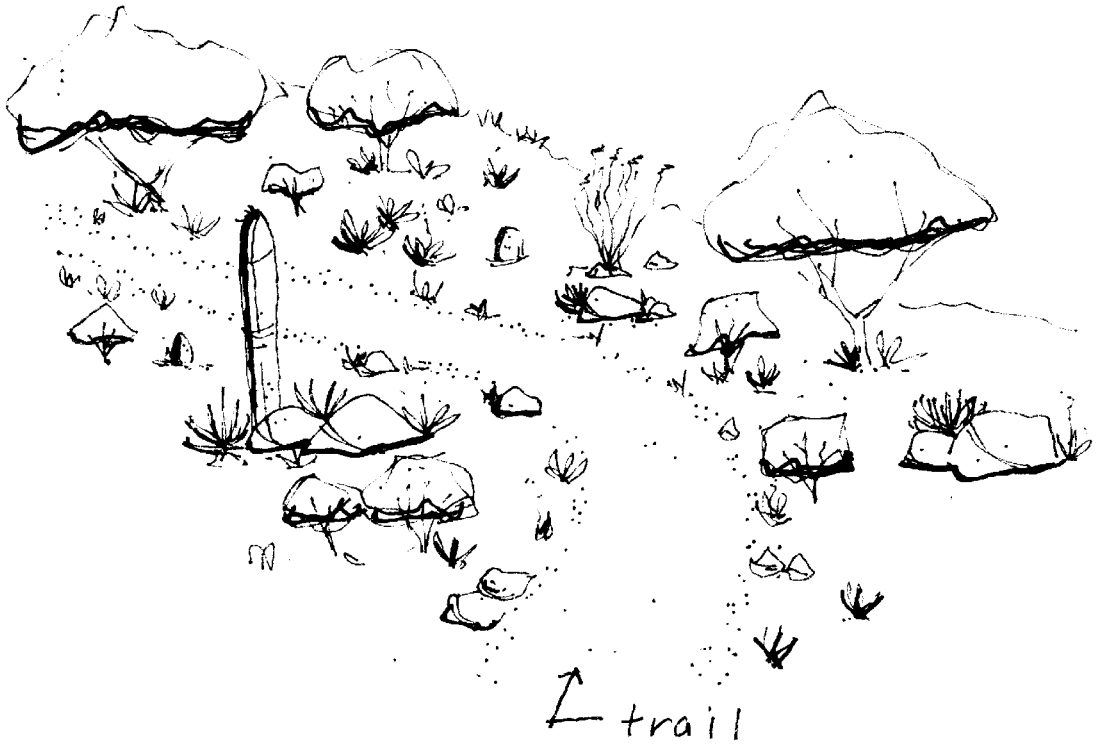


FIGURE 7.3-15

Climbing Turn

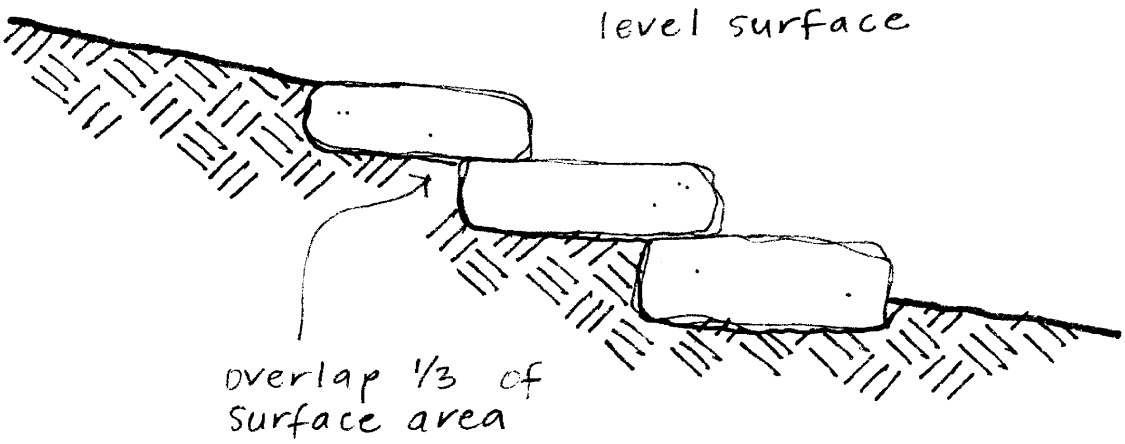
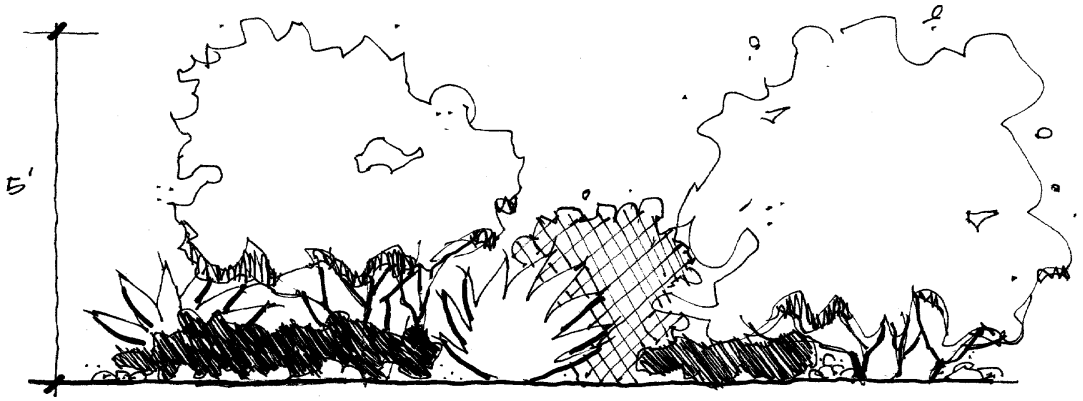
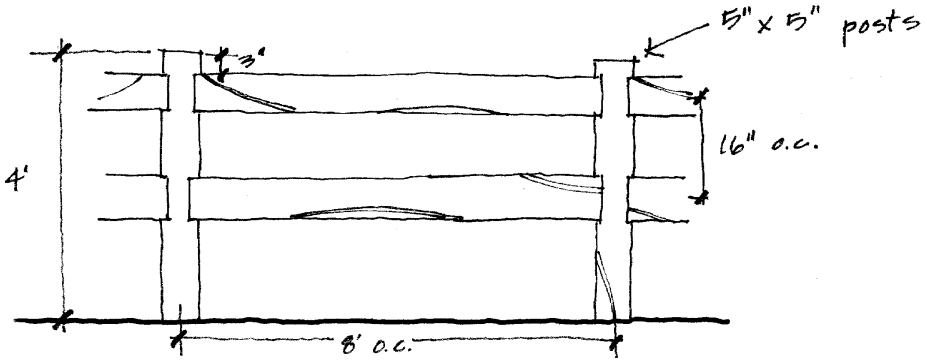


FIGURE 7.3-16

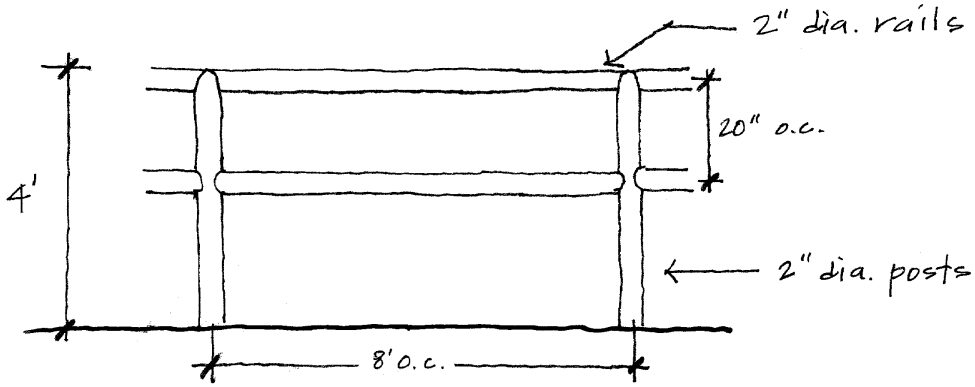
Rock Steps



Dense Landscape



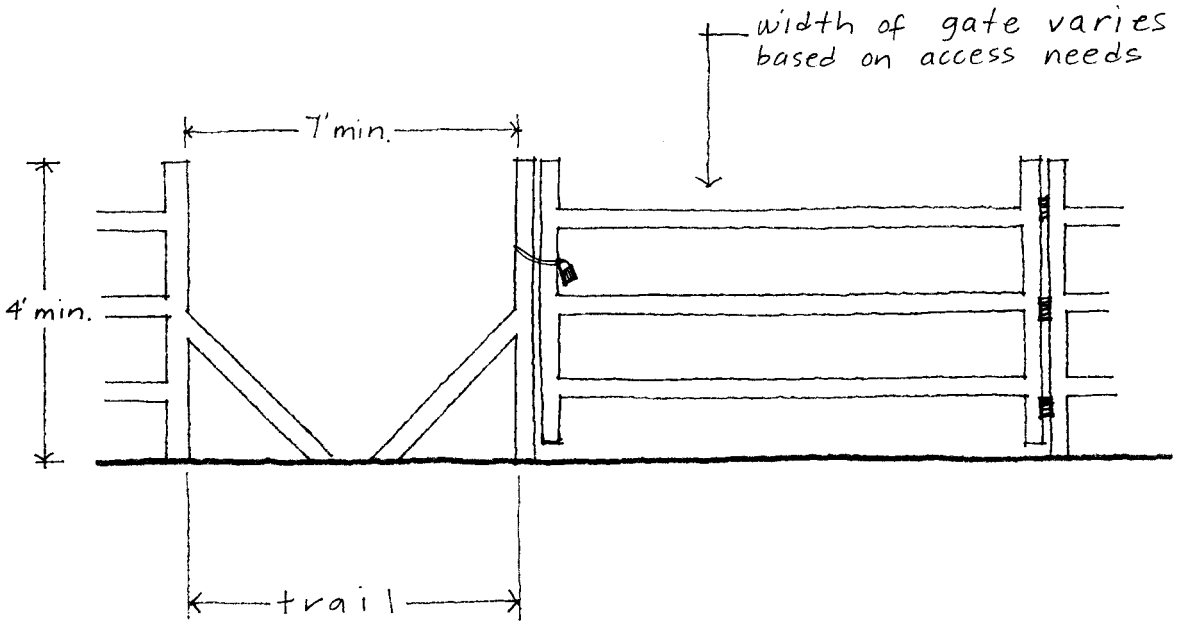
Post and Rail



Pipe Railing

FIGURE 7.3-17

Safety Barriers



Typical Trail Access Gate

FIGURE 7.3-18

Trail Access Gates

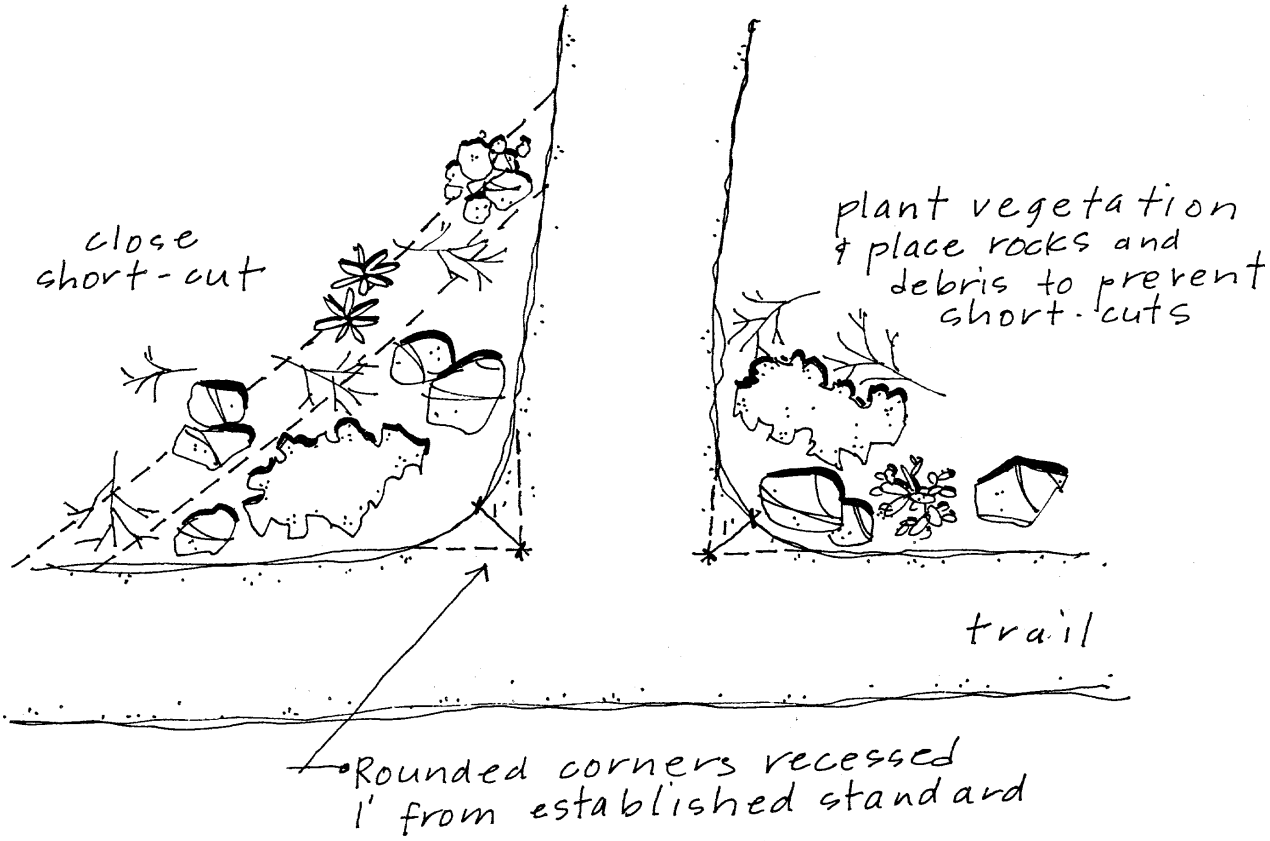
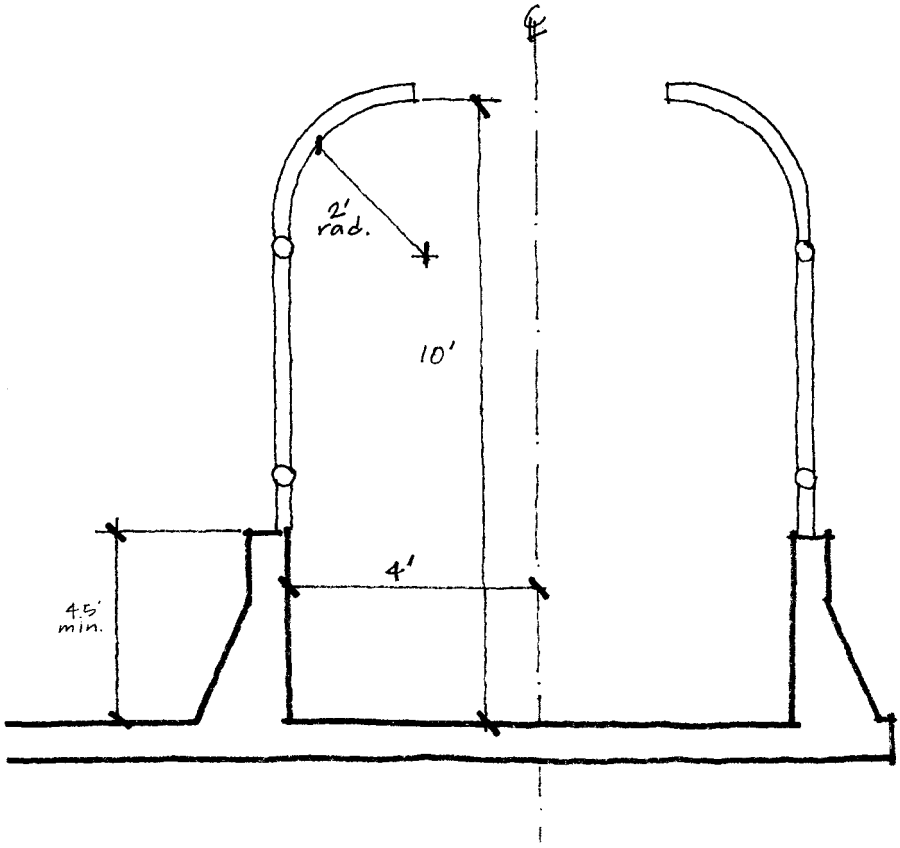
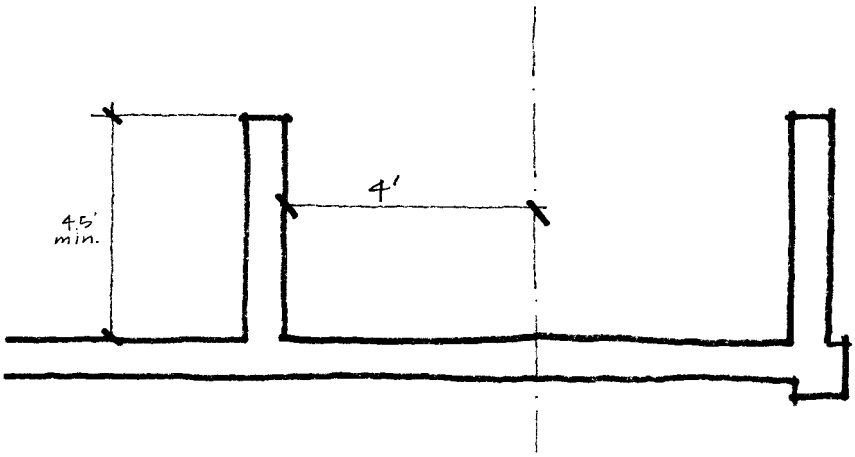


