ENGINEERING DEVELOPMENT STANDARDS (EDS)

SURPRISE
ARIZONA

August 2016

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List of Abbreviations

ADA	Americans with Disabilities Act
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
C of O	Certificate of Occupancy
EDS	Engineering Development Standards
FCDMC	Flood Control District of Maricopa County
FEMA	Federal Emergency Management Agency
MAG	Maricopa Association of Governments
MCDES	Maricopa County Department of Environmental Services
MCDOT	Maricopa County Department of Transportation
SUDC	Surprise Unified Development Code

CHAPTER 1 – POLICIES AND ENGINEERING DEVELOPMENT STANDARDS

1.1 INTRODUCTION

The purpose of the City of Surprise Engineering Development Standards (EDS) is to provide specific guidelines for the design and construction of public and private infrastructure. The information contained herein is limited to engineering standards, specifications, and guidelines that complement and support developments within the city. The city issues, adopts, and utilizes other documents as listed in Section 1.3 that pertain to the development process. These documents must be used in conjunction with this document according to their jurisdiction. The design concepts and specific technical data outlined in this document are not intended to supersede sound engineering judgment. All plans and engineering documents shall be prepared in accordance with this document and will be reviewed accordingly.

This document is not intended to repeal, abrogate, annul, or in any way impair or interfere with existing provisions of other laws or ordinances. Where these standards impose greater restrictions than those imposed or required by such existing provisions of law, ordinance, contract, or deed, the provisions of these standards shall prevail.

1.2 OVERVIEW OF THE ENGINEERING DEVELOPMENT STANDARDS

This document is divided into ten chapters that cover specific elements of the engineering design and development process, with Supplemental Standard Details following Chapter 10. Updates will be published and made available periodically. The user of this document must ensure that the latest update is being employed in the design. Please check the city website at http://www.surpriseaz.gov/ for the current EDS. The following is a list of the chapters included in this document:

Chapter 1 - Policies and Engineering Development Standards

Chapter 2 - Land Development Design and Construction Standards

Chapter 3 - Street Design Standards

Chapter 4 - Traffic Engineering Standards

Chapter 5 - Storm Water Standards

Chapter 6 - Water and Reclaimed Water Standards

Chapter 7 - Sewer System Design Standards

Chapter 8 - Landscaping and Irrigation Standards

Chapter 9 - Construction Plans

Chapter 10 - Construction Inspection Guidelines

Supplemental Standard Details

1.3 APPLICABLE POLICIES, CODES, AND STANDARDS

The applicant is responsible for obtaining and complying with current applicable policies, codes, and standards, including but not limited to the following:

1. Surprise Unified Development Code (SUDC)
2. City of Surprise General Plan
3. City of Surprise Integrated Water Master Plan (Water Resources and Water Infrastructure)
4. City of Surprise Water and Wastewater Facility Design Guidelines and Standards
5. City of Surprise Fire Department Emergency Access Book and Fire Code
6. City of Surprise Street Light Improvement District Process
7. City of Surprise Georeferencing Standards
8. City of Surprise Floodplain Management Ordinance
9. Federal, State, and County Regulations, including ADWR, FEMA, ADA, ADOT, MCDOT, MAG, NPDES, FCDMC, and MCDES
10. ADEQ Bulletins, including but not limited to Bulletins No. 8, 10 and 11
11. Arizona Game and Fish Department Guidelines for Bridge and Culvert Construction
12. Bell Road Access Management Plan
13. International Fire Code (IFC)

All developments shall be designed and constructed according to the standards mentioned above unless specific variances are approved by the city. Any deviation from the provisions presented in this document must be approved by the city through an Engineering Standards Modification Request as described in Section 1.4.

In the event there is a discrepancy or conflict among documents, the order of precedence in which documents shall govern is as follows: City approved Standard Modification Requests; Special Provisions; Project Plans; Standard Specifications and Details.

1.4 ENGINEERING STANDARDS MODIFICATION REQUESTS

The Engineering Standards referenced in the EDS are not intended to prevent the use of alternative design methods. The City Engineer or designee may approve modifications to the standards provided that:

a. The proposed modification meets the intent of this EDS and addresses health, life, and safety considerations.

b. There are practical difficulties that prevent the application of the standards outlined in the EDS. Economic or self-imposed hardships are not to be considered practical difficulties. The applicant is responsible for supplying necessary information to determine whether or not there are practical difficulties that prevent application of the Standards.

The following applies to Engineering Standards Modification Requests:

1. Each modification request is site specific. Approval of a modification request is not a precedent for the approval of any subsequent request.
2. The applicant must submit two copies of the plan that specifically show the modification being requested and a completed 'Engineering Standards Modification Request Summary Form'. The form must be sealed by an Arizona Registered Professional Civil Engineer. See Appendix 1-1 for example form.
3. The City Engineer or designee shall approve or deny the modification request in writing and provide a copy to the applicant.

1.5 INSURANCE REQUIREMENTS

Contractors and developers must provide a Certificate of Insurance naming the City of Surprise as an additional insured, including Liability, Auto, and Workers' Compensation.

1.5.1 Permittee Liability

The permittee shall be responsible for all liability imposed by law for damages arising from or related to work performed, or failed to be performed, by the permittee, permittee's agents, contractors, and all tiers of subcontractors under the permit. If any claim of such liability is made against the city, its officers, or its employees, permittee shall defend, indemnify, and hold harmless the city from any such claim.

1.5.2 Insurance Limits

No applicant shall be entitled to a permit unless they have filed and maintain on file with the city a current Certificate of Insurance certifying that the permittee carries public liability and property damage insurance issued by an insurance carrier authorized to do business in the State of Arizona, insuring the applicant, the city, and its agents against loss by reason of injuries to or death of persons, or damage to property arising out of or

related to work performed by the applicant, its agents, or its employees while performing work under the permit. Such insurance shall be primary and provide coverage for liability assumed by the applicant under this agreement and shall be provided by the permittee in the amounts established by the city.

1.5.3 Effective Timeframe of Insurance

Failure of the applicant to provide the city with such a certificate, and failure by the city to demand the filing by the permittee of such a certificate before such a permit is issued shall not be deemed sufficient to waive the permittee's obligation to provide insurance. Such insurance certificate shall remain in effect and shall be kept on file with the city until all work being performed by the permittee has been completed. Where an encroachment involves a permanent obstruction, such insurance certificate requirements shall remain in effect until such obstruction is removed. The insurance certificate shall provide coverage that cannot be canceled or expire without providing ten days written notice of such action to the city.

1.5.4 Insurance of Permittee's Agents, Contractors, and Subcontractors

Prior to permit issuance, permittee must identify and list all agents, contractors, and all tiers of subcontractors who will perform work for permittee under the subject permit. All such agents, contractors, and subcontractors must comply with all of the above provisions, including but not limited to providing a Certificate of Insurance to the City of Surprise containing all of the insurance requirements set forth in this section. The permittee shall be responsible for advising all subcontractors of these provisions and for ensuring compliance. If permittee engages any other agents, contractors, or any tier of subcontractor not initially scheduled prior to work commencing, permittee must notify the City of Surprise of such agent, contractor, or subcontractor and such agent, contractor, or subcontractor shall submit the appropriate Certificate of Insurance in compliance with this section.

APPENDIX 1-1

ENGINEERING STANDARDS MODIFICATION REQUEST SUMMARY FORM

City of Surprise, Public Works Dept.
Engineering Division
16000 N. Civic Center Plaza
Surprise, AZ 85374-7470

ENGINEERING STANDARDS MODIFICATION REQUEST SUMMARY FORM

The following request is made per City of Surprise Engineering Development Standards Section 1.5. This request is only applicable to the below project location and shall not be considered a standard acceptable design method within the City of Surprise. This request must be sealed by an Arizona registered Professional Civil Engineer.

Project Name:	
Project Location:	
Project Number:	
Engineering Number:	
Date:	

BACKGROUND:

REASON FOR REQUEST:

PROPOSED REQUEST/SOLUTION:

Attach additional pages if required

The following section is for City of Surprise use only

____ Engineering Services staff has reviewed the above request and determine the proposed to adhere to commonly practiced engineering principles. The request is approved for this project only.

____ Engineering Services staff has reviewed the above request and determine the proposed to be in conflict with commonly practiced engineering principles. It is not recommended for approval for the following reasons:

APPROVAL:

_____

City Engineer or Designee

CHAPTER 2 – LAND DEVELOPMENT DESIGN AND CONSTRUCTION STANDARDS

Developments shall provide for vehicle parking, refuse collection, fire department access, landscaping, waste control, on-site water and sewer collection systems, all necessary off-site water and sewer systems, on-site reclaimed water systems, and on-site storm water retention per applicable City of Surprise codes, ordinances, and standards. Detailed information regarding various elements associated with the development process is outlined below.