FIGURE 7.3-19

Trail Junctions



Overpass Cross Section



Bridge Cross Section

FIGURE 7.3-20

Trail Overpass and Bridge

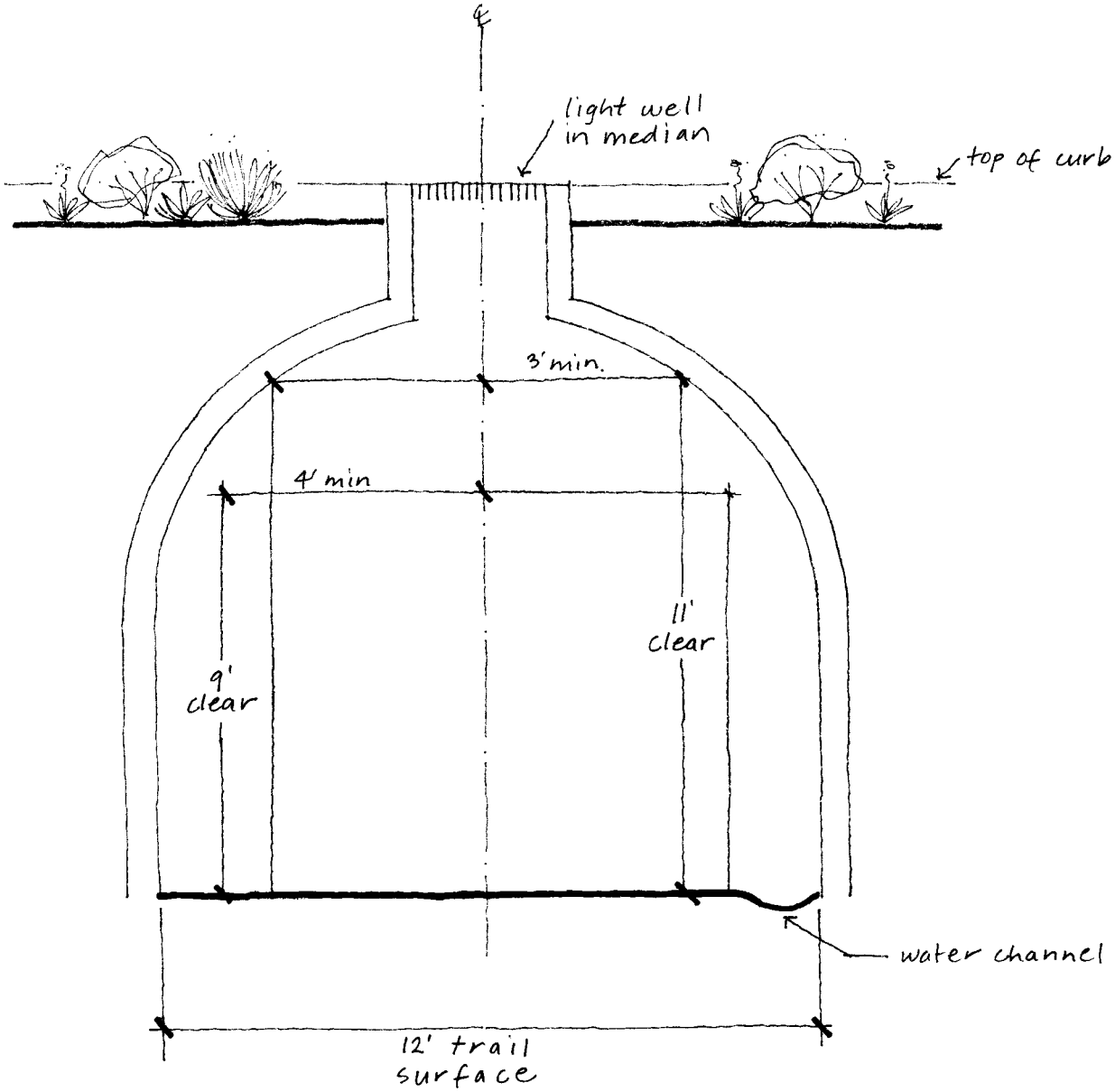
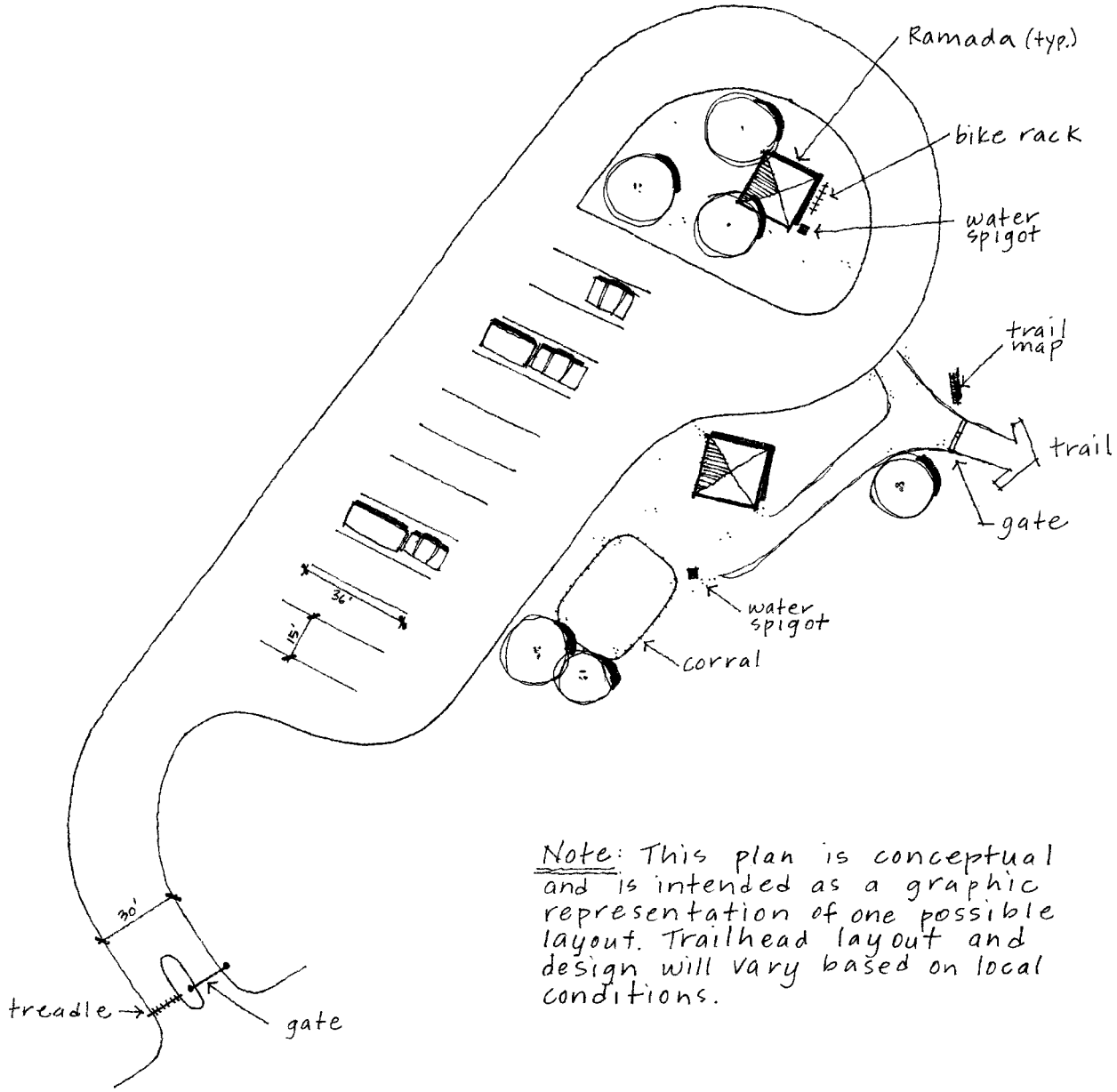


FIGURE 7.3-21

Trail Underpass



Major Trailhead – Conceptual Plan

FIGURE 7.3-22

Trail Access Facility Concept

FIGURE 7.3-23

Trail Sign

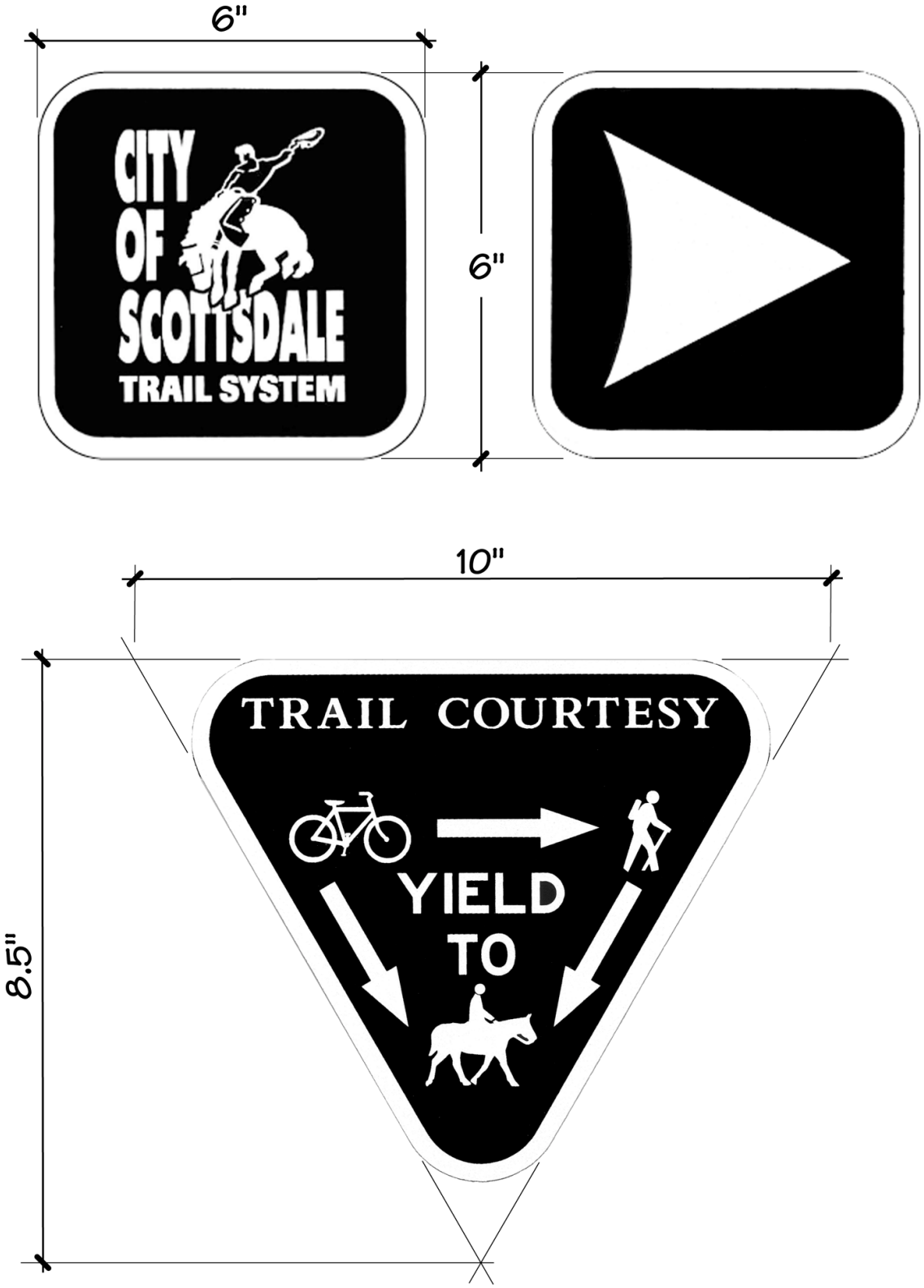


FIGURE 7.3-24

Trail Signs

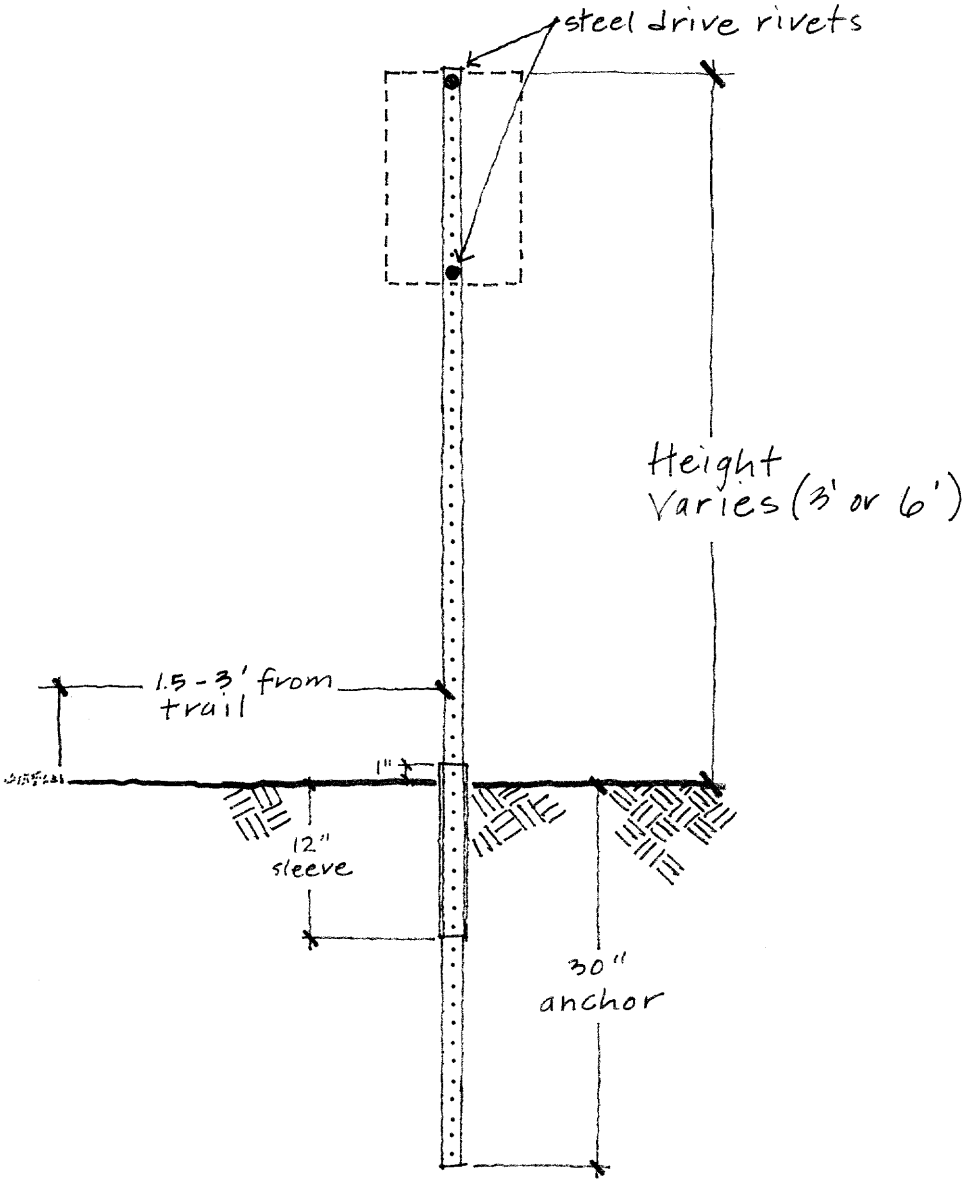
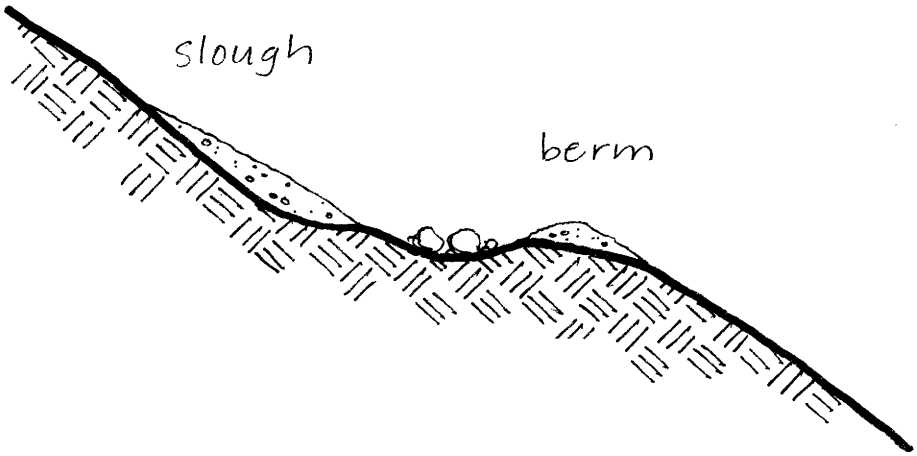