2.1 DEVELOPMENT PLANS AND SUPPORTING DOCUMENTS

1. The developer shall prepare a complete set of engineering documents including but not limited to the following (refer to Chapter 9 for guidelines and checklists).
    a. Off-Site Street Lighting (Chapter 2)
    b. Pavement Construction (Chapter 3)
    c. Striping and Signage (Chapter 4)
    d. Traffic Signals (Chapter 4)
    e. Traffic Impact Analysis (Chapter 4)
    f. Grading and Drainage (Chapter 5)
    g. Storm Drain System (Chapter 5)
    h. Drainage Reports (Chapter 5)
    i. Storm Water Pollution Prevention Plan (SWPPP) (Chapter 5)
    j. Potable Water System Construction (Chapter 6)
    k. Reclaimed Water System Construction (Chapter 6)
    l. Water Model Report (Chapter 6)
    m. Reclaimed Water Report (Chapter 6)
    n. Sanitary Sewer System Construction (Chapter 7)
    o. Wastewater Report (Chapter 7)
    p. Geotechnical Investigation (for reference purposes)

2. Civil plans may be submitted for review concurrently with a proposed site plan, or at the owner's discretion, submitted following site plan approval. In all cases, civil plans shall be approved prior to final plat approval.

2.2 ENGINEERING SERVICES DIVISION REVIEW TIME & FEES FOR DEVELOPMENT PLANS

Developer shall refer to the Engineering Plan Review and Permitting Application Packet available online at http://www.surpriseaz.gov for specific information.

2.3 DEVELOPMENT IN PHASES

The phasing of development will be reviewed on a case by case basis and must be approved by City Management. A narrative and phasing plan shall be submitted in support of each phase of development with specific identification of the following:

1. All lots, tracts, easements, common areas, and other land.
2. All streets, private streets, alleys, and other rights-of-way.
3. All utilities, including potable water, non-potable water, sanitary sewer, storm sewer, and drainage structures.
4. A description of the schedule and sequencing of the proposed phases and how significant delays in the completion of the subdivision and its public improvements will be mitigated.
5. A narrative describing plans for completing critical improvements should there be a termination of subdivision work or improvements for a period of six months.

2.4 PROJECT ABANDONMENT

The termination of permitted construction for a period of one month shall be considered as abandonment of the project. The owner or developer shall be required to complete all approved improvements in full. The city may complete the required improvements per the SUDC, at the owner's/developer's expense through the assurances, if the owner or developer is unable to complete them.

2.5 RIGHT-OF-WAY ACQUISITION FOR A PROPOSED DEVELOPMENT

When required, the acquisition and dedication of public rights-of-way and utility easements shall be coordinated through the city's Real Property Division. Deeds for these rights-of-way, easements and/or parcels shall be prepared by the developer and submitted to the city for approval, recording, and formal council acceptance. A Phase 1 Environmental Site Assessment in accordance with the latest ASTM/EPA standards is required for all rights-of-way to be dedicated to the city.

The property owner is responsible for the dedication of adjacent full streets of rights-of-way and shall provide the adjacent full street improvements including, but not limited to: paving, curb, gutter, sidewalk, landscaping, irrigation, street lighting, signage, signal installation/relocation, drainage infrastructure, and pavement striping. Half-street

dedication and improvements will be allowed when a concession is granted per the requirements in the SUDC.

2.6 FIRE DEPARTMENT ACCESS REQUIREMENTS

All developments shall provide access for Fire Department apparatus and personnel in accordance with the standards presented in this document, with the current SUDC, and with the Fire Department Emergency Access and Detail Guide. Requirements include:

1. A 20-foot minimum driveway width is required for fire truck access per IFC and Fire Department Emergency Access and Detail Guide.
2. Turning radii shall be per AASHTO SU-40 scale at all entrances and interior driveway intersections where fire truck access is required.
3. Buildings shall be located so that a fire department apparatus may be parked within 200 feet of the farthest point on the ground floor of the building. This 200-foot travel distance is measured along the route a person would follow on foot from the truck to any given portion of the building.
4. Specifications for the sprinkler systems vary with the type of development. It is the developer's responsibility to contact the Fire Plan Examiner's Office to determine the specific requirements for the development.
5. The minimum vertical clearance shall be 14 feet.
6. There shall be a minimum 10-foot building setback from fire lanes.
7. Any roadway intended for Fire Department access shall not have a grade greater than 8%.
8. Fire lane "No Parking" signs shall be posted for all fire lanes or stenciled on curbing. (See City of Surprise Standard Detail 4-21I).
9. Fire lane signs shall be posted perpendicular to the flow of traffic and shall be visible from both directions of travel. They shall be mounted between 5 and 7 feet above the final grade and at a maximum of 100-foot intervals and at any horizontal changes in direction.
10. When determined by the Fire Department, private security gates shall be equipped with pre-emptive equipment. This device shall satisfy the following conditions:
    a. In the event of an electrical power loss, the device shall be capable of fail-safe operation. In the event of an emergency, a means shall be provided to leave the gate(s) unlocked in the open position.
    b. A list of the approved devices may be obtained through the City of Surprise Fire Department.

2.7 PUBLIC STREET LIGHTS

2.7.1 Street Light Plan

Street lights are required in the public right-of-way. Street light layout plans must be prepared by a Professional Electrical Engineer registered in the State of Arizona. Street light plans shall be prepared in accordance with the ANSI/IES Roadway Lighting Manual, the City of Surprise Street Lighting Checklist (see Chapter 9), and Arizona Public Service Company (APS). All street lights must be installed by a qualified contractor and wired by APS/SRP authorized personnel. Upon approval, the owner/developer is responsible to forward the street light plans to APS for design, permits, and installation.

2.7.2 Street Light Improvement District (SLID)

All developments adjacent to local and collector roadways are subject to the formation of a SLID for operation and maintenance of the street lights. The Homeowners' Association for any development with private streets is responsible for all installation, electrical, and operation costs associated with the street lights. Refer to the City of Surprise Street Light Improvement District Application Packet for more details.

2.8 SOLID WASTE VEHICLE ACCESS AND ROUTE DESIGN

1. All solid waste collection routes shall meet engineering design criteria (street width and turning radii) in a manner that allows solid waste collection vehicles access to bin enclosures. The collection routes shall be designed so that collection vehicles can safely access and lift bins without obstructions (ground level or aerial obstructions).
2. To maintain the safety of the site, solid waste collection vehicles shall not be required to back up more than 50 feet when serving a trash bin.
3. No awnings or building projections shall be allowed in the route of the solid waste collection vehicle. A minimum overhead clearance of 14 feet is required along the route and a minimum overhead clearance of 25 feet is required over the bin enclosure area and along the route up to 50 feet from the steel posts.
4. Routes shall be clear of all obstructions (curbs, walls, overhead wires, and awnings) to prevent damage from the collection vehicle.
5. The collection vehicles must be able to travel through a site without backtracking.
6. Bin enclosures shall be located away from entrances and exits so that the collection vehicle does not create a safety hazard by blocking incoming or outgoing traffic.

2.9 CONSTRUCTION PERMITS

1. Civil construction permits are required for any roadway, grading, underground, and on-site improvements. Submittal of the Civil Improvement Plans for review

and acceptance is required to obtain a construction permit. The Engineering Services Division will issue separate Civil Permits for each type of infrastructure improvement required. For further information regarding specific applications and permit fees, refer to www.surpriseaz.gov.

2. All construction shall be in accordance with the approved plans and specifications. Prior to the issuance of a permit, the Contractor shall provide the following:

    - City of Surprise Business License
    - Maricopa County Dust Control Permit
    - Approved plan set
    - An appropriate financial guarantee for the completion of all off-site improvements
    - A copy of the improvement plans in AutoCAD and PDF format (upon approval of the Civil Plans and as outlined in the plan approval letter)
    - A PDF copy of all civil design reports

CHAPTER 3 – STREET DESIGN STANDARDS

3.1 GENERAL INFORMATION

1. The street system and classification shall be based on the City of Surprise Long Range Master Street Plan.
2. The technical street design requirements for all street classifications are shown in Table 3-2 on the following page. For rural minor roads, refer to MCDOT Roadway Design Manual Figure 5.4.
3. Street cross sections shall be in accordance with City of Surprise Standard Details 3-01 through 3-07.
4. All street intersections shall be constructed with concrete vertical curb returns and sidewalk ramps as specified within this chapter. For back of curb radii between 30 feet and 35 feet, use City of Surprise Standard Detail 3-11. For curb radii less than 30 feet, use MAG Detail 235-2. The radii of sidewalk ramps to the back of curb at intersection locations are detailed in Table 3-1.

Table 3-1 Radius of Sidewalk Ramps/Curb Returns to Back of Curb at Intersection Locations

Street Classification	Parkways	Arterial	Collector	Local
Parkways	*35′*	*35′*	*30′*	*N/A*
Arterial	*35′*	*35′*	*30′*	*20′*
Collector	*30′*	*30′*	*25’*	*20′*
Local	*N/A*	*20′*	*20′*	*20′*

5. Developments within the city are required to replace overhead facilities with a rating of less than 69 kV with underground facilities. This includes electrical, alarm, and communication facilities.
6. The minimum length of a cul-de-sac is 300’.
7. When matching existing pavement, a normal crown pavement cross slope shall be between 1.5% and 2.5%.
8. Pavement markers for fire hydrants shall be placed according to MAG Detail 122.
9. Sidewalk improvements shall be in accordance with the Americans with Disabilities Act (ADA), and MAG Specification 340 and Detail 230. The maximum slope of an ADA-approved ramp is 1:12 or 8.33% for running slope and 1:48 or 2.00% for cross slope. Changes in the level of sidewalk surfaces or ramps of ¼ inch or greater can become tripping hazards. Gaps in grates/openings wider than 1/2 inch are not allowed.