FIGURE 7.3-25

Trail Sign Installation

Before Reconstruction



After Reconstruction

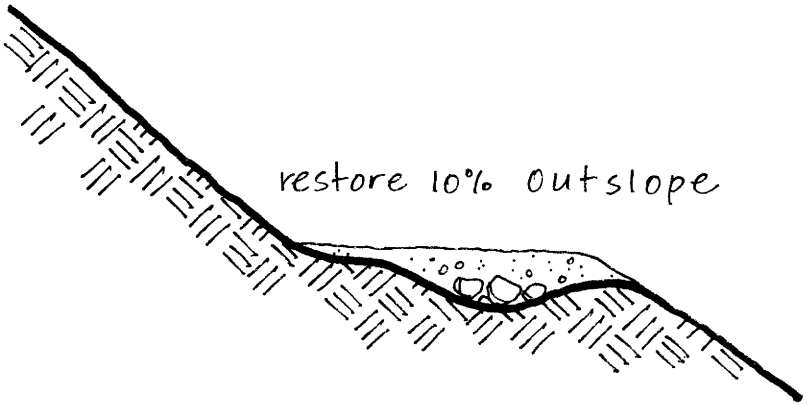


FIGURE 7.3-26

Slough and Berm

Section 7.4

Native Plant

Design Standards and Policies
Revised April 2000

Chapter 7
Landscaping

SECTION 7.4

NATIVE PLANT

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
7-401	GENERAL INFORMATION	
	A. Purpose	3
	B. Definitions	3
7-402	THE NATIVE PLANT PERMIT – SUBMITTAL REQUIREMENTS	
	A. Native Plant Application Form	5
	B. Native Plant Program	5
	C. Letter of Authorization	6
	D. Notice of Intent to Clear Land	6
	E. Tagging Plants in the Field	6
	F. NAOS exhibit	7
	G. Review Fee	7
	H. Prior Approvals	7
	I. Permit Fee	7
	J. Field Walk	7
7-403	REVIEW CRITERIA	
	A. Density/Intensity of Development	8
	B. On-site Natural Amenities	8
	C. Plant Inventory	8
	D. Revegetation and Natural Density	8
	E. Excess Plants	8
	F. Incorporation of Plants Into a Project	9
	G. Additional Information	10
7-404	INSPECTIONS	
	A. Field Walk	10
	B. Preliminary Site Inspection	10
	C. Nursery Inspection	11
	D. Tracking Form	11
	E. Final Inspection	11
7-405	ACTION ON APPLICATION	11
7-406	QUESTIONS AND ANSWERS	12

FIGURE	DESCRIPTION	PAGE
7.4-1	Native Plant Narrative and Application Form	16
7.4-2	Standards for Saguaro Relocation	17
7.4-3	Native Plant Tracking Form	18

Section 7.4 – Native Plant

7-401 GENERAL INFORMATION

A. Purpose

It has been determined that the preservation of the types and sizes of indigenous plant materials specified in Chapter 46 of the Scottsdale Revised Code enhance the City's physical and aesthetic character, increase the valuation of real property, and provide scenic opportunities unique to this region.

The following guidelines have been prepared to assist individuals and companies in compiling the necessary data required to submit for a native plant permit in compliance with Article 5, Chapter 46 of the Scottsdale Revised Code. It is the City's intent that the data gathered be used as part of the preliminary analysis for developing site plans for projects allowing for the preservation of protected plant materials to the greatest extent possible. Particular attention should be paid to specimen plants, dense massings of vegetation, stabilization of soils, and plant materials of a unique character.

B. Definitions

The following definitions shall be applicable to these guidelines.

1. "DESTROY" shall mean to kill, or to cause the death of any protected native plant by any means.

2. "METHODOLOGY' shall mean a written outline of the method or methods to be used to relocate, remove, and/or destroy protected plant material.

3. "MUTILATE" shall mean to deface, maim, damage, or disfigure any protected native plant by shooting, chopping, pushing over, burning, cutting, or any other means.

4. “NATIVE PLANT PERMIT” shall mean a permit issued by the City of Scottsdale pursuant to the provisions of Article 5, Chapter 46 of the Scottsdale Revised Code for the purpose of removing from the premises, or destroying any protected native plant.

5. “NATIVE PLANT PROGRAM’ shall mean a development plan specifying the proposed treatment of protected native plants for which a native plant permit is required.

6. “ PROTECTED NATIVE PLANT” shall mean cacti which are three (3) feet or greater in height and indigenous trees which are four (4) inches or greater in caliper of the following species:

TREES

Botanical Name	Common Name
Acacia constricta	Whitethorn Acacia
Acacia greggii	Catclaw Acacia
Berberis haematocarpa	Red Barberry
Canotia holocantha	Crucifixion Thorn
Celtis pallida	Desert Hackberry
Cercidium floridum	Blue Palo Verde
Cercidium microphylum	Foothills Palo Verde
Chilopsis linearis	Desert Willow
Juniperous mono sperma	One-Seeded Juniper
Olneya tesota	Ironwood
Populus fremontii	Cottonwood
Prosopis spp.	Mesquite
Quercus spp.	Scrub Oak
Rhus ovata	Sugar Sumac
Vauquelinea californica	Arizona Rosewood

CACTI

Botanical Name	Common Name
Carnegiea gigantea	Saguaro
Ferocactus spp.	Barrel
Fouquieria splendens	Ocotillo
Peniocereus greggii	Desert Night-Blooming Cereus
Yucca elata	Soaptree Yucca

7. “RELOCATE” shall mean to transplant a protected native plant to another location on the premises.

8. “REMOVE” shall mean to transport a protected native plant from the premises on which it has been growing for the purpose of transplanting it on another site.

9. “SPECIMEN” shall mean a plant that is relatively free of disease and physical deformations and is representative of the form and character of the species.

10. “UNSALVAGEABLE PLANT” shall mean a protected native plant that cannot be successfully relocated due to any of the following:

a. Deteriorated health from disease, infestation, or natural causes.
b. Physical constraints related to plant location, soil conditions, orientation, or general conditions that obstruct and/or prevent the application of city-approved relocation techniques.

11. “NATIVE PLANT” shall mean any plant listed on the City of Scottsdale protected native plant list as defined in Sec. 46-105 of the Scottsdale Revised Code.

7-402 THE NATIVE PLANT PERMIT – SUBMITTAL REQUIREMENTS

No protected plant material, as defined in Section 7-401.6 “Protected Native Plant” of this manual, may be relocated, removed, or destroyed without a native plant permit. No native plant permit shall be issued unless an application is submitted in conjunction with an existing or proposed development which requires development review board approval, city council approval, board of adjustment, or approval of a plat as determined by the city manager or designee. The submittal is separate from any other native plant submittal required for a Zoning Case, a Development Review Board Case, or a Preliminary Plat Case. For a native plant permit to be issued, the following items must be submitted to the Development Services Department (One Stop Shop) of the City of Scottsdale at 7447 E. Indian School Road, Suite 100. Submittals made with no action taken will be purged from the system after one year.

A. Native Plant Application Form.

A completed Native Plant Narrative and Application Form – see Figure 7.4-1 of this manual. *

B. Native Plant Program

A complete Native Plant Program with the following information, as outlined in Section 7.504 of the Scottsdale Zoning Ordinance:

1. Three (3) copies of a native plant inventory on an aerial photograph with a project overlay, or a site plan. The location of all protected native plants within the construction boundaries, and an additional fifty (50) foot buffer beyond the construction limits, or to the edge of the property, are to be shown on the plan.

a. The aerial or site plan shall include the project name, a scale (minimum scale is 1" = 50'), a north arrow, a vicinity map, the adjacent street names, and the name of the company performing the inventory.

2. A list identifying the tag number, species, size, general condition, and salvage status of each protected plant within the area of disturbance. If a plant is noted as non-salvageable, the reason or reasons for the assessment must also be noted.

3. A salvage contractor must have prior methodology approval by City staff. No native plant inventory will be accepted if it is not performed by a City of Scottsdale approved salvage contractor. If the cactus salvage contractor is different than the tree salvage contractor, both will need to be reviewed and approved.

a. Due to the large number of Saguaros which have expired after being transplanted, and the length of time for the decline of the plant to be identified; the City, in conjunction with the Desert Botanical Garden, has established baseline standards for Saguaro relocation (see Figure 7.4-2 of this manual). Any deviation from an approved methodology or the Standards for Saguaro relocation shall require prior City review and approval.

4. A relocation program identifying the ultimate use and placement of salvaged plant material including any proposals for plants to be removed from the project. *

5. Nursery location for storage of salvaged plants.

C. Letter of Authorization.

A letter of authorization from the property owner identifying a salvage contractor approved by the City. For single family home submittals, the name of the salvage contractor shall be noted on the native plant portion of the planning submittal. All inventories must be performed by a city-approved salvage contractor.

D. Notice of Intent to Clear Land.

A copy of the stamped "Arizona Department of Agriculture Notice of Intent to Clear Land" form. To obtain the form contact the Arizona Department of Agriculture, Native Plant Section at (602)542-3292 or visit their website at www.agriculture.state.az.us. *

E. Notice of Tagging of Plants in the Field.

Notice that all protected plants have been tagged and numbered in the field in conformance with Section 46-116 of the Scottsdale Revised Code.

1. White tag for plants remaining in place.
2. Red tag for plants being relocated/removed.
3. Blue tag for plants being destroyed.

Plants with white tags or no tags shall be protected for the duration of the project regardless of salvage status. Tags shall be numbered to correspond to the inventory numbering. In addition, construction boundaries, NAOS (Natural Area Open Space), and other areas required to be left undisturbed, are to be clearly staked in the field with yellow nylon rope or other means approved by the Planning Inspector for the project.

F. Natural Area Open Space exhibit for site

A copy of the N.A.O.S. exhibit for the site, showing locations of both natural and revegetated areas to be dedicated. All N.A.O.S. easements must be staked and roped in the field at the time of the native plant field walk.

G. Review Fee.

An initial review fee of fifty ($50) dollars is charged for the first hour in review. Additional hours required for the review will be charged at fifty ($50) dollars per hour at the time the permit is issued. For single family homes, this fee is included as part of the planning site plan review fee.

H. Prior Approvals.

If a project requires approval from the Development Review Board, the City Council, the Board of Adjustment or approval of a plat, the native plant permit shall not be issued until all necessary prior approvals have been issued by the above mentioned boards and council. This includes single family homes going thorough these processes. The native plant permit for all single family custom homes will be issued concurrent with the building permit.

I. Permit Fee.

At the time a permit is issued, a fee of twenty-five ($25) dollars plus one ($1) dollar for each native plant to be removed, relocated, or destroyed; shall be paid to the City. An

Administrative Fee of seventy-five ($75) dollars will also be added to the cost of each permit.

J. Field Walk.

Once the submittal has been made for commercial development, plats, and miscellaneous projects, City staff will schedule a field walk to verify inventory accuracy and plant location in relation to the project design. For single family homes, this review may be done at the time of the Preliminary Site Inspection after the permit has been issued.

* Items not required for individual single family custom-built homes.

7-403 REVIEW CRITERIA

In conformance with Section 7.503 of the Scottsdale Zoning Ordinance, no native plant program shall be approved until it has been demonstrated that the following criteria have been considered:

A. Density/Intensity of Development.

The density/intensity of development for the approved land use shall be an important element in the determination of the base requirements for plant retention and salvage. The proposed Relocation Program shall provide reasonable plant salvage, protection, and storage; and shall ensure consistency with existing neighborhood character.

B. On-Site Natural Amenities.

The site plans shall be designed to protect and incorporate significant on-site natural amenities (i.e. aesthetic, unique, historic, etc.) These relationships shall promote and enhance the character of the native environment rather than contrast with or domesticate it.

C. Plant Inventory.

A vegetation inventory and analysis shall provide a clear comprehensive overview and listing of plant material, their condition, and their physical relationship on-site so as to aid the site planning and determination of plant salvageability.

D. Revegetation and Natural Density.

A conceptual analysis and design of the site revegetation and/or landscaping shall ensure that the character of the project is consistent with the natural density, distribution, and maturity of the vegetation on the adjacent properties.

E. Excess Plants.

Should the conceptual analysis design reveal an excess supply of on-site salvageable plants, the relocation program shall propose alternative projects within the city where the salvaged plants may be relocated.

F. Incorporation of Plants in a Project.

Incorporation of plant material into site design shall take into consideration the following:

1. Conditions where protected plants should remain in place:

   a. Along natural washes where exposed roots, erosive soils, and steep slopes often make relocating plants difficult.
   b. Where dense massing of plant materials provides an aesthetic setting, but individual plants may be unsalvageable.
   c. In boulder outcroppings where digging out the root ball would be impractical.
   d. Where unstable soils decrease the ability of the root ball to hold together.
   e. Large specimen material which does not lend itself to relocation.
   f. When seasonal conditions reduce the salvageability rate to the point of making relocation undesirable.
   g. When plants occur in a unique grouping or form.
   h. When plants are located within designated scenic and vista corridors.
   i. Within land use buffers.

2. Conditions where protected plants may be relocated

   a. When retention of protected plant material is impractical due to reasonable construction, physical conditions which are good, and plant material which falls within the construction boundaries.

3. Conditions where protected plants may be removed from the site:

   a. When the density allowed on a site is high with minimal areas for placing plant material back on the project
   b. When conditions yield more plant materials than can be used back on the project.

In these cases, it is anticipated that part of the native plant program will include making the excess plant material available to other projects or interested salvage contractors, preferably for use within the city. In order to remove any protected plant material from a site, the persons removing the protected plants shall submit to the City Manager or his designee a plan demonstrating that one or more of the conditions noted above exists, and that all State of Arizona requirements have been met.

4. When protected plant materials may be destroyed:

a. When the physical condition of a protected plant is poor due to disease, infestation, mutilation, age, or poor natural conditions; and it is located within the construction boundaries.
b. If a protected plant is involved in a safety issue and it cannot be relocated, removed, or protected in place.

G. Additional Information

In addition to the criteria mentioned above, other items which may be requested to ensure compliance with the Scottsdale Zoning Ordinance as follows:

1. Topographic map with contours at a minimum of five (5) feet intervals to show steep slopes.
2. Identification of natural features such as bedrock and boulder outcroppings.
3. General information on the soil types which exist on the site.
4. Drainage patterns of all washes carrying fifty (50) c.f.s. or greater.
5. Zoning of all adjacent properties.
6. Location of all dedications and easements both on the property and adjacent to it including, but not limited to: Natural Area Open Space easements, drainage easements, right-of-way dedications, etc.
7. Proposed site plan as it relates to all of the above and including, but not limited to the following:

a. Street alignments
b. Driveways locations
c. Areas to be revegetated.
d. Parking areas

7-404 INSPECTIONS

The following inspections shall be made by City staff during the permit review process and the construction of the project:

A. Field Walk

The field walk is part of the first review of the Native Plant Program for commercial developments, plats, and miscellaneous projects. For single family homes, the field walk is part of the Preliminary Site Inspection. The purpose of the field walk is to verify the accuracy of the native plant inventory and to identify other items that may allow for the greatest preservation of protected plant material.

B. Preliminary Site Inspection.

A Preliminary Site Inspection (#42 Pre-Site Inspection) shall take place once a Native Plant Permit has been issued, but prior to the commencement of any salvage activities. At the time of this inspection, the applicant must present the copy of the approved Native Plant Program stamped “Planning Inspectors Copy”, and a copy of the permit. A permit inspection card, also issued with the permit, shall be posted on the site at all times.

C. Nursery Inspection

The Nursery Inspection is to assess the actual results of the relocation process. It is to take place one to two weeks after the last of the relocated plant materials have been placed in the nursery. The plant ID number from the inventory list shall be clearly marked on the box or plant. The inspection shall be arranged with the Inspection Services Division by calling (480) 312-5750.

D. Native Plant Tracking Form.

The purpose of the Native Plant Tracking Form, (see Figure 7.4-3 of this manual) is to track the overall success ratios of protected plants that have been salvaged. These numbers are being quantified as part of the City of Scottsdale’s Sustainability Indicators Project. The tracking form may be submitted to the Planning Inspector. Any project which requires a native plant permit needs to submit a tracking form. The tracking form must be submitted within three months from the commencement of salvage operations and prior to the issuance of the Certificate of Occupancy.

E. Final Inspection.

This inspection is to verify the ultimate location of relocated plant material and should be done in conjunction with final inspections for receiving the Certificate of Occupancy by calling (480) 312-5750.

7-405 ACTION ON APPLICATIONS

Upon submittal of an application for a Native Plant Permit, City staff may take one of three courses of action:

1. The application may be approved and the permit issued.
2. The application may be approved with conditions and the permit issued.
3. The application may be denied with conditions for approval.

Action taken on an application may be appealed to the Development Review Board in conformance with the procedures in Section 7.500 of the Scottsdale Zoning Ordinance. Submittals that are not acted upon within one year, will be purged from the system and any fees paid will not be refundable.

QUESTIONS AND ANSWERS

The following are answers to questions which are commonly asked about Native Plant Programs and Inventories:

A. What is a Native Plant Inventory?

The Native Plant Inventory is the identification of all native plants on a site protected by the Native Plant Ordinance. It is to contain, but is not limited to, the following items:

1. An aerial photograph with site plan overlay showing the location of all protected native plants within the proposed construction boundaries and within a fifty (50) foot buffer extending parallel to the boundary lines. These plans shall have a minimum scale of one inch equals fifty feet (1" = 50').

2. An inventory list, usually on 8 ½" x 11" sheets, identifying the species, size, general condition, and salvage status information for each specific plant located on the aerial photograph or site plan overlay noted above.

a. The species shall be listed by both botanical and common names.
b. The size of trees shall be in caliper inches and the size of cacti shall be in feet of height
c. General condition of the plant shall identify the salvageability of each specific plant. If a plant is not considered salvageable, the reason for the determination is to be noted.
d. Salvage status shall indicate what is going to happen to that plant – if it is to remain in place, to be relocated, or to be destroyed.

B. What standard is used to measure a tree's trunk diameter?

In order to measure the trunk of a tree, it must first be determined whether the tree is a single-trunk or a multi-trunk tree.

1. A single trunk tree shall mean a tree with a single trunk protruding above grade attached to a single root ball. The diameter of single-trunk trees shall be

measured at a point twelve (12) inches above grade. If the tree starts to branch out before that point, the measurement shall be taken at the point where the branching begins.

2. A multi-trunked tree shall mean a tree having more than one trunk, two of which are three (3) inches or greater in diameter, protruding above grade from a single root ball and being separated by any portion of each. Multi-trunk trees shall be measured by the following method:

a. Square the diameter of each trunk
b. Add the squared diameters of all the trunks together
c. Take the square root of the total above to give you the working diameter for that tree

Measurements shall be taken prior to any pruning or branch removal operations and must take into account the entire base of the tree.

C. How is the height measured for a cactus?

A cactus is measured from the base at grade to the highest vertical point of the plant. The height of all arms is also included in the total. Ocotillo and Yucca are also measured in this way, except that the flower stalk of the Yucca is not included.

D. What is meant by tagging native plants?

Tagging native plants is the means by which each protected plant is identified and its salvage status is noted as follows:

1. A number is to be assigned to each specific plant. This number will identify that plant throughout the course of the project.

2. The number assigned to a given plant shall be visible on the plant or plant container at all times.

3. The salvage status of each plant shall be noted by the use of the following color code system

a. Plants to be destroyed shall be tagged with blue survey tape
b. Plants to be salvaged and relocated shall be tagged with red survey tape
c. Plants to remain in place shall be tagged with white survey tape

E. What should be inventoried and tagged?

The Native Plant Inventory is to include all plants of the types and sizes listed in Section 7-401.B.5 of the guidelines and Section 46-105 of the Scottsdale Revised Code (botanical name governing). The areas to be inventoried are as follows:

1. Everything within the designated construction boundaries, to include any areas required for access to the construction site – vehicular access, utility access easements, etc.

2. Everything within a fifty (50) foot buffer area parallel to the boundaries of the actual construction boundaries, up to the property lines.

3. Any other areas which are determined by City staff and the applicant to be of concern.

F. What can be done to the protected plants prior to obtaining a Native Plant permit?

No disturbance of any protected plants may occur prior to being issued your native plant permit. For prior approval of pruning, you may contact the Planning Inspector for the project at (480) 312-5750. Excessive pruning may be deemed mutilation as defined in Section 7-401-B.5 of these guidelines and Section 46-105 of the Scottsdale Revised Code.

G. Can I just destroy the protected plants and replace them with more and better materials?

For plant materials which have been determined by an approved salvage contractor to be salvageable, the answer is no. If a large number of the plant materials on a site are determined to be unsalvageable, a replacement program may be submitted as part of the Native Plant Program. The intent of a replacement program should be to provide a variety of plant types and sizes to match what exists in the surrounding desert community. The quantity of trees to be used in the replacement program shall be determined by City staff and the applicant, and will be based on the total number of trees and the total caliper inches being destroyed in relationship to what would be salvaged under normal conditions.

H. What is a field walk and how do I arrange one?

The field walk is performed by City staff. Its purpose is to verify the accuracy of the Native Plant Inventory; to check the actual location of plant material in the field; and to check their physical relationship to the construction limits to determine any additional plants that may remain in place. The field walk is typically set up within two weeks from the time of receiving a complete submittal

from Development Services. The applicant or a representative need not be present, but if you wish to be, you can contact the City's Project Review Department at (480) 312-7080.

I. Why do I have to indicate the location of a nursery site, and what is that inspection for?

The nursery site is identified to assure as little disturbance to the site as possible. The inspection of the nursery site is to verify the results of the Native Plant Program and should be done when all the plants being relocated have been placed in the nursery; on larger projects, this may be completed in phases. Inspections can be arranged with the individual inspector from the Inspection Services Department assigned to your project. Their number will be listed on the permit.

J. Why must a salvage contractor be approved by the City?

Standard methods for relocating plants have needed to be adjusted and fine tuned to work with the native plants of the Sonoran Desert. It has only been within the past two decades that methods have been developed which yield reasonable salvage rates on native trees. For this reason, the City has required that salvage contractors submit their methodologies for review and approval. New technology and refinements can be submitted for review and used on a trial basis until shown to be as effective or superior to the existing methods.

K. How does someone get on the City's list of approved salvage contractors?

To become listed as an approved salvage contractor with the City of Scottsdale, a person or company must submit a methodology outlining step-by-step procedures used to relocate and maintain protected native plant materials. This may be submitted to the City Manager's designee within the Project Review Division of the Community Development Department for review and approval. Prior to approval of a methodology, the salvage contractor must present a valid City of Scottsdale Privilege Tax License number. You may receive information on obtaining a Privilege Tax License number by calling (480) 312-2400.

L. Who can prepare a Native Plant Inventory?

Anyone who has been approved as a salvage contractor may prepare a Native Plant Inventory. Any inventory work that is done by an individual or company that is different from the company that is doing the salvage work must also include a formal letter from the approved salvage contractor stating their acceptance of the plant inventory. Changes to an approved native plant

program will not be accepted by the Planning Inspector and will be returned to Project Review for re-approval.

M. What about salvaging the plants that are not protected by the Native Plant Ordinance?

The City of Scottsdale strongly encourages the salvage and reuse of plants that are not on the protected list. Although this effort is voluntary, the city publishes a list of groups and companies who are interested in salvaging small, unprotected plants either for reuse on the same site or for purchase for use in other landscape or restoration projects. In most cases, the salvage of existing plant material is more cost effective and achieves a natural appearance in a shorter period of time.

NATIVE PLANT NARRATIVE & APPLICATION FORM

Office Use Only
_____ NP_____
Submittal Date_____
Project # _____

Project Name_____

♦ Property Address_____

Owner Name, Address & Phone #_____

_____

Proposed Salvage Contractor, Cacti Salvage Contractor, & Tax License # _____

_____

♦ Quarter Section #_____-_____

Number of protected plants to be relocated: _____
Number of protected plants to be destroyed: _____
Total number of protected plants affected: _____

Please give a brief description below of your project including estimated timing of relocation, DR or PP case number, plant nursery location, and any other relevant information:

_____

_____

_____

_____

Native Plant Permit approval is dependent upon an approved final plat or DR case number
List approval date - ❒ Preliminary Plat _____ ❒ Development Review _____

Your City of Scottsdale Project Coordinator is: _____

Please attach this sheet to your plant inventory, site plan indicating proposed improvements, plant nursery location, N.A.O.S. protection plan, letter of authorization identifying a city approved salvage contractor, and copy of AZ Dept of Agriculture's Notice of Intent to Clear Land form for a complete native plant submittal.

Return to Development Services 'One Stop Shop' for review and approval. Only complete submittals will be accepted over the counter. Do not attempt to move any plant materials prior to being issued your Native Plant Permit.

Review time will be approximately two (2) weeks from time of notice that plants have been tagged.

♦ This information is available at the City of Scottsdale Records Division - 312-2356

Figure 7.4-1

City of Scottsdale
Standards for Saguaro Salvage and Transplantation

1. Dig around saguaro leaving a minimum of two (2) feet of root out from the base and deep enough to allow for removal of a reasonable portion of the root ball.

2. Prune any shredded or damaged roots and dust with sulfur and streptomycin.

3. Planting hole should have one foot of loose native soil and be large enough to accommodate the larger lateral roots.

4. Saguaro should be re-planted at the same depth or no more than 6” deeper than its original position.

5. Mark original north orientation so saguaro may be re-planted in the same direction to reduce risk of sunburn.

6. Pack thoroughly using a mixture of native soil and sandy soil to promote root growth and better drainage.

7. After transplant, allow 2-3 weeks for damaged roots to heal before first water.

8. Water every two weeks during the first year and once a month during the second year after transplant by drip irrigation. If planted alone or within a nursery, place 4-1 gallon per hour emitters evenly spaced 2 to 3 feet from base and allow water to run for 8-15 hours per session.

9. If planted as a final location within landscaped areas, planting saguaro at least four (4) feet from small shrubs or a tree is ideal.

10. If a moat system is approved by City of Scottsdale Planning Inspection, a circular swale should be dug that is approximately one foot wide by 4” to 6” deep at center at a distance three to four feet out from the saguaro trunk. Water slowly and thoroughly twice a month for no less than two years.

11. Developer shall ensure that maintenance shall be provided for a minimum of two years from the time of placement at its final location.

12. Saguaro is established once it responds to rainfall by expanding.

13. Variations from the above process shall require approval from a City Planning Inspector.

Figure 7.4-2

Native Plant Tracking Form

City of Scottsdale Sustainability Indicators Project Data

To be completed by salvage contractor:_____

Project:_____

Native Plant Case Number:_____ DR or PP Number: _____

Plan Check Number :_____

Address:_____

Native Plant Permit Number:_____

Number of protected plants on site
Total:_____

Number of protected plants destroyed
Total:_____

Number of protected plants actually attempted for salvage
Trees:_____ Cacti:_____ Total:_____

Number of protected plants successfully surviving salvage after 3 months or prior to transplant
Trees:_____ Cacti:_____ Total:_____

Date of completion:_____

* The contractor must also provide a listing of plant tag numbers that have survived salvage operation

- **Please complete and submit to City of Scottsdale Planning Inspection at or before three months after the completion of salvage. This information will serve as the City's requirement for total number of plants surviving salvage and will be required for all projects prior to issuance of a Certificate of Occupancy.**
- **Contractor must notify the City Planning Inspector 24 hours in advance of when inventories of survived plants will be performed.**
- **No native plants will be removed from the site prior to notifying the City Planning Inspector.**

Completed forms may be mailed or hand delivered to the Planning Inspector in care of Inspection Services, 9191 E. San Salvador, Scottsdale, AZ 85258. Forms may also be faxed to 312-5704. For more information, please contact 312-5750.

Figure 7.4-3

Section 7.5

PARK FACILITIES
DESIGN STANDARDS AND POLICIES
REVISED DECEMBER 1999

CHAPTER 7
LANDSCAPING

SECTION 7.5
PARK FACILITIES

PAGE INDEX

SECTION	PARAGRAPH TITLE	PAGE
7-501	Introduction	1
7-502	Definitions A. Neighborhood Park B. Community Park C. Specialty and Regional Park	1
7-503	Location Standards A. The General Plan B. Parks Master Plan	2
7-504	Park Master Plan Development Process A. Master Plan Approval Process Steps	2
7-505	Park Design A. Development Review B. Park Development C. Sidewalks D. Playgrounds E. Softball/Baseball Fields F. Court Facilities G. Irrigation H. Landscaping I. Construction Material J. Signage K. Parking	3

FIGURE LIST

FIGURE	DESCRIPTION
7.5-1	New Building Standards
7.5-2	Custodial Room – Space and Equipment Standards

SECTION 7.5
PARK FACILITIES

7-501 INTRODUCTION

The Park Design Standards & Policies have been established to assure that Scottsdale's Park and Recreation facilities provide quality and safe experiences for its citizen's. These standards and policies are not intended to provide specific design criteria, but to serve as a guide during the design phase. The design review of each park will be done on an individual basis.

7-502 DEFINITIONS

A. Neighborhood Park: Provides primary park services and facilities which are easily accessible and available to local residents. Not intended for large group use. Typically between seven and 20 acres and serving from one block up to an entire neighborhood. Neighborhood parks are preferably located adjacent to elementary schools, neighborhood centers, or within a 15 minute walking distance of households in the service area.

B. Community Park: Provides a full range of centralized recreational activities for major portions of the City with capabilities of accommodating large group reservations. Generally feature a community center building designed to meet multi-generational recreation needs. Typically between twenty and 80 acres, serving several neighborhoods or approximately 10,000 to 25,000 people. Community parks are preferably located in the center of several neighborhoods, adjacent to a middle school or high school where possible.

C. Specialty and Regional Park: Provides specialized facilities and preserves significant unique features of the community, including environmentally sensitive areas. The size of these parks will vary as well as the specific number of people served by these parks; however, the parks should be oriented to serve the entire community and beyond. Location of park will vary depending on the dynamics of the park (e.g. park theme or mountain park).

7-503 LOCATION STANDARDS

A. The General Plan
The Public Facility Element of the General Plan for Scottsdale provides the basis for identification of the locations for the parks. A copy of the Public Facility Element is available at the One Stop Shop, 7447 E. Indian School Road, Suite 100, 312-2500.

B. Parks Master Plan – Vision 2020
The Parks Master Plan establishes park policy, delineates future park needs by acreage and facilities, and locates parks based on demographics. The Master Plan specifies standards to guide park development in Scottsdale. A copy of the Parks Master Plan can be obtained from the Community Maintenance & Recreation Division, Pepperwood Building, 7340 Scottsdale Mall, 312-2722.

7-504 PARK MASTER PLAN DEVELOPMENT PROCESS

A Master Plan is developed for each park. The Public Facility Element of the General Plan, in conjunction with the Community Maintenance & Recreation Division's Parks Master Plan – Vision 2020,help to guide the planning of facilities in each park.