10. All trench backfill and pavement replacement shall be in accordance with MAG Details 200-1 and 200-2 and the Pavement Cut Policy contained within the current SUDC.

11. AMERICANS WITH DISABILITIES ACT (ADA)

    a. Safety railing along slopes shall be in accordance with ADA. The following are conditions where ADA safety railings are required: A 1:1 or greater slope with a 1-foot or larger drop, a 2:1 or greater slope with a four-foot or larger drop, and a 3:1 or greater slope with a six-foot or larger drop.

    b. Detectable Warnings: MAG Section 340.2.1.1 states that detectable warnings such as truncated domes shall contrast visually with adjoining surfaces. Visual contrast shall be obtained by color, and safety yellow or another approved color such as terracotta is recommended. All truncated domes must be approved, and the currently approved suppliers for the City of Surprise are *ACO, ARCIS, Armor-Tile* and *TekWay*. Other suppliers may be approved, but they must have a verifiable history and approval from the City of Surprise prior to ordering.

3.2 VALLEY GUTTERS

1. Concrete valley gutters shall be constructed per MAG Detail 240.

2. Valley Gutter Guidelines:

    a. Valley gutters are not allowed to cross parkways, arterials and collectors.

    b. Valley gutters crossing local street intersections with local or collector streets shall be a minimum of six feet wide.

    c. Mid-block valley gutters on local streets shall be a minimum of eight feet wide. Mid-block valley gutters are not permitted on any other street classification.

    d. Asphalt valley gutters are not allowed on public streets.

TABLE 3-2

TECHNICAL DESIGN REQUIREMENTS BY STREET CLASSIFICATION

ITEM		PARKWAY	MAJOR ARTERIAL	MINOR ARTERIAL	COLLECTOR	LOCAL	LOCAL CUL-DE-SAC
DESIGN SPEED (VD)		55 MPH	55 MPH	55 MPH	50 MPH	30 MPH	N/A
DESIGN VEHICLE		WB-20D (WB-67)	SU-40	SU-40	SU-40	SU-40	SU-40
SUPERELEVATIONS (E_{MAX})		4%	4%	4%	4%	N/A	N/A
MINIMUM RIGHT OF WAY (FULL LENGTH)		200'	136'	110'	105' (HIGH VOLUME) 80' (RESIDENTIAL) 60' (COMMERCIAL)	55' (ON STREET PARKING) 40' (NO PARKING)	125'
MINIMUM STREET WIDTH (BACK OF CURB TO BACK OF CURB)		140'	101' (W/O BIKE LANE) 111' (W/ BIKE LANE)	79'	77' (HIGH VOLUME) 53' (RESIDENTIAL) 38' (COMMERCIAL)	32' (ON STREET PARKING) 28' (NO PARKING)	105’
CURB (*)	(MAG STD DET 220-1)	VERTICAL CURB AND GUTTER				ROLL CURB AND GUTTER (VERTICAL CURB AND GUTTER IS ALLOWED WHERE REQUIRED FOR DRAINAGE)	
SIDEWALK WIDTH (*)	(MAG STD DET 230)	12'	6'	6'	6' (HIGH VOL & RES) 5' (COMMERCIAL)	5' (ON STREET PARKING) N/A (NO PARKING)	5'
PAVEMENT STRUCTURE (β)		PER GEOTECHNICAL RECOMMENDATIONS. 5" AC OVER 9" ABC MINIMUM			PER GEOTECHNICAL RECOMMENDATIONS. 3" AC OVER 8" ABC MINIMUM		
LONGITUDINAL SLOPE		0.3% MINIMUM 8% MAXIMUM			0.3% MINIMUM 12% MAXIMUM		0.3% MIN 12% MAX
CROSS SLOPE		2% MINIMUM - 3% MAXIMUM					
VERTICAL CURVES (α)	REQUIRED WHEN:		GRADE CHANGE EXCEEDS 1.0%		GRADE CHANGE EXCEEDS 2.0%		
	CREST CURVE MINIMUM		LENGTH = 160 x A	LENGTH = 85 x A	LENGTH = 55 x A	LENGTH = 28 x A	LENGTH = 28 x A
	SAG CURVE MINIMUM		LENGTH = 160 x A	LENGTH = 75 x A	LENGTH = 55 x A	LENGTH = 35 x A	LENGTH = 35 x A
HORIZONTAL CURVES	REQUIRED WHEN:		TANGENT CL DEFLECT MORE THAN 7 DEGREES		TANGENT CL DEFLECT MORE THAN 10 DEGREES		
	MINIMUM RADIUS		500'		100'		
	MINIMUM TANGENT CL BETWEEN REVERSE CURVES		150'		100'		
TAPERS (β)	LENGTH		Vd x W			$(Vd^2 \times W) / 60$	

NOTES: A = ALGEBRAIC DIFFERENCE OF THE TWO SLOPES. | W = DISTANCE FROM LIP OF GUTTER TO EDGE OF EXISTING PAVEMENT.

(α) LENGTH OF VERTICAL CURVE SHALL BE ADJUSTED TO AN EVEN ONE-HALF STATION (I.E. 160 x A = 532'; USE 550'). | (β) PAVEMENT SECTION FOR INTERIM ROADWAY TAPERS SHALL BE 3" AC OVER 8" ABC MIN.

(*) 4-INCH ROLL CURB WILL BE ALLOWED ON LOCAL STREETS ONLY WHERE DRIVEWAYS ARE ANTICIPATED AND 6-INCH VERTICAL CURB IS NOT REQUIRED FOR STORM WATER DRAINAGE CAPACITY. IN THESE AREAS THE SIDEWALK SHALL BE CONSTRUCTED 5-INCHES THICK PER MAG STANDARD DETAIL 250-1. 4-INCH THICK SIDEWALK MAY BE CONSTRUCTED IN COMMON AREAS NOT SUBJECT TO DRIVEWAY TRAFFIC.

APPENDIX 3-1

DRIVEWAY PLAN FOR RESIDENTIAL LOT

SURPRISE
ARIZONA

CITY OF SURPRISE (APPENDIX 3-1)
Driveway Plan for Residential Lot
(Attach (2) copies to civil permit application)

Property Information:

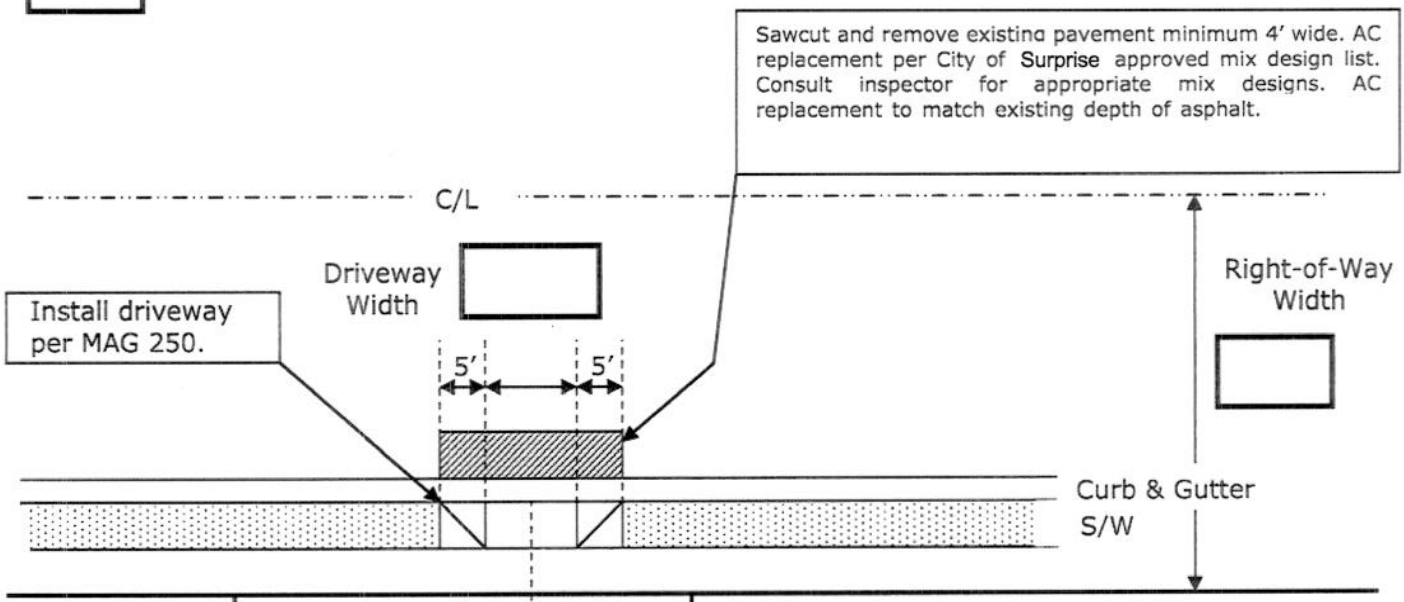
Owner's Name: _____

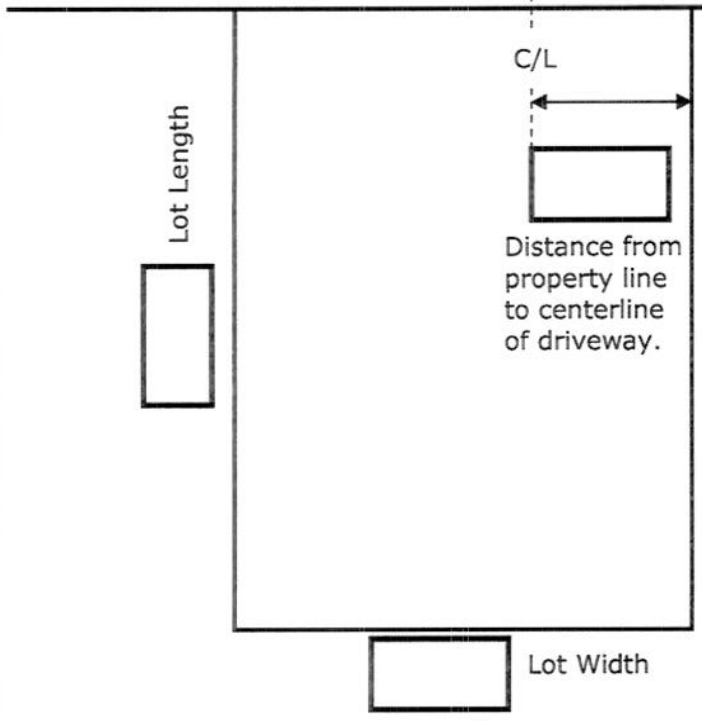
Site Address: _____ Zip Code: _____

Phone Number: _____ APN#: _____

Site/Construction Plan:

☐ **Boxes to be completed by applicant.**





THIS SECTION TO BE COMPLETED BY CITY STAFF

Permit Quantities:

Concrete Base Fee	_____	EA
Driveway Cut Residential	_____	EA
Driveway Residential	_____	EA
Paving Base Fee	_____	EA
Pavement	_____	SY

Approval:

_____

DATE

CHAPTER 4 – TRAFFIC ENGINEERING STANDARDS

4.1 GENERAL INFORMATION

1. All proposed street and intersection designs are subject to review by the City Engineer or designee for applicability, capacity, and safety.
2. The contractor must have approved plans prior to conducting the work.
3. All new developments are responsible for the cost, design, and installation of pavement markings on city streets adjacent to the development project. This includes the removal of all existing pavement markings that are in conflict with the new pavement markings adjacent to or impacted by the development project and associated improvements.
4. Full median breaks shall be limited to the 1/4 mile point. At a maximum, median breaks for left turns into the adjacent site may be allowed at the 1/8 mile point (left turns out are not allowed).
5. Continuous raised medians are required on all streets that are designated as parkways or arterials. Refer to Supplemental Standard Details for cross sections.
6. Right of way shall be dedicated on all arterial streets for far side bus bays (turnouts) at intersections per detail 3-14. Right-of-way shall be dedicated between intersections at half mile intervals on arterial streets and parkways as directed by the City Engineer or designee.
7. Signal modifications that are a result of street widening or recommended in the Traffic Impact Analysis related to the development are the responsibility of the developer.
8. Where speed humps are permitted, they shall be in accordance with the City of Surprise Neighborhood Traffic Management Plan.

4.2 STREET AND LANE CLOSURE PERMITS

All work in the city Right-of-Way that requires the restriction and/or closure of any pedestrian or vehicular traveled way shall require an approved Traffic Control Plan by the City Engineer or designee. It is the responsibility of the contractor to obtain the approval of a Traffic Control Plan. All Traffic Control Plans must be date and time specific to the work being performed. All Traffic Control Plan submittals shall be from a contractor that is certified with the City of Surprise to place and remove temporary traffic control in the City of Surprise. It is the responsibility of each of the developer's contractors to follow the City of Surprise Temporary Work Zone Traffic Management Policy.

4.3 TRAFFIC IMPACT ANALYSIS PROCEDURES

It is the responsibility of the developer to provide a Traffic Impact Analysis report, regardless of the size of the development. It is the responsibility of the developer's consultant to follow the attached Traffic Impact Analysis procedures in Appendix 4-1.

4.4 TRAFFIC CONTROL POLICIES AND PROCEDURES

For city traffic control policies and requirements refer to the following city documents:

1. Temporary Work Zone Traffic Management Policy, which can be found at http://www.surpriseaz.gov/documentview.aspx?did=6280

For information regarding the following items contact traffic.control@surpriseaz.gov

2. Temporary Traffic Control Device Installation and Removal, Certification Application – Annual Permit Application
3. Traffic Control Plan Review For Traffic Restrictions – Submittal Form TE-1
4. Traffic Control Plan Review For Road Closures – Submittal Form TE-2

APPENDIX 4-1

TRAFFIC IMPACT ANALYSIS (TIA)

Traffic Impact Analysis (TIA) Procedures

A. INTRODUCTION

Goal three of the City of Surprise Strategic Plan is to provide a seamless, comprehensive and safe transportation system. The review and management of development-generated traffic is an integral part of operating and maintaining a safe and efficient roadway system and meeting this goal. The Traffic Impact Procedures as outlined in this document have been established to meet this objective. The Traffic Impact Procedures establish a range of traffic impact study categories based on the characteristics of the development and the estimated peak hour traffic volumes. The procedures also outline the analysis approach and methods.

A Traffic Impact Analysis, TIA, identifies existing traffic volumes and conditions, development traffic volumes and conditions and their combined impacts on the existing and future roadway system. The TIA is a useful tool for early identification of potential traffic problems and can play an important part in the success of a development. When insufficient attention is given to the assessment of traffic impacts, the following problems may result:

- On-site congestion and/or congestion on adjacent roadways
- Inadequate site access
- High accident experience
- Limited flexibility to modify the development to eliminate problems or adjust to changed conditions

These problems can negatively affect the success of a development and can damage the marketability and return on investment of the development. The performance of a TIA provides an opportunity for the city and the developer to share information and jointly address traffic related problems. It provides a means of balancing development needs with the functional integrity of the roadways that serve both the development and the region.

The need for a Traffic Impact Study should be assessed as early as possible in the development process when there is maximum flexibility for eliminating traffic-related problems. Preparation of a TIA, at this stage in the development process, is also recommended in Chapter 2 “Site Planning” of the Institute of Transportation Engineers publication ‘Transportation and Land Development’.

The procedures contained herein are provided to:

- Assist developers through the approval process by outlining the requirements and level of detail of traffic analysis that will be required of them during the approval process.
- Standardize the types and details of analysis required in the assessment of traffic impacts for developments with similar levels of size and intensity.
- Ensure consistency in the preparation and review of a TIA through standardization of the reports.

A TIA per the following guidelines will be required of all developments or additions to existing developments. A Traffic Impact Statement is required for developments generating lower peak hour volumes to determine where current traffic problems or concerns may exist. It should include at a minimum: The existing condition analysis, including any existing driveways or intersections in the vicinity, a sight distance evaluation, the traffic generation, the access number and spacing, an access queuing evaluation, and an onsite circulation evaluation.

If a TIA was done for the project at a master site plan level or a PAD level, an addendum or update will be required if the original study is greater than two years old, if additional intersections or driveways are being added, if the new development is different from what was assumed in the master study causing an increase in trips generated, or if surrounding development has changed the background assumptions in the original study.

The City Engineer or designee, in accordance with the intent of these guidelines, will determine the scope for the initial TIA or the need for a revised TIA. This can be done through the city's development review process or through a separate meeting for this purpose.

An engineering firm selected by the developer may prepare the Traffic Impact Analysis.

The first step for any TIA is to determine the size and scope of TIA required for the site.

B. TIA EVALUATION

A TIA per the following guidelines will be required of all developments or additions to existing developments. The specific analysis requirements and level of detail are determined by the following categories:

1. **A TRAFFIC IMPACT STATEMENT:** Required for developments generating less than 100 trips in the peak hour. It shall include at a minimum: The existing condition analysis, including any existing driveways or intersections in the vicinity, a sight distance evaluation, the traffic generation, the access number and spacing, an access queuing evaluation, and an onsite circulation evaluation.
2. **CATEGORY I:** Developments which generate 100 or more peak hour trips but fewer than 500 trips during the morning or afternoon peak hour.
3. **CATEGORY II**: Developments which generate 500 or more peak hour trips but fewer than 1,000 trips during the morning or afternoon peak hour.
4. **CATEGORY III**: Developments which generate 1,000 or more peak hour trips but fewer than 1,500 trips during the morning or afternoon peak hour.
5. **CATEGORY IV**: Developments which generate more than 1,500 trips during the morning or afternoon peak hour.