A. Master Plan Approval Process Steps

1. Planning Consultant/Parks & Recreation Team

   - Prepare alternative development concepts
   - Conduct public input meetings with neighborhood and community
   - Develop Preliminary Master Development Plan for presentation

2. Parks & Recreation Commission

   - Conduct Public Hearing to review and recommend on Preliminary Park Master Plan

3. Planning Consultant/Parks & Recreation Team

   - Prepares Final Park Master Plan from Parks & Recreation Commission recommendation
   - Makes application for Municipal Use Permit to Planning Commission

4. Parks & Recreation Commission

   - Reviews and recommends to the Planning Commission and the City Council for approval of the Final Park Master Plan

5. Planning Commission

   - Reviews and recommends to City Council for approval of the Municipal Use Permit based on recommended Final Park Master Plan

6. City Council

- Review and approval of Final Park Master Plan and Municipal Use Permit

7. Approved Park Master Plan

   - End of formal public review and involvement

7-505 PARK DESIGN

A. Development Review

1. Park design must be approved by the Development Review before any development occurs on the park site.

B. Park Development

1. Park land ratio shall consist of open space (25%), passive space (25%) and facility space (50%).

2. Whenever possible, parks shall be located adjacent to school sites to create a fluid joint use between the park and school facilities.

C. Sidewalks

1. Designated multi-use paths shall be a minimum of twelve (12) feet in width. See Sections 3.4 & 7.3 of this manual for bike paths and multi-use paths.

2. Sidewalks utilized specifically for pedestrians shall be a minimum of eight (8) feet in width.

3. All multi-use paths shall be located a safe distance away from active courts or fields.

4. Concrete shall be M.A.G. “A” spec, 5” slump 3,000 psi, 6” deep or 4” deep with 6” turndowns.

D. Playgrounds

1. Playgrounds shall meet or exceed all current U.S. Consumer Products Safety Commission (CPSC), American Society of Test/Measurement (ASTM), American Disability Act (ADA) and International Play Equipment Manufactures Association (IPEMA) standards.

2. Upon completion/installation of new playground equipment, the installation shall be inspected by a third party National Playground Safety Inspector (NPSI).

3. Playground equipment/play opportunities shall be available for pre-school children (2-5 years old) and school-age children (5-12 years old).

4. Chilled drinking fountain(s) shall be installed in close proximity to the playground, but preferably not closer than 25 feet due to the problems encountered with sand. Drinking fountains shall meet ADA guidelines by having a wheelchair accessible fountain installed at 34” AFF, (measured to the deck), and a standard height

drinking fountain installed at 40” AFF. In addition, a child height drinking fountain shall be installed at 28” AFF. Drinking fountains shall not be constructed of ferrous metals whether protected by galvanization, paint or otherwise. Drinking fountains within 100 feet of playgrounds shall have assessable sand traps installed on the drains. It would be more desirable to install the drinking fountains on a building than installing free standing units. Chillers shall be located within 24” of the drinking fountains, no recirculating pumps shall be allowed. Water piping serving drinking fountains shall be copper. Chilled water tubing shall be insulated.

5. Playgrounds shall have water features for the purpose of providing water for sand castles, etc. and shall be constructed of non-ferrous metals and/or ultra violet resistant plastic. The design shall meet all playground safety standards. Water shall be provided via type L copper tubing and shall be separately valved. Faucets on the water posts shall meet ADAG for push pressure and be self-closing.

6. Public telephone(s) shall be installed in close proximity to the playground.

7. Metal playground slides are unacceptable.

8. Appropriate transfer stations, resilient materials will be installed to meet ADA access standards to playground equipment.

9. Playground surface, safety zones shall consist of a double washed premium sand, at a minimum depth of 12 inches.

10. There shall be some type of shade protection either from adjacent ramadas, (16 ft x 16 ft minimum) and/or non deciduous trees on the perimeter of the playground (30 inch box).

E. Softball/Baseball Fields

1. All fields shall be lighted to meet all current Illuminating Engineering Society (I.E.S.) standards and utilize effective shielding systems to reduce spill light off play areas.

2. Infields shall be constructed with an approved non-toxic organic binder, red color mix material especially prepared for ballfields. Material shall be a minimum of four (4) inches in compacted depth. Bind by crushed aggregate screenings down to ¼” or 3/8” fine particles.

3. Home plate and mounds shall be filled with a minimum of two (2) inches of fine grey brick clay incorporated at a uniform rate with established infield red mix. Infields and outfield turf areas shall consist of a Tif Hybrid Bermuda Grass.

4. Chilled drinking fountain(s) shall be installed in close proximity to the playground, but preferably not closer than 25 feet due to the problems encountered with sand. Drinking fountains shall meet ADA guidelines by having a wheelchair accessible fountain installed at 34” AFF, (measured to the deck), and a standard height drinking fountain installed at 40” AFF. In addition, a child height drinking fountain shall be installed at 28” AFF. Drinking fountains shall not be constructed of ferrous metals whether protected by galvanization, paint or otherwise. Drinking fountains within 100 feet of playgrounds shall have assessable sand traps installed on the drains. It would be more desirable to install the drinking fountains on a building

than installing free standing units. Chillers shall be located within 24" of the drinking fountains, no recirculating pumps shall be allowed. Water piping serving drinking fountains shall be copper. Chilled water tubing shall be insulated.

F. Court Facilities

1. All court facilities shall be lighted to meet all current Illuminating Engineering Society (I.E.S.) standards. Tennis courts should also meet United States Tennis Association (U.S.T.A.) standards.

2. All tennis courts should meet U.S.T.A. standards. Concrete courts should be considered due to extended life in a desert environment.

3. Sand Volleyball courts shall consist of Double Washed Mortar Premium Grade at a depth of twelve (12) inches.

4. Chilled drinking fountain(s) shall be installed in close proximity to the playground, but preferably not closer than 25 feet due to the problems encountered with sand. Drinking fountains shall meet ADA guidelines by having a wheelchair accessible fountain installed at 34" AFF, (measured to the deck), and a standard height drinking fountain installed at 40" AFF. In addition, a child height drinking fountain shall be installed at 28" AFF. Drinking fountains shall not be constructed of ferrous metals whether protected by galvanization, paint or otherwise. Drinking fountains within 100 feet of playgrounds shall have assessable sand traps installed on the drains. It would be more desirable to install the drinking fountains on a building than installing free standing units. Chillers shall be located within 24" of the drinking fountains, no recirculating pumps shall be allowed. Water piping serving drinking fountains shall be copper. Chilled water tubing shall be insulated.

5. Water for wetting courts shall be provided in the net standards with a Hunter series head in each standard. The source of water will be domestic and not from the irrigation system. All water piping shall be type L copper. The water shall be controlled by a system timer that allows for watering times up to 15minutes and locks out the controls for a minimum of 30 minutes between activations. Activation shall be by a 24 volt momentary contact switch mounted on a net standard or other pole.

G. Irrigation

1. Systems shall be capable of interfacing with existing Motorola Irrinet computerized central system.

2. Irrigation guidelines, except as noted below, shall comply with Section 7-104, Median Landscaping, of this Manual.

   - Irrigation pipe 2" in diameter or larger shall be Class 200.
   - All gate valves shall be AWWA C-509.
   - All irrigation boxes shall be set at grade and supported by blocks to prevent crushing by traffic.

3. See Figure 7.1-5 of this manual.

H. Landscaping

1. Plant material shall consist of low water use, drought tolerant species. Plant material shall be approved by Community Maintenance & Recreation Division staff prior to installation. See Figure 7.1-6 of this manual.

I. Construction Material

1. Park fixtures and ramadas shall consist of steel, metal, aluminum or recycled material or approved equal, wood will not be permitted. Roofing material needs to be 20 year guaranteed metal, standing seam with Kynar finish.

2. Headers consisting of concrete, brick, ultraviolet treated vinyl or metal shall be installed between turf and landscaped areas.

3. All drinking fountains installed in parks shall meet ADA guidelines by having a wheelchair accessible fountain installed at 34" AFF, (measured to the deck), and a standard height drinking fountain installed at 40" AFF. In addition, a child height drinking fountain shall be installed at 28" AFF in locations where small children may be present. Drinking fountains shall not be constructed fo ferrous metals whether protected by galvanization, paint or otherwise. Drinking fountains within 100 feet of playgrounds shall have assessable sand traps installed on the drains. It would be more desirable to install the drinking fountains on a building than installing free standing units. Chillers shall be located within 24" of the drinking fountains, no recirculating pumps shall be allowed. Water piping serving drinking fountains shall be copper. Chilled water tubing shall be insulated.

4. See Figure 7.5-1, New Building Standards, in this Manual

J. Signage

1. The standard park sign will be located at the main entrance of every neighborhood and community park. The park sign mold can be obtained from the City of Scottsdale Community Maintenance & Recreation Division.

2. Specialty parks may deviate from standard park signage with the approval from the Community Maintenance & Recreation Division. A marquee meeting the City's Sign Ordinance may be acceptable upon the approval of Community Maintenance & Recreation Division and obtaining a City sign permit.

3. All signage must meet the City of Scottsdale's Sign Ordinance. Ordinance information can be obtained at the One Stop Shop, 7447 E. Indian School Road, Suite 100, 312-2500.

K. Parking

1. All parking shall meet ADA Guidelines and the City of Scottsdale's parking requirements stipulated in the Parks Master Plan and City zoning requirements.

2. Parking lots lights shall meet all current Illuminating Engineering Society (I.E.S.) standards.

3. Non-deciduous trees (24 inch boxes minimum) shall be planted adjacent to parking lots to provide shading. An acceptable ratio is one tree per every five parking stalls.

FIGURE 7.5-1

GENERAL COMMENTS

This section deals with facilities constructed for the City of Scottsdale. These facilities for the most part serve to conduct the City's business or for the use of the citizenry. The reason for this section is to assure that the City constructs facilities that perform as expected, are able to be maintained at reasonable cost and use components and systems that are based on life cycle costs among other criteria.

It is understood that a building may be constructed using thousands of items. We will only highlight a relatively few in this guide.

Facilities Management will expect new construction documents to call for the use of these items or types of systems.

FACILITY TYPES

General Use Buildings:

Office Buildings
Libraries
Recreation Centers
Solid Waste Transfer Stations
Water Reclamation Plants
Maintenance & Warehouse Buildings

Vandal Resistant Facilities:

Park Restroom Facilities
Public Transit Facilities
Park Ramadas
Parking Lot Shade Structures

Miscellaneous Structures:

Bike Path Tunnels
Bike Path Drinking Fountains
Bike Path Lighting and Controls

PLUMBING

PIPING

DRAINS:

- Cast iron soil pipe.
- ABS DWV pipe when permissible by code.

VENTS:

- Cast iron soil pipe.
- ABS DWV pipe when permissible by code.
- Vandal resistant vent caps to be installed at vandal resistant facilities.

SEWER:

- ABS DWV schedule 40 pipe.
- PVC SDR pipe 6” and above.
- Yard clean out to have threaded cap below cast iron sewer traffic cover with concrete apron. 12” x 12” square.
- Clean outs to be located every 90 feet. Horizontal length.
- Clean outs in concrete shall have nickel bronze covers.

DOMESTIC WATER:

- Type “L” hard drawn copper above ground.
- Type “L” soft drawn or hard drawn below ground outside of buildings.
- Type “K” soft drawn below ground under buildings (only where necessary).
- Yard piping - Type “L” copper. 1-1/2” and larger shall be silver soldered. PVC is not permissible.
- Pressure regulator required on all City of Scottsdale buildings. Watts U5B
- All branch lines to be valved when possible.
- Valves to be full port ball valves through 2”. 2-1/2” and larger to be butterfly valves with worm gear operator.
- Underground valves up to 2” shall be brass with rectangular operating stem.

SOLDER:

- To be lead free.
- Flux to be non-acid and joints to be wiped clean.

FIXTURES

WATER CLOSETS:

- Top spud, wall mount, siphon jet, elongated bowl with flushometer valve and white solid plastic seat.
- When tank types are required for reduced water piping size, they should be of the “Flushmate” flushometer design, 1.6 GPM. Eljer tank type is not permissible.
- Closets to be hung on approved carriers.

URINALS:

- Wall hung, top spud, blow out type.

LAVATORIES:

- Counter top lavatories shall be enameled cast iron with stainless steel rim or Bradley Terreon solid surface material.

- Wall hung lavatories shall be enameled cast iron with Eljer Bucknell #052-0197 or equal lugs for exposed arm carrier.

SINKS:

- Minimum 18 gauge stainless steel, Eljer ADA, kitchen sinks to be four hole with fourth hole plugged if not used initially. Brass body basket strainer Dearborn #16 or equal.
- Mop sinks - Floor type Fiat #2424. Faucet to be Chicago #897 with integral stops, vacuum breaker and wall support. Provide splash shields on walls adjoining mop sink.

DRINKING FOUNTAINS:

- Drinking fountains should be wall hung stainless steel, or solid surface material.
- Fountains should have rounded edges.
- Bubbler heads shall be metal - no plastic or rubber parts.
- Must have adjustable stream height regulator.
- Epoxy coated steel drinking fountains are not acceptable. Please submit for approval.
- Fountains with non-approved materials, i.e., lead aluminum, steel in contact with water are not acceptable, including aluminum drain parts. Please submit for approval.
- Chillers to have HF134a refrigerant.
- All City of Scottsdale drinking fountains should be chilled and at least one at each location wheelchair accessible. ADAG requires min. 2 fountains @ each location. Second fountain to be mounted @ 40" AFT. If site is where children may gather, i.e., parks, libraries, etc., a third fountain should be mounted at 28" above finished floor.
- Remote chillers shall be located within 3 feet of drinking fountains.
- Outdoor fountains to have remote chillers.

FAUCETS:

- Lavatory--Faucets to be single handle of cartridge design Moen #8470.
- Kitchen--single handle cartridge type (prefer Moen #7300).
- Bar sink--single handle cartridge type (prefer Moen #4901).
- Mop sink--chrome plated, wall mount, with integral stops, vacuum breaker and hose threads (prefer Chicago #897).
- Showers--pressure balanced with integral stops (prefer Moen #8350).
- Wall hydrants to be Acorn 8000 series or Woodford Model B24.
- Hose bibbs to be Woodford 24P - 3/4".

TRIM:

- Exposed traps to be 17 gauge with clean out and chrome plated brass slip joint nuts.
- All exposed tubular to be 17 gauge. All slip joint nuts to be brass.
- Extensions of exposed tubular shall be made with solder joint extensions.
- Angle stops to be Aqua-flo EZ turn ball valves #V-101-A.
- Concealed traps and tubular may be constructed of ABS or PVC.
- Supply tubes to be chrome plated nose formed type. Corrugated tube is not acceptable.
- Clean out covers and screws shall be stainless steel or chrome plated bronze with stainless steel screws.
- Disposer to be commercial grade 3/4 h.p. - lse 333ss Pro.
- ADA trap covers to be Trubro.

PUMPS:

- Circulating pumps shall be magnetic drive close coupled pumps. Prefer Grundfos 42-18 SU,with thermo switch.

- Storm water sump pumps shall have separate receiving basin to catch solids. Prefer Myers vortex type pump.
- Sewage ejectors shall be submersible Vortex type, packaged duplex systems with fiberglass tank, mercury float switches, check valves and controls by same manufacturer. Prefer Myers, Tornado series.

TRAP PRIMERS:

- Should be of type that is piped off of water closet flush valve (concealed type that operate on drop in pressure rarely work). Prefer Sloan #F-72-A1.
- Trap primers not located near a flush valve shall be operated by electric timer.

FLOOR DRAINS:

- Floor drains shall have nickel bronze grate with standard screws (no vandal resistant screws).
- Floor drains to have removable sediment bucket in vandal resistant areas where debris may accumulate.

ALL BACKFLOW PREVENTORS:

- To have bronze strainers installed upstream.
- Install 1/4" flare fittings with flare caps in all test cocks.
- Install per City of Scottsdale standard detail.
- Provide insulated cover on outdoor free standing backflow preventors, hot box or equal.

ON HVAC SYSTEMS:

- Where a single backflow preventor feeds 2 or more areas such as a cooling tower and a chilled water loop, dual checks with unions shall be installed on each to prevent water from one area flowing to another area. Prefer Watts #7, suffix U or equal. See drawing attached.

ALL FIRE SYSTEMS:

- Require a double check valve in accordance with City of Scottsdale's Backflow Ordinance #2346, unless entire system is of potable piping and fittings.

TELEPHONE AND EMERGENCY EQUIPMENT:

- Requiring cooling 24 hours a day, have separate independent back-up cooling units, under energy management control.

DOORS AND HARDWARE - EXTERIOR

STANDARD SWING TYPE: (Hollow metal)

- Door and frame with Roton hinge.
- Surface mounted closer - L.C.N. 4040.
- Use commercial heavy duty locksets with all metal structural and operating parts. They must accept the City's "Best" removable core keying system with 626 finish.