The developer must first estimate the number of vehicle trips generated by the proposed development using the procedure(s) outlined in this document. The

developer must obtain the concurrence of the City Engineer or a designated representative on the number of trips generated by the development, and the appropriate analysis category.

C. ANALYSIS APPROACH AND METHODS

The traffic analysis approach and methods are presented below.

1. STUDY AREA

The minimum study area will be determined by project type and size in accordance with the criteria in Table 1. The City Engineer may require expansion of the study area when the minimum study areas identified in Table 1 do not provide sufficient information to meet the intent of the Traffic Impact Analysis guidelines. For example, a large development in a rural area located two miles from a freeway interchange from which most of the trips are anticipated to access the development may require an enlarged study area to include assessment of the freeway interchange.

2. STUDY HORIZON YEARS

The study horizon year is the future year that should be studied with the development. The existing background traffic shall be adjusted to provide a reasonable estimation of the traffic without the site in the horizon year. The horizon years are determined by the project type and size in accordance with the criteria in Table 1.

a. Assume full occupancy and build-out for single-phase developments. Multi-phase developments may require assessment of up to three (3) horizon years corresponding to key phases as directed by the City Engineer.

b. An enlarged study area may be required when the minimum study areas identified in Table 1 do not provide sufficient information to meet the intent of the TIA guidelines.

TABLE 1

Analysis Category	Development Characteristic	Study Horizons (a)	Minimum Study Area (b)
I	Traffic Impact Statement 1-100 peak trips Small Development 100-499 peak trips	1. Opening Year	1. Site access drives 2. Adjacent signal controlled intersections within ¼ mile and/or major street intersections without signal control and driveways within 500 feet
II	Moderate Development 500-999 peak hour trips	1. Opening year 2. 5 years after opening	1. Site access drives 2. All signal controlled intersections within ½ mile and/or major street intersections without signal control and major driveways within ½ mile
III	Large Development 1,000-1,500 peak hour trips	1. Opening year 2. 20 years after opening	1. Site access drives 2. All signal controlled intersections within 1 mile and/or major street intersections without signal control and major driveways within 1 mile
IV	Regional Development > 1,500 peak hour trips	1. Opening year 2. 20 years after opening	1. Site access drives 2. Key signal controlled intersections and major street intersections without signal control within 3 miles

3. ANALYSIS TIME PERIOD

a. Both the morning and afternoon weekday peak hours are to be analyzed. If the proposed project is expected to generate no trips or a very low number of trips during either the morning or evening peak periods, the requirement to analyze one or both of these periods may be waived by the City Engineer or designee.

b. Where the peak traffic hour in the study area occurs during a time period other than the normal morning or afternoon peak travel periods (for example midday), or occurs on a weekend, or the proposed project has unusual peaking characteristics, these peak hours must also be analyzed.

4. SEASONAL ADJUSTMENTS

The traffic volumes for the analysis hours should be adjusted for the peak season if appropriate. The City Engineer shall approve use of seasonal adjustment factors. The intent is not to assess maximum peak hourly volumes, such as the day after Christmas for a retail development, but to address peak seasonal volumes. If traffic counts were collected in a retirement community in July, and the peak traffic period occurs during the winter months, the counts shall be adjusted to winter months.

5. DATA COLLECTION REQUIREMENTS

All data is to be collected in accordance with the latest edition of the ITE Manual of Transportation Engineering Studies or as directed by the City Engineer if not specifically covered in the ITE Manual.

a. Turning movement counts shall be obtained for all existing cross-street intersections to be analyzed during the morning, noon and evening peak periods. Available turning movement counts may be extrapolated a maximum of two years with concurrence of the City Engineer.

b. The current and projected daily traffic volumes shall be presented in the report. Available daily count data may be obtained from the city and extrapolated a maximum of two years with the concurrence of the City Engineer. Where daily count data are not available, mechanical counts may be required at the City Engineer's discretion.

c. Roadway geometric information shall be obtained including roadway width, number of lanes, turning lanes, vertical grade, location of nearby driveways, both adjacent and across the street and lane configuration at intersections.

d. The location and type of traffic controls shall be identified.

6. TRIP GENERATION AND DISTRIBUTION

a. The latest edition of ITE's Trip Generation shall be used for selecting trip generation rates. The guidelines contained in the Trip Generation shall be used to determine whether the average trip generation rate or equation should be used.

b. Other rates may be used with the approval of the City Engineer in cases where Trip Generation does not include trip rates for a specific land use category, or includes only limited data, or where local trip rates have been shown to differ from the ITE rates.

c. Projected trips shall be distributed and added to the projected non-site traffic based on engineering judgment, existing traffic patterns and conversations with city staff if needed.

7. CAPACITY ANALYSIS

a. Level of service shall be computed for signal controlled and non-signal controlled intersections as identified in the Study Area in Table 1, in accordance with the latest edition of the Highway Capacity Manual.

b. For signal-controlled intersections, operational analyses shall be performed for time horizons up to 5 years. Operational analyses shall also be performed for street sizing. The planning method will be acceptable for time horizons beyond 5 years and is also acceptable for Traffic Impact Analysis prepared at the Development Master Plan level, unless used for street sizing.

c. For urban roadways, and rural highways where signal controlled intersections are at or less than 1 mile apart, the capacity of the roadway is generally dominated by the capacity of the adjacent signal controlled intersections. Roadway levels of service need not be computed for these facilities.

d. For rural highways where the signal-controlled intersections are more than 1 mile apart, the level of service on the highway shall be estimated in accordance with the latest edition of the Highway Capacity Manual.

8. TRAFFIC SIGNAL NEEDS

a. A traffic signal needs study shall be conducted for all arterial/arterial, arterial/collector and collector/collector intersections within the Study Area for the opening year. If the warrants are not met for the opening year, they should be evaluated for a 5-year horizon for Categories II, III and IV.

b. Traffic Signal needs studies shall be conducted per the MUTCD.

9. QUEUING ANALYSIS

A queuing analysis shall be conducted for all turn lanes under stop or signal control within the study area. Examples for estimating queue lengths for signal controlled and non-signal controlled intersections are given below.

For signal controlled intersections, find the number of vehicles arriving at the intersection (ADOT Traffic Impact Analysis for Proposed Development)

Vehicles/cycle (for random arrivals) = (vehicles/hour)/(cycles/hour)

Storage length =2 x vehicles/cycle x 25 feet

Example: *Find the storage length required for 150 vph turning left if the signal cycle is 90 seconds.*

Vehicles/cycle = (150 veh/hr)/(1 cycle/90 sec)/(3600 sec/hr)= 3.75 veh/cycle

Storage length = 2 x 3.75 veh/cycle x 25 feet = 187.5 feet

USE 200 feet

For non-signal controlled intersections, find the number of vehicles per average 2-minute period (AASHTO Green Book)

Vehicles/2 min period = (vehicles/hour)/(30 periods/hour)

Storage length = vehicles/2 min period x 25 feet

Example: *Find the storage length required for 150 vehicles turning left at a non-signal controlled intersection.*

Vehicles/2 min period = (150 veh/hr)/(30 periods/hr) = 5 vehicles

Storage length = 5 veh x 25 feet = 125 feet

USE 125 feet

10. SPEED CONSIDERATIONS

Vehicle speed is used to estimate safe stopping and cross-corner sight distances. Sight distance shall conform to the American Association of State Highway and Transportation Officials (AASHTO) standards. The design speed used shall be ten miles above the posted speed limit.

11. IMPROVEMENT ANALYSIS

The roadways and intersections within the study area shall be analyzed with and without the proposed development to identify any projected impacts in regard to level of service and safety.

a. Where an intersection will operate at a level of service below D, alternatives which mitigate these impacts shall be evaluated and included as part of the study.

b. Where a highway will operate at a level of service below D, alternatives which mitigate these impacts shall be evaluated and included as part of the study.

12. CERTIFICATION

The Traffic Impact Analysis shall be prepared under the supervision of a Professional Engineer (Civil) registered in the State of Arizona.

D. STUDY AND REPORT FORMAT

1. INTRODUCTION AND SUMMARY

a. Purpose of report and study objectives

b. Executive Summary

- Site location and study area
- Development description
- Principal findings
- Conclusions/Recommendations

2. PROPOSED DEVELOPMENT (Site and Nearby)

a. Site location

b. Land use and intensity

c. Site plan (copy must be legible)

- Access geometrics

d. Development phasing and timing

3. STUDY AREA CONDITIONS

a. Study area

- Area of significant traffic impact (including road segments, intersections and driveways)
- Market area

b. Land use

- Existing land use
- Anticipated future development

c. Site accessibility

- Existing and future area roadway system
- Site circulation

4. ANALYSIS OF EXISTING CONDITIONS

a. Physical characteristics

- Roadway characteristics (number of lanes, classification, etc.)
- Traffic control devices
- Transit service
- Pedestrian/bicycle facilities
- Nearby driveways

b. Traffic volumes

- Daily, morning, afternoon peak periods and others as required

c. Level of service
   - Morning peak hour, afternoon peak hour, and others as required

d. Safety related deficiencies, crash experience

e. Data sources

5. PROJECTED TRAFFIC

a. Site traffic forecasting (each horizon year)
   - Trip generation
   - Mode split (if applicable)
   - Pass-by traffic (if applicable)
   - Trip distribution
   - Trip assignment

b. Non-site traffic forecasting (each horizon year)
   - Projections of non-site traffic by Maricopa Association of Governments Association of Governments Transportation Planning Office (MAGTPO) may be used. For larger developments and study areas, a transportation planning model run may be required.
   - Total traffic (each horizon year)

6. TRAFFIC AND IMPROVEMENTS ANALYSIS

a. Site access

b. Level of service analysis
   - Without project (including programmed improvements for each horizon year)
   - With project (including programmed improvements for each horizon year)

c. Roadway improvements
   - Improvements by City of Surprise or others to accommodate non-site traffic
   - Additional improvements necessary to accommodate site traffic

d. Traffic safety
   - Sight distance
   - Acceleration/deceleration lanes, left-turn lanes
   - Adequacy of location and design of driveway access

e. Pedestrian considerations

f. Speed considerations

g. Traffic control needs

h. Traffic signal needs (base plus 5-year horizon)

i. Effect on Signal Progression if applicable

7. INTERNAL PROJECT SITE CIRCULATION (IF APPLICABLE)

a. Conflict points
   - Vehicle/vehicle
   - Vehicle/pedestrian
   - Sight distances
   - Building access delivery points
   - Drive-through lanes

b. Design features
   - Widths of internal circulation roadways
   - Parking dimensions
   - Sight distance per AASHTO Standards

c. Other features
   - Fire lanes
   - Delivery truck circulation/truck docks
   - Access to waste containers

8. CONCLUSIONS / RECOMMENDATIONS

a. Roadway improvements
   - Phasing

b. Site access

c. Internal site circulation

d. Transportation demand management actions (if appropriate)

e. Other

9. APPENDICES (Shall be included on a CD, not printouts)

a. Traffic counts

b. Capacity analyses worksheets

c. Traffic signal needs studies

10. EXHIBITS

The following information shall be provided on clear and legible figures:

a. Site location

b. Site plan

c. Existing transportation system(s) (Number of lanes, traffic control, etc.)

d. Existing and future area development

e. Existing daily traffic volumes
f. Existing peak hour turning volumes
g. Future transportation system
h. Estimated site traffic (daily and peak periods)
i. Directional distribution of site traffic (daily and peak periods)
j. Total future traffic (peak periods)
k. Queuing distance at study intersections, per lane (total traffic in peak periods)
l. Protected levels of service including existing, horizon year non-site and total horizon year (with site development) conditions
m. Recommended improvements

DESIGN STANDARD REFERENCE

A. Design in accordance with the current Maricopa County Roadway Design Manual and other current MAG and MCDOT policies, procedures and standards
B. Capacity analyses in accordance with the latest edition of the Highway Capacity Manual
C. Traffic Signal needs studies in accordance with the latest edition with ADOT PGP-4C-2-X, “Traffic Signal Needs Study”
D. Data collection in accordance with the latest edition of the ITE Manual of Traffic Engineering Studies
E. Trip generation in accordance with the latest edition of the ITE publication Trip Generation

CHAPTER 5 – STORM WATER STANDARDS

5.1 GENERAL INFORMATION

1. The purpose of this document is to provide guidance and standards for the City of Surprise (the city) storm water system requirements in conjunction with the following documents: Maricopa Association of Governments (MAG) Standards, City of Surprise Preliminary and Final Drainage Report Guidelines as published in Appendix 5-3, City of Surprise Underground Retention/Detention Systems Standards and Specifications as published in Appendix 5-4, the Drainage Design Manuals as published by the Flood Control District of Maricopa County (FCDMC) which includes Hydrology, Hydraulics, and Erosion Control, and the FCDMC Wittmann Area Drainage Master Plan Rules of Development. Refer to Chapter 10 for additional information regarding inspection procedures.
2. Any deviation from these standards shall require prior written approval from the city following the Engineering Standards Modification Request procedures explained in Chapter 1, Section 1.5.
3. The standards contained in this section are intended to expand upon and supplement information contained in the SUDC.
4. All developments within the city shall provide such storm drainage facilities as are necessary to ensure that all structures and properties, both within the development and those located upstream and downstream of the development, shall be protected from adverse impacts of storm waters due to the proposed and constructed development.
5. Off-site historical flow must be accepted and released from developments essentially at the same locations, including depth, flows and velocities, less than or equal to those encountered under pre-development conditions.
6. In general, development within or modification of the floodplain is discouraged. Development should be located outside of the 100-year floodplain. If development within the floodplain is necessary, approval from the Flood Control District of Maricopa County for Floodplain Use Permit is required.
7. Development within the floodway is prohibited.
8. The City defers to the Maricopa County Drainage Policies and Standards for first flush retention requirements, when applicable.

5.2 DRAINAGE REPORT

1. A Preliminary Drainage Report shall be submitted in support of Preliminary Plats, Site Plans, and Conditional Use Permits.
2. A Final Drainage Report and Conditional Letter of Map Revision (CLOMR), when required, shall be submitted in support of all civil plans and final plats. Endangered Species Act compliance documentation to FEMA is required prior to the issuance of any CLOMR (see FEMA Procedure Memorandum 64).

3. All Drainage Reports shall adhere to the City of Surprise Preliminary and Final Drainage Report Guidelines as published in Appendix 5-3.

5.3 STREET DRAINAGE

1. Parkways, arterials and collectors shall be designed to carry the ten-year flow between the curbs while maintaining a 12-foot dry lane in each direction, and carry the 100-year flow within the right-of-way.
2. Local streets shall carry the ten-year storm between the curbs and the 100 year storm within the right-of-way.
3. Streets required to provide all-weather access shall be designed with a maximum overtopping depth of six inches during the 100 year design storm.

5.4 LOT GRADING

1. Lots shall be graded to drain surface water away from foundation walls. The grade shall fall a minimum of six inches within the first ten feet.
2. For residential lots, where conditions prohibit six inches of fall within ten feet, the grade shall slope away from the foundation at a minimum slope of 5%, and the water shall be directed to drains or swales. Impervious surfaces shall have a minimum slope of 2% when located within ten feet of the building foundation.
3. For residential lots where climatic and soil conditions warrant, the slope of ground away from the building foundation is permitted to be reduced to not less than 2.0% slope.
4. Minimum residential side yard slopes shall be 0.5% and shall drain to the street.
5. All finish floors shall be a minimum of 18 inches above the low adjacent top of curb and a minimum of 12 inches above the 100 year water surface elevation.
6. A building permit is required, from City of Surprise Building Safety Division, for retaining walls greater than 4’ in height, measured from the bottom of the footing to the top of the wall.
7. Openings in walls may be required to allow the passage of existing flows through the site. Opening requirements will be reviewed on a case-by-case basis.

5.5 BOX CULVERTS

1. Culverts for collector and arterial streets are to be designed to convey, at a minimum, the 100-year 2-hour peak discharge with no flow crossing over the roadway.
2. Adequate fencing or railings must be provided along all walls including wing walls and any other vertical walls that pose a fall hazard. Railings must be painted. The approved paint color for railings is “Rolling Stone #CLC 1249W” as distributed by Frazee Paint, or approved equal. See MAG Detail 145.

3. All culverts constructed must have a minimum of four feet vertical clearance from invert to finished grade.

4. Water mains shall maintain a minimum of six feet of horizontal and two feet of vertical separation from culverts. Protection is required per MAG Standard Details 404-1 to 404-3 and Section 610.5.5 of the MAG Standard Specifications.

5.6 STORM DRAINS

1. The minimum pipe size shall be 18-inch inside diameter (ID) within city rights-of-way.

2. Standard material for storm drains within the right-of-way is to be rubber gasket reinforced concrete pipe (RGRCP) Class III or greater per MAG Standard Specification 618.2.

3. Access barriers/trash racks are required on the exposed ends of all storm drains 18 inches in diameter and greater. See City of Surprise Standard Details 5-04A, 5-04B and 5-04C. Refer to MAG details 502-1 and 502-2 for pipes less than 30 inches in diameter.

4. Water mains shall maintain a minimum of four feet of horizontal and two feet of vertical separation when below storm drain pipes. Protection is required per MAG Standard Details 404-1 to 404-3 and Section 610.5.5 of the MAG Standard Specifications.

5. The installation of storm drain pipe within the right-of-way shall follow MAG Detail 200-1.

6. Manhole construction shall be per MAG standards and specifications.

7. Location of manholes are to be at junctions of one or more pipes, changes in grade, changes in alignment and change in pipe sizes (pipe crowns to match).