STANDARD SWING TYPE: (Aluminum frame with glass)

- Medium style.
- 10" bottom rail.
- Welded inner joints.
- Closer, surface mounted - suggest L.C.N. 4040.
- Lockset to accept the City's BEST removable core system, and to have all metal internal parts.

- Hinge - center hung, overhead concealed pivot.
- Panic bar, surface mounted only. (Von Duprin or equal)
- Opening size to meet ADA.
- Thresholds, weather seals, kick and push plates, door stops and wall bumpers to be included as standard equipment.

AUTOMATIC DOORS:

- Swing type door - Dor-O-Matic Astro swing or equal.
- Slider/Bipass - Dor-O-Matic Astroslide or equal.
- Sensor type - Door-O-Matic Astro-Scan or equal - no floor pads.
- Commercial lockset with “Best” removable core with 626 finish.
- Keying to match the City’s “Best” system with 626 finish.
- If building has emergency generator, automatic doors should be on generator back-up.

OVERHEAD DOORS:

- Motor and hand chain operated with a keyed switch for exterior access.
- Coiling – Commercial duty.
- Sectional - commercial duty.
- Operator type - electric.

SECURITY FOR LIMITED ACCESS:

- Key pads to be compatible with the City’s Hirsch system.
- Sequencers for the master key are to be provided in all new buildings.
- Locks/keys must match the City’s Best removable core system.

AUTOMATIC TRAFFIC CONTROL ROLLING GATES:

- Power operator shall utilize electric motor and hydraulic drive.
- The gate shall utilize V-groove steel wheels that follow an inverted angle iron track set in a concrete footing.
- Keypad to control access must be compatible with the City’s “Hirsch” system.

BATH PARTITIONS:

- Bath partitions to be solid plastic. Santana, Light Blue or equal in office buildings.
- Handicapped accessible per current code.

RESTROOM ACCESSORIES:

- JRT Junior Toilet Paper Dispensers for Parks; Scott #0956-4 stainless steel.
- Nice Touch plastic soap dispensers #380143; white; for office/nicer public facilities; Waxie Janitorial Supply.
- Sanitary napkin machines to be “Bobrick” model B-2800, surface mount or B-3500 recessed mount, with 25 cent coin mechanisms.
- Toilet seat covers without lock; surface mount; Bobrick #B-221; for areas not needing security; AZ Washrooms.

CEILING TILE:

- Lay in tile shall be 2’ x 2’ tegular edge Armstrong 704-A.

CITY OF SCOTTSDALE
HVAC & R SPECS

Part 1: General

The provisions of these standards regulate the design of the mechanical systems. Emphasis is to be placed on system efficiency, energy, and water conservation, economy of maintenance, and utility expense to minimize life-cycle costs.

It shall be the responsibility of the consulting engineer to secure all as-built drawings and to make field inspections, as required, and to obtain all information needed for the work.

A. Provide (residential) (commercial) mechanical systems including:
- (Heating) (Cooling) (heating and Cooling) system.
- (Hot air duct) Hot water baseboard) Heat pump) system.
- Fans, sheet metal work, registers, grilles and diffusers.
- Piping distribution system and insulation.
- Humidification systems.
- Temperature controls.
- Testing, adjusting and balancing.

A. Modify, relocate and extend existing service to accommodate new work. Relocate existing components as required for new system.
B. Coordinate with Owner's room uses to provide adequate system for all contract area.
C. Coordinate location of mechanical systems to avoid interference with location of other systems, including piping and lighting fixtures.
D. Do not cut structural elements without prior written approval.

Part 2: Submittals

A. Submit for approval product data, operating and maintenance data, balancing reports and record documents.
B. Submit signed and sealed shop drawings for review and as required for building permit.
C. Prior to the completion of a project, at least 4 sets of maintenance manuals, operating manuals, parts manuals, as-built and shop drawings of all equipment covered in this section shall be submitted to the city, with one set specifically to the H.V.A.C. team.

Part 3: Quality Assurance

A. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use journeyman level installers with universal certification for proper refrigerant usage. Delivery, handle, and store materials in accordance with manufacturers instructions.
B. Arrangement of systems indicated on the drawings is diagrammatic, and indicates the minimum requirements for mechanical work. Site conditions shall determine the actual arrangement of systems. Take field measurements before fabrication. Be responsible for accuracy of dimensions and layout. Overhead ductwork shall be laid out to obtain maximum head room.
C. All installations shall be designed for total system energy efficiency and conservation. HVAC systems should be designed based on a life-cycle cost analysis. A comprehensive energy study shall be performed for all buildings 10,000 sq ft. or more, using computer simulation programs such a TRACE, DOE2, or others approved for use by the federal government. The computer simulation program shall be used to perform the energy analysis and evaluation of alternative building methods, materials, orientations, lighting and HVAC systems. A diversity factor will not be calculated into the sizing of HVAC equipment to eliminate the down sizing of the equipment.
D. All systems shall be designed so that they are easily adaptable to the future growth of the facility.
E. All design considerations shall comply with ASHRAE standards.
F. Exterior design conditions:
   Outdoor design temperatures shall be:
   Summer-120 degree F Dry Bulb, 76 degree F Wet Bulb
   Winter-34 degree F Dry Bulb
G. Interior design condition:
   Cooling-72 degrees F Dry Bulb
   Heating-74 degrees F Dry Bulb
   Evaporative cooling – 1 air change/2 minutes
H. No equipment, piping, hangers, ducting, or electrical will be abandoned in place. All Unused equipment will be removed.

Part 4: Products/Materials

A. Piping: Schedule 40 seamless black steel, ASTM A 53, Grade A;
B. Type L copper pipe ASTMB 68 **No PVC at all**.
C. Where a single backflow preventor feeds 2 or more areas such as a cooling tower and a chilled water loop, dual checks with unions shall be installed on each to prevent water from one area flowing to another area. Prefer Watts #7, suffix U or equal.

Part 5: Component Standards

In large systems (10 tons or more), utilize several small units.

In larger systems (100 tons or more), when a single unit is called for, utilize high efficiency, multiple-compressor, water-cooled chiller.

All equipment to be rated at Air Conditioning and Refrigeration Institute's (ARI) conditions.

- Unitary air conditioners and heat pumps should be selected based on SEER (units less than 5.4 tons) and EER (units over 5.4 tons) ratings. SEER rating should be a minimum of 13.0 and EER rating should be a minimum of 12.
- Chillers should utilize HFC refrigerants. Chillers should not exceed consumption of 0.56 kw/ton (100% full load in accordance with ARI standards).

- All electric motors exceeding 1,000 operating hours annually shall be energy efficient and shall have minimum acceptable nominal efficiency for single speed motors as specified below. Energy efficiency rating must be made using testing methodology IEEE-112, Test Method B.

HP	Min. Rated EFF (%)
1-4	84.0%
5-9	89.5%
10-19	91.5%
20-49	92.8%
50-99	94.1%
100-124	94.5%
125 & Greater	95.0%

Placement of Equipment

- To minimize safety hazards and to provide for ease of accessibility for maintenance and repair, major air conditioning and heating equipment components (compressors, air handlers, heaters, etc.), shall not be located in areas immediately above hard ceilings. If design suggests that major equipment be located in hard ceiling areas, approval of the HVAC team is required. In all cases, an adequate permanent work platform shall be provided for maintenance functions.
- Roof-mounted equipment must be curbed. Roof-mounted equipment shall not be located closer than six feet from roof edge. Safe access must be provided for all roof-mounted equipment.
- Equipment may not be placed in a space in such a manner that the maintenance, repair, removal of the equipment requires and alteration to the doorway, roof, ceiling, floor, wall or adjacent equipment.
- Multi-storied facilities shall be designated with a minimum of one air handler per floor.
- Central air distribution is to be accomplished by variable air volume systems with variable fan speed rather than constant volume systems for the same system static pressure. (This approach reduces energy use during part load conditions and takes advantage of each zone's operational characteristics).
- Consider economizer cycle (free cooling) by using "plate & frame" heat exchanger for systems with cooling tower capacity exceeding 100 tons and energy management and temperature control system (EMTCS) for automated valve control.
- Avoid multi-zoned packaged air conditioning units.
- Evaporative cooling shall be evaluated and installed where practical. Evaporative coolers shall utilize Celdek/Glasdek pad media, or approved equal, with a minimum thickness of 8 inches.

Air Distribution System

- Air shall be supplied to the occupied space by low-velocity ducts.
- To minimize air circulation fan horsepower, ductwork shall be designed for the lowest practical total pressure drop.

Small Buildings (Up to 25 tons)

- Packaged and split heat pump and a/c systems with a S.E.E.R. rating of 13.0 or higher with economizers.
- Gas fired furnace.

- All units to be ground mounted when possible.
- Sight glasses to be installed on all split systems.
- All units should have access from and be installed so they may be maintained without the use of ladders.

Medium Buildings (25-100 tons)

- Air cooled high efficiency package chiller units.
- Reciprocating or Scroll compressors.
- Gas fired boiler (heating) (Parker, Cleaver-Brooks or Unilux.)
- Fan powered V.A.V. boxes
- Four pipe system or Central air handling station with V.F.C. and hot water coil in fan powered V.A.V. box.
- All outdoor units to be ground mounted when possible.
- Sight glasses to be installed on all split systems.
- All units should have access from and be installed so they may be maintained without the use of ladders.

Large Building (100 tons and Up)

- High efficiency chiller
- Screw or Centrifugal compressor shall have open drive motors using V.F.D.
- Gas fired boiler (heating)
- Fan powered V.A.V. boxes
- Four pipe system or Central air handling station with V.F.D. and hot water coil in fan powered V.A.V. box
- System shall be capable of using 100% outside air or plate and frame heat exchanger for economizer operation.
- All units to have access from and be installed on the ground floor.
- Efficiency - .65KW per ton-ARI Certified in the form of an Integrated Part Load Value (IPLV).

Pumps:

- Shall be of the back pull-out design, end suction, close coupled base mounted.
- High EEF motors.
- Isolation valves in Discharge and Suction Line.

Cooling Towers;

- Non-sprinkled dual cell.
- Plastic fill and metering devices.
- Vertical discharge, propeller fan only.
- Motor out of the air stream.
- Tower shall incorporate a bypass system low ambient conditions.
- V.F.D. for periods of low load conditions

Water Treatment

- Indoor loop pot feed, engineered to size
- Outdoor open loop-solid state (Lakewood) P.H. and T.D.S. controller combination. L.M.I.
- Chemical pump and 55 gallon plastic drum

Energy Management Control System

- All buildings shall be D.D.C. micro processor capable of running in City's existing Robert Shaw software and computer.
- Robert Shaw version 11.4 as of 2/15/95.

- All buildings utilizing 50 tons or greater cooling systems will be wired to and controlled by a Siebe DMS 3500 front end with an ethernet card.

Part 5 - General:

- All installations shall conform to all national and local codes as adopted by the City of Scottsdale
- Provide “As Built” drawings on CD-Rom discs, Auto Cad format, and hard copy.
- All units shall have disconnects mounted within 6’ of units.
- Disconnects to be Heavy Duty Blade type.
- All control wiring to be routed and installed into EMT conduit.
- All seal-tight conduit shall be metal core, with metal connectors
- Flex duct limited to 6’, Foil backed
- Insulate condensate lines, condensate lines to be copper. Condensate lines shall have a union installed within 6” condensate outlet of the unit.
- No standing pilots
- Use standard size and type filters as defined by Eco Air C-35 or other local A/C filter manufacturer.
- 2” minimum thickness, pleated, filters only, with return air filter frame to ceiling mounted. Use filter grill type or equivalent and specified in submittal form.

Part 6 - Evap Coolers:

- Arvin Master Cool units are to used where evap coolers are to be installed.
- Clean Machine optional pump kits installed
- Evap cooler drains to be piped with minimum Type M cooper to floor sink or custodial sink
- Evap cooper feed to be minimum Type L cooper on roof mounted units
- There shall be a ball valve shut off at each unit.

Part 7 - Commercial Ice Machine:

- Manitowoc ice machines only
- Chillers to have HFC 134a refrigerant
- Remote mounted condensers on indoor applications
- No water cooled condensers

Part 8 - Exhaust Fans:

- All exhaust fans over 1/3 hp to be belt driven.
- All belt driven blowers to have grease zerk fittings.

Part 9 - HVAC Specs

1. Sight glasses on liquid lines of split DX systems.
2. Refrigerant piping shall be brazed using filler material meeting AWS A5.8
3. All control wiring will be run in E.M.T.
4. Split DX systems will have total refrigerant charge weighed and the number will be furnished to the H.V.A.C. crew.
5. Filter boxes shall not contain obstructions in filter tracks, screwhead, thread, rivet.
6. Only personnel with a universal certification for refrigerant recovery and handling are to be permitted to work on the refrigeration equipment for the city.
7. Have the abandoned in place materials removed before a job is started. All unused equipment related to the upgrade is to be removed.
8. After the service/install is completed contract shall “thoroughly clean area of debris that they caused.”
9. 10% of funds are to be withheld by city until job is completed to satisfaction of City Inspector and H.V.A.C. crew.

10. Techs are to have universal certification in proper refrigerant handling procedures.

FIGURE 7.5-1

GENERAL COMMENTS

This section deals with facilities constructed for the City of Scottsdale. These facilities for the most part serve to conduct the City's business or for the use of the citizenry. The reason for this section is to assure that the City constructs facilities that perform as expected, are able to be maintained at reasonable cost and use components and systems that are based on life cycle costs among other criteria.

It is understood that a building may be constructed using thousands of items. We will only highlight a relatively few in this guide.

Facilities Management will expect new construction documents to call for the use of these items or types of systems.

FACILITY TYPES

General Use Buildings:

Office Buildings
Libraries
Recreation Centers
Solid Waste Transfer Stations
Water Reclamation Plants
Maintenance & Warehouse Buildings

Vandal Resistant Facilities:

Park Restroom Facilities
Public Transit Facilities
Park Ramadas
Parking Lot Shade Structures

Miscellaneous Structures:

Bike Path Tunnels
Bike Path Drinking Fountains
Bike Path Lighting and Controls

PLUMBING

PIPING

DRAINS:

- Cast iron soil pipe.
- ABS DWV pipe when permissible by code.

VENTS:

- Cast iron soil pipe.
- ABS DWV pipe when permissible by code.
- Vandal resistant vent caps to be installed at vandal resistant facilities.

SEWER:

- ABS DWV schedule 40 pipe.
- PVC SDR pipe 6” and above.
- Yard clean out to have threaded cap below cast iron sewer traffic cover with concrete apron. 12” x 12” square.
- Clean outs to be located every 90 feet. Horizontal length.
- Clean outs in concrete shall have nickel bronze covers.

DOMESTIC WATER:

- Type “L” hard drawn copper above ground.
- Type “L” soft drawn or hard drawn below ground outside of buildings.
- Type “K” soft drawn below ground under buildings (only where necessary).
- Yard piping - Type “L” copper. 1-1/2” and larger shall be silver soldered. PVC is not permissible.
- Pressure regulator required on all City of Scottsdale buildings. Watts U5B
- All branch lines to be valved when possible.
- Valves to be full port ball valves through 2”. 2-1/2” and larger to be butterfly valves with worm gear operator.
- Underground valves up to 2” shall be brass with rectangular operating stem.

SOLDER:

- To be lead free.
- Flux to be non-acid and joints to be wiped clean.

FIXTURES

WATER CLOSETS:

- Top spud, wall mount, siphon jet, elongated bowl with flushometer valve and white solid plastic seat.
- When tank types are required for reduced water piping size, they should be of the “Flushmate” flushometer design, 1.6 GPM. Eljer tank type is not permissible.
- Closets to be hung on approved carriers.

URINALS:

- Wall hung, top spud, blow out type.

LAVATORIES:

- Counter top lavatories shall be enameled cast iron with stainless steel rim or Bradley Terreon solid surface material.

- Wall hung lavatories shall be enameled cast iron with Eljer Bucknell #052-0197 or equal lugs for exposed arm carrier.

SINKS:

- Minimum 18 gauge stainless steel, Eljer ADA, kitchen sinks to be four hole with fourth hole plugged if not used initially. Brass body basket strainer Dearborn #16 or equal.
- Mop sinks - Floor type Fiat #2424. Faucet to be Chicago #897 with integral stops, vacuum breaker and wall support. Provide splash shields on walls adjoining mop sink.