8. Manhole spacing shall be a maximum of 400 feet on lines with pipes 18 inches to 36 inches in diameter and 660 feet on lines with pipes greater than 36 inches in diameter.

9. The minimum cover over storm drain pipes shall be two feet.

10. All storm drain within City of Surprise right-of-way is required to be designed in both plan and profile view.

5.7 OPEN CHANNELS

1. Where man-made channels are required, the emphasis should be placed on a "natural" appearance with non-erosive velocities or appropriate erosion protection per the Drainage Policies and Standards for Maricopa County, Arizona.
2. All channelization within regulatory floodplains must be designed so that the cumulative effect of all new development does not raise the 100-year water surface elevation by more than one foot. The one-foot rise in water surface may not occur at the sole expense of the adjacent property.
3. See Table 5-1 for allowable channel side slopes.
4. Channels shall be a minimum of eight feet wide at the bottom.
5. Channels shall not encroach into utility easements or right-of-way.

5.8 STORM INLETS

1. Catch basins or scuppers are required to convey water from a public street to a retention basin or storm system. Depressed curb shall not be utilized as a method to convey flows from a public street.
2. Catch basins are to have curb-opening inlets. Catch basins with grates are not allowed within the right-of-way. Scuppers are also not permitted within the right-of-way in conjunction with detached sidewalks.
3. Per the City of Surprise Details 5-01 to 5-02, the contractor shall identify all new catch basins, scuppers, and headwalls with a storm drain inlet marker inset into the wet concrete during construction. Two-part epoxy shall only be used to attach storm drain inlet markers to existing drainage structures.
4. Catch basins located within commercial or industrial developments that handle, store, dispense, sell, recycle, or dispose of motor vehicle fuels or lubricants shall be designed to include storm drain inlet protection best management practice devices as identified in the FCDMC Drainage Design Manual.

5.9 RETENTION / DETENTION FACILITIES

1. Storm water from a 100-year, 2-hour storm event that falls on the parcel being developed, including the respective one-half of all abutting streets, shall be retained within the boundaries of the parcel being developed.
2. The required retention volume is to be computed using the following formula:

   $V = (C \cdot P \cdot A) / 12$

   Where:

   V = volume in acre-feet
   C = average runoff coefficient per FCDMC Hydrology Manual.
   P = rainfall depth in inches, for the 100-year, 2-hour storm per FCDMC Hydrology Manual Appendix A.
   A = area in acres
3. All retention basins shall have a maximum designed depth of three feet.

4. All retention basins shall have a clearly defined positive method of outfall regardless of proposed depth. Surface percolation is explicitly not approved as a sustainable method of positive outfall.

5. All retention basins shall be designed to dissipate within a 36-hour period.

6. Turfed areas are only allowed in designated active recreation areas or within a designated bioswale.

7. Ultimate outfall from the basin must be provided for events causing flows in excess of the 100-year event flow.

8. Maximum side slopes shall be as shown in Table 5-1 below.

Table 5-1 Side Slopes for Basins and Channels

Location Description	Side Slope
Side slopes adjacent to public or private sidewalks or where there is pedestrian-type access within ten feet of that portion of the basin	6:1
Side slopes adjacent to walls, fences, hedges, etc. (i.e., limited or no pedestrian-type access to that area)	4:1

9. The Engineer is to consider potential landscaping to account for the retention basin final volume calculations.

10. Erosion protection shall be provided at all basin inlets/outlets per FCDMC Drainage Design Manual, Erosion Control.

11. Retaining walls (i.e. vertical slopes) may be used in areas adjacent to permanent walls, fences, etc.

12. Retention/detention in parking lots is not allowed.

13. Retention/detention facilities shall not encroach into easements for private utilities without written approval of the encroachment from all companies with utilities within the easement.

14. Retention/detention facilities shall not encroach into public rights-of-way or into public easements.

15. The top of retention/detention facilities shall be at least ten horizontal feet from any building or public right-of-way.

16. The ultimate outfall of all drainage from a development must be a public street, storm drain, drainage channel, or natural watercourse. If such an outfall does not exist, the project must provide an outfall.

17. Underground retention must follow the City of Surprise Underground Retention/Detention Systems Standards and Specifications as published in Appendix 5-4.

18. Surface retention is not required on single-family residential lots under one acre in size and is discouraged on daycare playgrounds.

19. When site walls are also being used for one side of the retention basin, the frontage part of the wall can be a maximum of five feet high on the retention side.

20. Buildings adjacent to retention basins are to have finish floors a minimum of one foot above the 100-year, 2-hour water surface elevation.

21. Offsite storm runoff should not be routed into or through onsite storm water storage facilities.

22. No more than 50% of a project's primary frontage shall be utilized for retention.

23. Private utilities installed beneath retention/detention basins (if permitted) shall have a minimum of 30 inches of cover.

24. Drywells are required for any depth of retention in excess of one foot and for retention basins that have volume greater than 1,000 cubic feet. Basin bottom percolation shall not be used to reduce the volume used for drywell requirement calculations.

25. Dual chamber drywells are required for all storm water retention applications.

26. Drywells shall be installed according to ADEQ guidelines and shall also be registered with ADEQ by the property owner.

27. Drywells shall be maintained by the land owner or the association formed by the owner.

28. For drywells associated with surface retention basins, a maximum design percolation rate of 0.5 cubic feet per second (cfs) per dry well shall be used in calculating the number of dry wells required. For drywells associated with underground storage systems, a percolation rate of 0.1 cfs per drywell shall be used.

29. The drywell volume shall not be considered in the design calculations for sizing retention/detention.

30. Multi-chamber drywells such as the Envibro System or approved equal are required for fueling stations. A maximum percolation rate of 0.1 cfs may be used for these systems.

31. Drywell rim elevations shall be set a minimum of 0.3 feet above finish grade of basin bottom.

5.10 DETENTION FACILITIES

1. Natural drainage-ways convey flood water and are used for trails and open space corridors. The consideration to maintain natural vegetation and wildlife habitat is an important element that contributes to the sustainability of the land.

2. Natural drainage-ways shall remain in as natural state as is practicable with any modifications proposed, including any erosion mitigation measures.

3. New developments' pre-development and post-development storm water flows that directly outfall into natural drainage-ways shall limit peak flows from both the 10-year and 100-year storm event to the project site pre-development conditions via design of detention facilities.

4. Detention Basin Standards include:

    a. Detention basin outlet capacity shall not increase downstream channel capacities in the pre-development condition.

    b. Embankment protection of the detention basin shall be considered for each basin. See FCDMC Drainage Manual, Erosion Control for protection measures.

    c. Off-channel detention basins shall be required.

    d. Detention basins shall be designed to dissipate within 36 hours of the storm event.

    e. All detention basins shall have emergency spillways which safely pass the 100-year storm event without compromising the structural integrity of the facility or diverting flows from their historic drainage pattern.

    f. A minimum of one foot of freeboard is required above the emergency spillway.

    g. Allowable peak discharge shall be not greater than the pre-development 100-year, 2-hr storm event flows.

5.11 DRAINAGE EASEMENT

Refer to the SUDC Chapter 122 for dedication of drainage easements.

5.12 STORM WATER POLLUTION PREVENTION PLAN (SWPPP) CHECKLIST

Owners, developers, engineers, and/or contractors are required to prepare a Storm Water Pollution Prevention Plan (SWPPP) for developments within the City of Surprise with a disturbed area of one acre or greater, or are part of a common plan of development or sale that will ultimately disturb one or more acres. Appendix 5-1 contains a checklist for the preparation of a SWPPP.

APPENDIX 5-1

CHECKLIST

FOR

STORM WATER POLLUTION PREVENTION PLAN (SWPPP)

SURPRISE
ARIZONA

PUBLIC WORKS DEPARTMENT

16000 N. Civic Center Plaza
Surprise, Arizona 85374
Office: (623) 222-7000
Fax: (623) 222-7001
Web Site: www.surpriseaz.gov

SWPPP Guidance Document

(Storm Water Pollution Prevention Plan)

Development/Project Name: _____

Parcel/Section Number: _____

Address/Location: _____

Net Area (Acre(s)): _____

SIC/NAICS CODE: _____

The City of Surprise requires all development with a disturbed area of one acre or greater or that is part of a common plan of development or sale that will ultimately disturb one or more acres to submit the required Storm Water Pollution Prevention Plan (SWPPP). The owner/developer must submit all required documents (Storm Water Pollution Prevention Plan (SWPPP), Notice of Intent (NOI), and the Storm Water Management Plan (SWMP)) to the Arizona Department of Environmental Quality (ADEQ) as required by law and under the AZPDES Construction General Permit, AZG2013-001.

In addition, the SWPPP shall include all requirements of Maricopa County Rule 310 and all requirements of the SUDC as it pertains to storm water. Copies of all requirements, forms and guidance are available in the Drainage Design Manual for Maricopa County Erosion Control available at the Flood Control District, 2801 West Durango St., Phoenix, Arizona 85009, Phone No (602) 506-1501 and the City of Surprise website.