DRINKING FOUNTAINS:

- Drinking fountains should be wall hung stainless steel, or solid surface material.
- Fountains should have rounded edges.
- Bubbler heads shall be metal - no plastic or rubber parts.
- Must have adjustable stream height regulator.
- Epoxy coated steel drinking fountains are not acceptable. Please submit for approval.
- Fountains with non-approved materials, i.e., lead aluminum, steel in contact with water are not acceptable, including aluminum drain parts. Please submit for approval.
- Chillers to have HF134a refrigerant.
- All City of Scottsdale drinking fountains should be chilled and at least one at each location wheelchair accessible. ADAG requires min. 2 fountains @ each location. Second fountain to be mounted @ 40" AFT. If site is where children may gather, i.e., parks, libraries, etc., a third fountain should be mounted at 28" above finished floor.
- Remote chillers shall be located within 3 feet of drinking fountains.
- Outdoor fountains to have remote chillers.

FAUCETS:

- Lavatory--Faucets to be single handle of cartridge design Moen #8470.
- Kitchen--single handle cartridge type (prefer Moen #7300).
- Bar sink--single handle cartridge type (prefer Moen #4901).
- Mop sink--chrome plated, wall mount, with integral stops, vacuum breaker and hose threads (prefer Chicago #897).
- Showers--pressure balanced with integral stops (prefer Moen #8350).
- Wall hydrants to be Acorn 8000 series or Woodford Model B24.
- Hose bibbs to be Woodford 24P - 3/4".

TRIM:

- Exposed traps to be 17 gauge with clean out and chrome plated brass slip joint nuts.
- All exposed tubular to be 17 gauge. All slip joint nuts to be brass.
- Extensions of exposed tubular shall be made with solder joint extensions.
- Angle stops to be Aqua-flo EZ turn ball valves #V-101-A.
- Concealed traps and tubular may be constructed of ABS or PVC.
- Supply tubes to be chrome plated nose formed type. Corrugated tube is not acceptable.
- Clean out covers and screws shall be stainless steel or chrome plated bronze with stainless steel screws.
- Disposer to be commercial grade 3/4 h.p. - lse 333ss Pro.
- ADA trap covers to be Trubro.

PUMPS:

- Circulating pumps shall be magnetic drive close coupled pumps. Prefer Grundfos 42-18 SU,with thermo switch.

- Storm water sump pumps shall have separate receiving basin to catch solids. Prefer Myers vortex type pump.
- Sewage ejectors shall be submersible Vortex type, packaged duplex systems with fiberglass tank, mercury float switches, check valves and controls by same manufacturer. Prefer Myers, Tornado series.

TRAP PRIMERS:

- Should be of type that is piped off of water closet flush valve (concealed type that operate on drop in pressure rarely work). Prefer Sloan #F-72-A1.
- Trap primers not located near a flush valve shall be operated by electric timer.

FLOOR DRAINS:

- Floor drains shall have nickel bronze grate with standard screws (no vandal resistant screws).
- Floor drains to have removable sediment bucket in vandal resistant areas where debris may accumulate.

ALL BACKFLOW PREVENTORS:

- To have bronze strainers installed upstream.
- Install 1/4" flare fittings with flare caps in all test cocks.
- Install per City of Scottsdale standard detail.
- Provide insulated cover on outdoor free standing backflow preventors, hot box or equal.

ON HVAC SYSTEMS:

- Where a single backflow preventor feeds 2 or more areas such as a cooling tower and a chilled water loop, dual checks with unions shall be installed on each to prevent water from one area flowing to another area. Prefer Watts #7, suffix U or equal. See drawing attached.

ALL FIRE SYSTEMS:

- Require a double check valve in accordance with City of Scottsdale's Backflow Ordinance #2346, unless entire system is of potable piping and fittings.

TELEPHONE AND EMERGENCY EQUIPMENT:

- Requiring cooling 24 hours a day, have separate independent back-up cooling units, under energy management control.

DOORS AND HARDWARE - EXTERIOR

STANDARD SWING TYPE: (Hollow metal)

- Door and frame with Roton hinge.
- Surface mounted closer - L.C.N. 4040.
- Use commercial heavy duty locksets with all metal structural and operating parts. They must accept the City's "Best" removable core keying system with 626 finish.

STANDARD SWING TYPE: (Aluminum frame with glass)

- Medium style.
- 10" bottom rail.
- Welded inner joints.
- Closer, surface mounted - suggest L.C.N. 4040.
- Lockset to accept the City's BEST removable core system, and to have all metal internal parts.

- Hinge - center hung, overhead concealed pivot.
- Panic bar, surface mounted only. (Von Duprin or equal)
- Opening size to meet ADA.
- Thresholds, weather seals, kick and push plates, door stops and wall bumpers to be included as standard equipment.

AUTOMATIC DOORS:

- Swing type door - Dor-O-Matic Astro swing or equal.
- Slider/Bipass - Dor-O-Matic Astroslide or equal.
- Sensor type - Door-O-Matic Astro-Scan or equal - no floor pads.
- Commercial lockset with “Best” removable core with 626 finish.
- Keying to match the City’s “Best” system with 626 finish.
- If building has emergency generator, automatic doors should be on generator back-up.

OVERHEAD DOORS:

- Motor and hand chain operated with a keyed switch for exterior access.
- Coiling – Commercial duty.
- Sectional - commercial duty.
- Operator type - electric.

SECURITY FOR LIMITED ACCESS:

- Key pads to be compatible with the City’s Hirsch system.
- Sequencers for the master key are to be provided in all new buildings.
- Locks/keys must match the City’s Best removable core system.

AUTOMATIC TRAFFIC CONTROL ROLLING GATES:

- Power operator shall utilize electric motor and hydraulic drive.
- The gate shall utilize V-groove steel wheels that follow an inverted angle iron track set in a concrete footing.
- Keypad to control access must be compatible with the City’s “Hirsch” system.

BATH PARTITIONS:

- Bath partitions to be solid plastic. Santana, Light Blue or equal in office buildings.
- Handicapped accessible per current code.

RESTROOM ACCESSORIES:

- JRT Junior Toilet Paper Dispensers for Parks; Scott #0956-4 stainless steel.
- Nice Touch plastic soap dispensers #380143; white; for office/nicer public facilities; Waxie Janitorial Supply.
- Sanitary napkin machines to be “Bobrick” model B-2800, surface mount or B-3500 recessed mount, with 25 cent coin mechanisms.
- Toilet seat covers without lock; surface mount; Bobrick #B-221; for areas not needing security; AZ Washrooms.

CEILING TILE:

- Lay in tile shall be 2’ x 2’ tegular edge Armstrong 704-A.

CITY OF SCOTTSDALE
HVAC & R SPECS

Part 1: General

The provisions of these standards regulate the design of the mechanical systems. Emphasis is to be placed on system efficiency, energy, and water conservation, economy of maintenance, and utility expense to minimize life-cycle costs.

It shall be the responsibility of the consulting engineer to secure all as-built drawings and to make field inspections, as required, and to obtain all information needed for the work.

B. Provide (residential) (commercial) mechanical systems including:
- (Heating) (Cooling) (heating and Cooling) system.
- (Hot air duct) Hot water baseboard) Heat pump) system.
- Fans, sheet metal work, registers, grilles and diffusers.
- Piping distribution system and insulation.
- Humidification systems.
- Temperature controls.
- Testing, adjusting and balancing.

E. Modify, relocate and extend existing service to accommodate new work. Relocate existing components as required for new system.
F. Coordinate with Owner's room uses to provide adequate system for all contract area.
G. Coordinate location of mechanical systems to avoid interference with location of other systems, including piping and lighting fixtures.
H. Do not cut structural elements without prior written approval.

Part 2: Submittals

D. Submit for approval product data, operating and maintenance data, balancing reports and record documents.
E. Submit signed and sealed shop drawings for review and as required for building permit.
F. Prior to the completion of a project, at least 4 sets of maintenance manuals, operating manuals, parts manuals, as-built and shop drawings of all equipment covered in this section shall be submitted to the city, with one set specifically to the H.V.A.C. team.

Part 3: Quality Assurance

H. Comply with governing codes and regulations. Provide products of acceptable manufacturers which have been in satisfactory use in similar service for three years. Use journeyman level installers with universal certification for proper refrigerant usage. Delivery, handle, and store materials in accordance with manufacturers instructions.

I. Arrangement of systems indicated on the drawings is diagrammatic, and indicates the minimum requirements for mechanical work. Site conditions shall determine the actual arrangement of systems. Take field measurements before fabrication. Be responsible for accuracy of dimensions and layout. Overhead ductwork shall be laid out to obtain maximum head room.

J. All installations shall be designed for total system energy efficiency and conservation. HVAC systems should be designed based on a life-cycle cost analysis. A comprehensive energy study shall be performed for all buildings 10,000 sq ft. or more, using computer simulation programs such a TRACE, DOE2, or others approved for use by the federal government. The computer simulation program shall be used to perform the energy analysis and evaluation of alternative building methods, materials, orientations, lighting and HVAC systems. A diversity factor will not be calculated into the sizing of HVAC equipment to eliminate the down sizing of the equipment.

K. All systems shall be designed so that they are easily adaptable to the future growth of the facility.

L. All design considerations shall comply with ASHRAE standards.

M. Exterior design conditions:
Outdoor design temperatures shall be:
Summer-120 degree F Dry Bulb, 76 degree F Wet Bulb
Winter-34 degree F Dry Bulb

N. Interior design condition:
Cooling-72 degrees F Dry Bulb
Heating-74 degrees F Dry Bulb
Evaporative cooling – 1 air change/2 minutes

H. No equipment, piping, hangers, ducting, or electrical will be abandoned in place. All Unused equipment will be removed.

Part 4: Products/Materials

D. Piping: Schedule 40 seamless black steel, ASTM A 53, Grade A;

E. Type L copper pipe ASTMB 68 **No PVC at all**.

F. Where a single backflow preventor feeds 2 or more areas such as a cooling tower and a chilled water loop, dual checks with unions shall be installed on each to prevent water from one area flowing to another area. Prefer Watts #7, suffix U or equal.

Part 5: Component Standards

In large systems (10 tons or more), utilize several small units.

In larger systems (100 tons or more), when a single unit is called for, utilize high efficiency, multiple-compressor, water-cooled chiller.

All equipment to be rated at Air Conditioning and Refrigeration Institute's (ARI) conditions.

- Unitary air conditioners and heat pumps should be selected based on SEER (units less than 5.4 tons) and EER (units over 5.4 tons) ratings. SEER rating should be a minimum of 13.0 and EER rating should be a minimum of 12.
- Chillers should utilize HFC refrigerants. Chillers should not exceed consumption of 0.56 kw/ton (100% full load in accordance with ARI standards).

- All electric motors exceeding 1,000 operating hours annually shall be energy efficient and shall have minimum acceptable nominal efficiency for single speed motors as specified below. Energy efficiency rating must be made using testing methodology IEEE-112, Test Method B.

HP	Min. Rated EFF (%)
1-5	84.0%
5-10	89.5%
10-20	91.5%
20-50	92.8%
50-100	94.1%
100-125	94.5%
125 & Greater	95.0%

Placement of Equipment

- To minimize safety hazards and to provide for ease of accessibility for maintenance and repair, major air conditioning and heating equipment components (compressors, air handlers, heaters, etc.), shall not be located in areas immediately above hard ceilings. If design suggests that major equipment be located in hard ceiling areas, approval of the HVAC team is required. In all cases, an adequate permanent work platform shall be provided for maintenance functions.
- Roof-mounted equipment must be curbed. Roof-mounted equipment shall not be located closer than six feet from roof edge. Safe access must be provided for all roof-mounted equipment.
- Equipment may not be placed in a space in such a manner that the maintenance, repair, removal of the equipment requires and alteration to the doorway, roof, ceiling, floor, wall or adjacent equipment.
- Multi-storied facilities shall be designated with a minimum of one air handler per floor.
- Central air distribution is to be accomplished by variable air volume systems with variable fan speed rather than constant volume systems for the same system static pressure. (This approach reduces energy use during part load conditions and takes advantage of each zone's operational characteristics).
- Consider economizer cycle (free cooling) by using "plate & frame" heat exchanger for systems with cooling tower capacity exceeding 100 tons and energy management and temperature control system (EMTCS) for automated valve control.
- Avoid multi-zoned packaged air conditioning units.
- Evaporative cooling shall be evaluated and installed where practical. Evaporative coolers shall utilize Celdek/Glasdek pad media, or approved equal, with a minimum thickness of 8 inches.

Air Distribution System

- Air shall be supplied to the occupied space by low-velocity ducts.
- To minimize air circulation fan horsepower, ductwork shall be designed for the lowest practical total pressure drop.

Small Buildings (Up to 25 tons)

- Packaged and split heat pump and a/c systems with a S.E.E.R. rating of 13.0 or higher with economizers.
- Gas fired furnace.

- All units to be ground mounted when possible.
- Sight glasses to be installed on all split systems.
- All units should have access from and be installed so they may be maintained without the use of ladders.

Medium Buildings (25-100 tons)

- Air cooled high efficiency package chiller units.
- Reciprocating or Scroll compressors.
- Gas fired boiler (heating) (Parker, Cleaver-Brooks or Unilux.)
- Fan powered V.A.V. boxes
- Four pipe system or Central air handling station with V.F.C. and hot water coil in fan powered V.A.V. box.
- All outdoor units to be ground mounted when possible.
- Sight glasses to be installed on all split systems.
- All units should have access from and be installed so they may be maintained without the use of ladders.

Large Building (100 tons and Up)

- High efficiency chiller
- Screw or Centrifugal compressor shall have open drive motors using V.F.D.
- Gas fired boiler (heating)
- Fan powered V.A.V. boxes
- Four pipe system or Central air handling station with V.F.D. and hot water coil in fan powered V.A.V. box
- System shall be capable of using 100% outside air or plate and frame heat exchanger for economizer operation.
- All units to have access from and be installed on the ground floor.
- Efficiency - .65KW per ton-ARI Certified in the form of an Integrated Part Load Value (IPLV).

Pumps:

- Shall be of the back pull-out design, end suction, close coupled base mounted.
- High EEF motors.
- Isolation valves in Discharge and Suction Line.

Cooling Towers;

- Non-sprinkled dual cell.
- Plastic fill and metering devices.
- Vertical discharge, propeller fan only.
- Motor out of the air stream.
- Tower shall incorporate a bypass system low ambient conditions.
- V.F.D. for periods of low load conditions

Water Treatment

- Indoor loop pot feed, engineered to size
- Outdoor open loop-solid state (Lakewood) P.H. and T.D.S. controller combination. L.M.I.
- Chemical pump and 55 gallon plastic drum

Energy Management Control System

- All buildings shall be D.D.C. micro processor capable of running in City's existing Robert Shaw software and computer.
- Robert Shaw version 11.4 as of 2/15/95.

- All buildings utilizing 50 tons or greater cooling systems will be wired to and controlled by a Siebe DMS 3500 front end with an ethernet card.

Part 5 - General:

- All installations shall conform to all national and local codes as adopted by the City of Scottsdale
- Provide “As Built” drawings on CD-Rom discs, Auto Cad format, and hard copy.
- All units shall have disconnects mounted within 6’ of units.
- Disconnects to be Heavy Duty Blade type.
- All control wiring to be routed and installed into EMT conduit.
- All seal-tight conduit shall be metal core, with metal connectors
- Flex duct limited to 6’, Foil backed
- Insulate condensate lines, condensate lines to be copper. Condensate lines shall have a union installed within 6” condensate outlet of the unit.
- No standing pilots
- Use standard size and type filters as defined by Eco Air C-35 or other local A/C filter manufacturer.
- 2” minimum thickness, pleated, filters only, with return air filter frame to ceiling mounted. Use filter grill type or equivalent and specified in submittal form.

Part 6 - Evap Coolers:

- Arvin Master Cool units are to used where evap coolers are to be installed.
- Clean Machine optional pump kits installed
- Evap cooler drains to be piped with minimum Type M cooper to floor sink or custodial sink
- Evap cooper feed to be minimum Type L cooper on roof mounted units
- There shall be a ball valve shut off at each unit.

Part 7 - Commercial Ice Machine:

- Manitowoc ice machines only
- Chillers to have HFC 134a refrigerant
- Remote mounted condensers on indoor applications
- No water cooled condensers

Part 8 - Exhaust Fans:

- All exhaust fans over 1/3 hp to be belt driven.
- All belt driven blowers to have grease zerk fittings.

Part 9 - HVAC Specs

11. Sight glasses on liquid lines of split DX systems.
12. Refrigerant piping shall be brazed using filler material meeting AWS A5.8
13. All control wiring will be run in E.M.T.
14. Split DX systems will have total refrigerant charge weighed and the number will be furnished to the H.V.A.C. crew.
15. Filter boxes shall not contain obstructions in filter tracks, screwhead, thread, rivet.
16. Only personnel with a universal certification for refrigerant recovery and handling are to be permitted to work on the refrigeration equipment for the city.
17. Have the abandoned in place materials removed before a job is started. All unused equipment related to the upgrade is to be removed.
18. After the service/install is completed contract shall “thoroughly clean area of debris that they caused.”
19. 10% of funds are to be withheld by city until job is completed to satisfaction of City Inspector and H.V.A.C. crew.

20. Techs are to have universal certification in proper refrigerant handling procedures.

Chapter 8

Fire Protection
Design Standards and Policies
Revised December 1999

Chapter 8, Fire Protection Requirements, provides guidelines in the placement of fire hydrants, fire lanes, emergency access provisions, and building sprinkler systems.

Section 8.1

FIRE PROTECTION REQUIREMENTS
DESIGN STANDARDS AND POLICIES
REVISED DECEMBER 1999

CHAPTER 8
FIRE PROTECTION

SECTION 8.1
FIRE PROTECTION REQUIREMENTS

PAGE INDEX

SECTION	PARAGRAPH TITLE	
8-101	GENERAL COMMENTS	1
8-102	PLACEMENT OF FIRE HYDRANTS	1
8-103	FIRE LANES	2
8-104	EMERGENCY ACCESS PROVISIONS	2
8-105	BUILDING SPRINKLER SYSTEMS	2

FIGURE LIST

FIGURE	DESCRIPTION
8.1-1	Minimum Requirements for Gated Entrances to Residential Subdivisions
8.1-2	Minimum Requirements for Fire Department Turn-Arounds
8.1-3	Fire Department Siamese Connection

SECTION 8.1
FIRE PROTECTION REQUIREMENTS

8-101 GENERAL COMMENTS

Fire Protection requirements are determined by the Fire Department, utilizing the 1997 Uniform Fire Code along with the City Ordinance #3100, which amends certain section of this code. It is the intent of the Fire Department to establish requirements consistent with nationally recognized practices for the safeguarding, to a reasonable degree, of life and property from hazards of fire and explosion arising from the storage, handling, and the use of hazardous substances, materials, and devices and from conditions hazardous to life and property arising from the use or occupancy of buildings or premises.

8-102 PLACEMENT OF FIRE HYDRANTS

A. The spacing of fire hydrants is to be measured along the street or roadway in which a fire hose would be laid. Generally, this spacing is measured along the curb line.

B. The spacing of fire hydrants in developments consisting of lots with single-family residences on each lot must be no greater than 1200-feet on center when street grade is less than 9%; and no greater than 600-feet on center when street grade is greater than 9%.

C. The spacing of fire hydrants in commercial and industrial areas and in multi-family residential developments such as apartments and condominiums must be no greater than 700 feet. This spacing applies to interior, on-site locations for hydrants as well as to locations along public right-of-way.

D. Two-way, reflective, blue, raised pavement markers must be provided to identify the location of fire hydrants, in accordance with City of Scottsdale Standard Detail 2363. These markers are readily available from businesses providing highway marking materials.

8-103 FIRE LANES

After reviewing the plan for the proposed development, the Fire Department may require that fire lanes be provided around structures for fire fighting access. If fire lanes are needed, the following criteria for the lanes apply.

A. The minimum width of a fire lane is 20 feet. See Figure 8.1-1 for other lane width requirements.

B. The fire lane surface must be suitable for all-weather use, usually 2" AC over 6" ABC. Minimum 50,000 lb. gross vehicle weight.

C. The minimum vertical clearance for fire department apparatus is 13'-6".

D. The radius of the outside edge of the lane on a turn must be no less than 45-feet for commercial and 40.5-feet for residential. See Figure 8.1-2.

E. The fire lanes must be posted in accordance with the City of Scottsdale Standard Detail 2365.

8-104 EMERGENCY ACCESS PROVISIONS

After reviewing the plan for a proposed development, the Fire Department may require that an access be provided for fire fighting and emergency vehicle use in addition to the planned public access ways. Such an emergency access would normally be closed and locked, but any lock placed on an emergency access gate must be approved by the Fire Department. If a development is planned with only one public access point, the Fire Department will almost always require an emergency access to insure that an emergency vehicle can reach the interior of the development when the normal access is blocked. Emergency access ways must always be secured by an easement. City of Scottsdale Standard Detail 2364 describes the requirement for the construction and identification of emergency access ways.

8-105 BUILDING SPRINKLER SYSTEMS

The water system design must accommodate the requirement for building sprinkler systems. The following subparagraphs describe the requirements:

A. Sprinkler systems are required for:

1. All new commercial or industrial buildings (including basements).

2. All multi-family residential structures (apartments, condominiums, time-share developments, etc.).

3. All parking area structures (underground or aboveground).

4. All single-family residences constructed after January 1, 1986.

B. The remote Fire Department connection for a sprinkler system must be installed in such a manner that it is from four feet to eight feet from the back of curb of a public or private roadway. The location of the sprinkler system connection must be unobstructed and readily accessible to the Fire Department. See Figure 8.1-3 and the

lower right corner of City of Scottsdale Standard Detail 2363. This connection must also be within an appropriate distance of a fire hydrant as determined by the Fire Department.

C. Pavement markers for Fire Department sprinkler system connections must be provided as shown in the lower right corner of City of Scottsdale Standard Detail 2363.

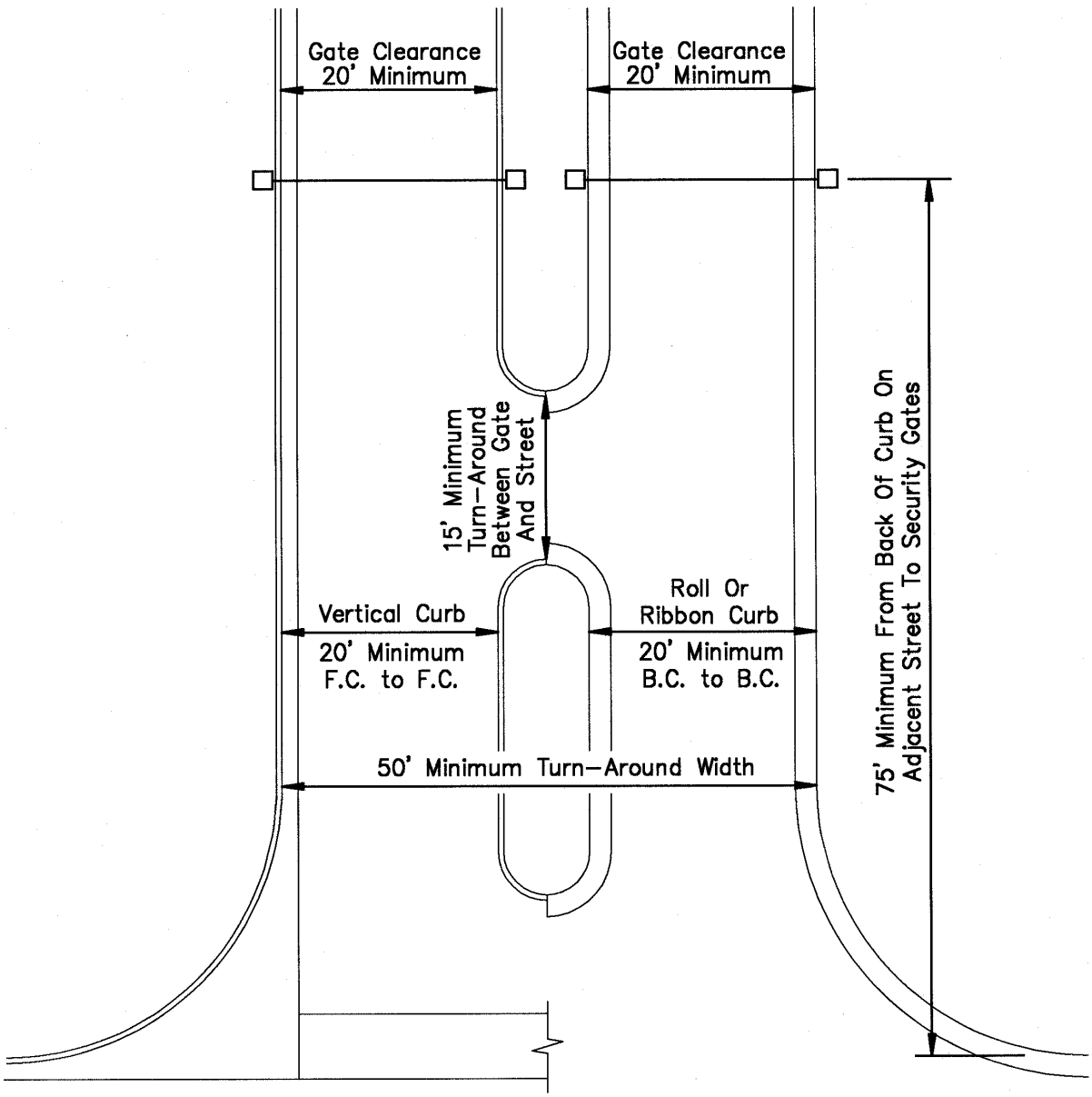
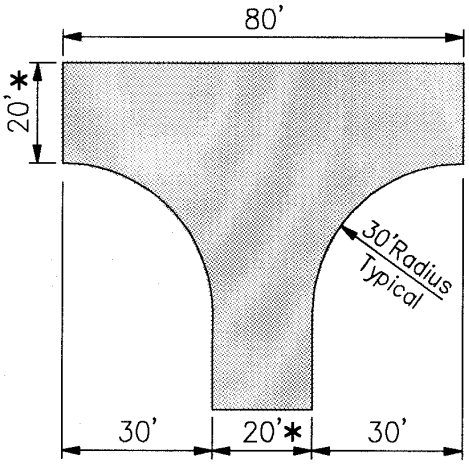
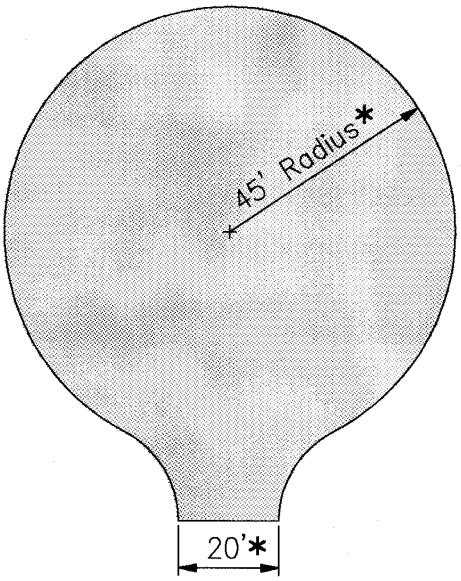


FIGURE 8.1-1

Minimum Rrequirements For Gated
Entrances To Residential Subdivisions



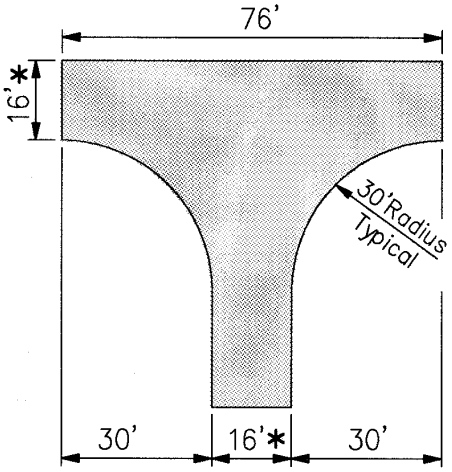
T-TYPE



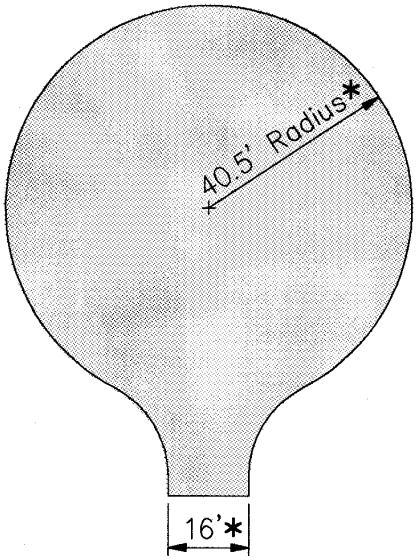
CUL-DE-SAC

COMMERCIAL

* To Back Of Curb For Roll Or Ribbon Curb.
To Face Of Curb For Vertical Curb.



T-TYPE



CUL-DE-SAC

RESIDENTIAL

FIGURE 8.1-2

Minimum Requirements For
Fire Department Turn–Arounds

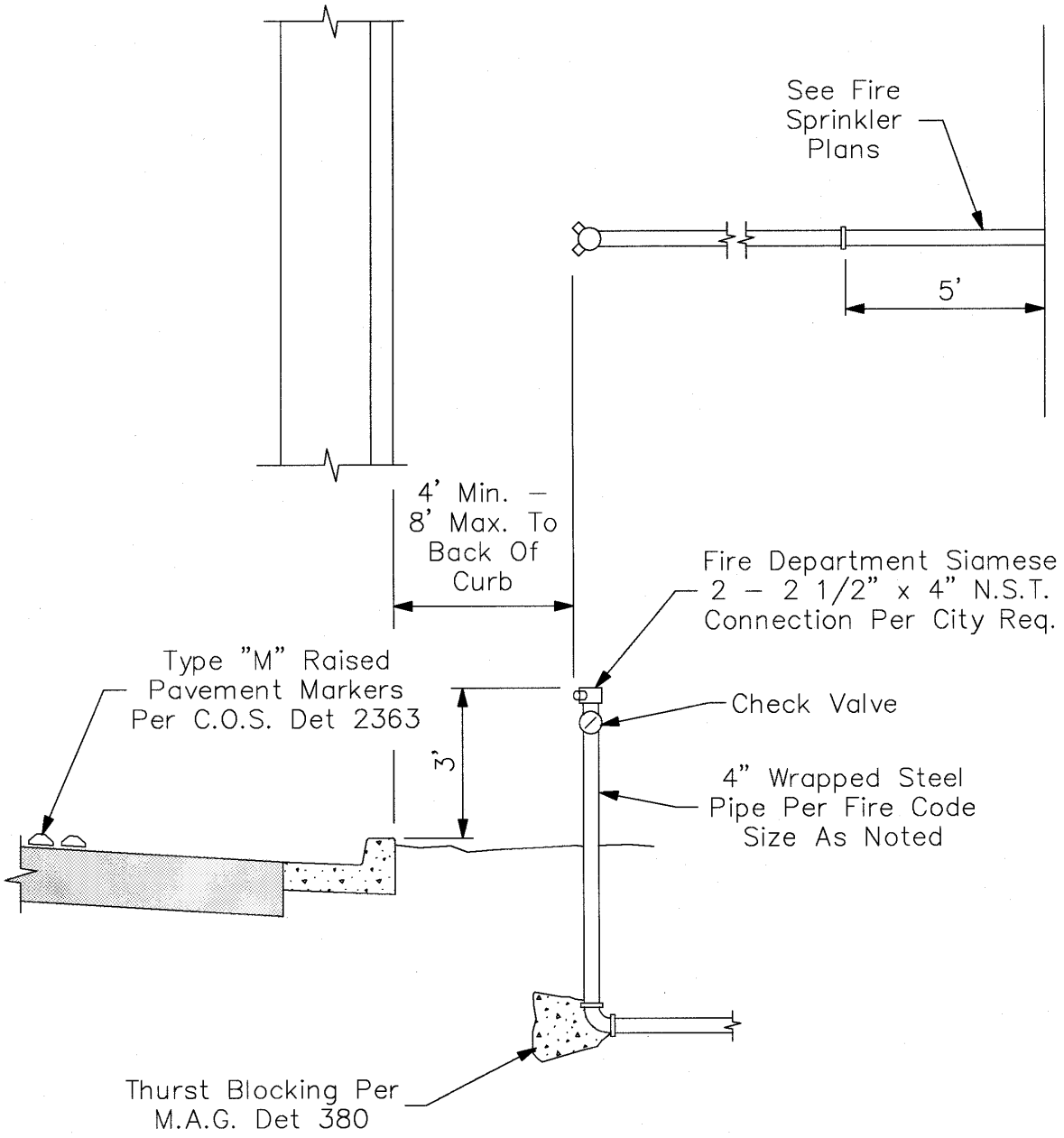


FIGURE 8.1-3

Fire Department Siamese Connection