The following checklist serves to minimize redline comments on the site plans and to maintain consistency among plan reviewers for storm water. Plan approval, issuing permits, and certain grading clearances depend on compliance with the comments made on this checklist. The engineers of record shall satisfy themselves of the completeness and accuracy of the design.

This review shall serve as a courtesy review only. The Owner/Developer is ultimately responsible to ensure that all of the requirements outlined under AZPDES with ADEQ are followed.

Please return this checklist and the check prints with your next submittal. Discussion of redline-comments on plans or this checklist should be directed to the City of Surprise Review Engineer.

General Requirements:

Site Plan Sheet Information:

- □ Sheets to be 24" X 36"
- □ All sheets to be sealed by an active Arizona Registered Professional Civil Engineer

Cover Sheet

- □ Project title block with name and address of project
- □ Legal description of project location including Township, Range, and Section
- □ Total site area (acres)
- □ Total area of disturbance (acres)
- □ Vicinity map showing one-mile radius around project with north arrow
- □ Index of plan sheets if more than one plan sheet
- □ Owner/developer name, address, and phone number
- □ Engineer name, address, and phone number
- □ Contractor name, address, and phone number. If contractor is not known, leave this blank for future completion

Plan Sheets

- □ Legend
- □ North arrow and bar scale
- □ Existing contours
- □ Floodplains
- □ Drainage patterns and slopes after grading
- □ Areas of soil disturbance
- □ Areas not to be disturbed
- □ Areas where final stabilization has been accomplished
- □ Construction ingress/egress to the site
- □ Locations and methods of structural and nonstructural controls
- □ Locations where stabilization practices are to occur
- □ Locations of on-site and off-site material, waste, borrow areas, or equipment storage
- □ Locations of all surface water bodies
- □ Locations where storm water is discharged
- □ Location of other pollutant sources such as fueling operations, asphalt plants, concrete plants, etc.
- □ Location and quantity of offsite to onsite flows
- □ Location of all temporary and permanent basins
- □ Location of equipment maintenance, parking areas
- □ Details of all applicable BMPs

SWPPP Manual Information:

- □ A copy of the approved SWPPP shall be maintained on the site and available for review.
- □ The Notice of Intent (NOI) shall be completed and submitted to the City of Surprise and Arizona Department of Environmental Quality (ADEQ) prior to any construction activity.
- □ The Contractor, Owner or Operator shall perform a visual inspection of the construction site a minimum of once every seven days and within 24 hours of rainfall events greater than or equal to one-half inch.
- □ The Contractor, Owner or Operator shall prepare reports documenting any findings on the conditions of the SWPPP controls and note any erosion problem areas.
- □ Facilities shall be maintained as necessary to ensure their continued functioning.

- □ All temporary siltation controls shall be maintained in a satisfactory condition until such time that construction is completed, permanent drainage facilities are operational, and the potential for erosion has passed as determined by the City Engineer or designee.
- □ The implementation of these plans and the construction, maintenance, replacement and upgrading of these facilities is the responsibility of the permittee/contractor until all construction is approved and the Notice of Termination has been submitted.
- □ The owner/operator/contractor of the site must also maintain records with the following information:
    - The dates when major grading activities occur in a particular area;
    - The dates when construction activities cease in an area, temporarily or permanently;
    - The dates when an area is stabilized, temporarily or permanently; and
    - The dates when any maintenance and or replacement or removal of required BMPs takes place.
- □ The operator is required to maintain full compliance with the general construction permit, as issued by ADEQ, to maintain an effective SWPPP. The SWPPP must be updated to accurately reflect site features and operations. The plan must also be amended if it is determined by the City Engineer or designee as not effective at minimizing pollutant discharges from the site.
- □ Once the construction activities have been completed and the site has met the final stabilization requirements of the permit, the authorized site representative may file a Notice of Termination (NOT) with ADEQ. A copy of the NOT must also be submitted to the City of Surprise. This will effectively terminate coverage under the permit.
- □ The site owner or the authorized representative shall sign and certify the plan.
- □ The person must certify that all information is true and assumes liability for the SWPPP.
- □ The registrant preparing the plan may be liable to the site operator/owner.
- □ Example of plan certification:

    I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage this system, or those persons directly responsible for gathering the information, I believe the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment. In addition I certify that the permittee will comply with all terms and conditions stipulated in the General Permit No. AZG2008-001 issued by the Arizona Department of Environmental Quality (ADEQ).
- □ Any violations and fines are the responsibility of the operator/owner and site contractor.
- □ ADEQ also requires that the contractors and subcontractors responsible for implementing measures in the SWPPP be listed in the plan with the measures for which they are responsible.
- □ Any contractor or subcontractor must also sign a certification statement that they understand the permit requirements as reflected in the SWPPP.

- □ Example of contractor or subcontractor certification statement:

    I (Name of Contractor or Subcontractor) acting as (Job Title) for the (Project Name), an authorized representative, having reviewed this SWPPP and all of the relevant documents, do herby certify that I understand all components of this plan and will perform all required inspections and maintenance activities as required; and that I will keep all necessary, required and up to date records at the job site.
- □ In the SWPPP a legend identifying grades, symbols, and lines, etc.
- □ Maricopa County Rule 310 permit number
- □ Construction activity description of the purpose or goal(s) of the construction project.
- □ List of soil disturbing activities necessary to complete the project.
- □ Location and steepness of slopes after final grading.
- □ Drainage patterns of the site after major grading activities and the location of the points where storm water will discharge from the site.
- □ Location and areas of soil disturbing activities or the total area of the site where soil will be disturbed.

- □ Location and areas of non-disturbance. This would include natural open space, jurisdictional washes and any others noted in Section 404 of the Clean Water Act. All of these non-disturbed areas must be delineated and fenced in the field.
- □ Post construction drainage patterns must be shown.
- □ Description of the erosion and sediment controls that are to be used during construction. These controls include stabilization measures for disturbed areas and structural controls to divert runoff and remove sediments. Selected controls must be per the Best Management Practices (BMP) outlined in the Drainage Design Manual for Maricopa County, Erosion Control.
- □ Show location of all temporary or permanent sediment basins being installed.
- □ Pollution controls for construction site waste material storage.
- □ Pollution controls for preventing offsite tracking of sediments and generation of dust.
- □ Pollution controls for hazardous material storage.
- □ Pollution controls for equipment maintenance areas.
- □ Pollution controls for parking areas.
- □ Description of storm water management controls that will be installed to control pollutants after construction completion.
- □ All grading activities to be performed on any site that is a part of a larger common plan or development.
- □ A list and description of BMPs that will be utilized on site.
- □ Sequence of major activities that would include the installation of all controls, earth disturbing activities, stabilization activities, the maintenance required for the controls and a clear timeline showing the order in which these activities will take place.

Additional Notes or Comments about Storm Water Pollution Prevention on this Construction site: _____

_____

_____

_____

_____

_____

_____

PUBLIC WORKS DEPARTMENT

16000 N Civic Center Plaza
Surprise, Arizona 85374
Office: (623) 222-7000
Fax: (623) 222-7001
Web Site: www.surpriseaz.gov

Section 404 Certification

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 administered by the U.S. Army Corps of Engineers (COE), 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.

Certification of Section 404 Permit Status			
Owner's Name:			
Project Name/Description:			
Project Location/Address:		Phone:	- -
		Case No:	

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 Section 404 Permit has already been obtained for this project.

   OR

   ☐ 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:

   ☐ No watercourses or other waters of the U.S. exist on the property.

   ☐ No jurisdictional waters of the U.S. exist on the property. Attached is a copy of the COE's Jurisdictional Determination.

   ☐ 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 5-2

CHECKLIST

FOR

CONSTRUCTION SITE SWPPP INSPECTION

SURPRISE
ARIZONA

PUBLIC WORKS DEPARTMENT

16000 N Civic Center Plaza
Surprise, Arizona 85374
Office: (623) 222-7000
Fax: (623) 222-7001
Web Site: www.surpriseaz.gov

Construction Site SWPPP Inspection Checklist

Inspector Information			
Name:		Date:	/ /
Phone:	- -	Time In: Time Out:	: :

Type of Inspection									
☐	Initial Level 1	☐	Level 1 Monthly or Rain Event	☐	Levels 1 and 2	☐	Level 3	☐	Final

Facility Information			
Development/Project:			
Location/Address:			
AZPDES ID	AZCON-		
Parcel or Section #s:			
Owner:		Phone:	- -
Operator:		Phone:	- -

Site Information									
Nature of Project	☐	**Residential**	☐	**Roadway**	☐	**Utility**	☐	**Right-of-Way**
	☐	Commercial	☐	Industrial	☐	Geotechnical	☐	Offsite
Stage of Construction	☐	Clearing	☐	Grubbing	☐	Infrastructure	☐	Vertical
	☐	Mass Grade	☐	Rough Grade	☐	Final Grade	☐	Stabilization
Is the site located within one-mile of a river or direct tributary thereof?						☐	Yes	☐	No
If yes, list name and proximity to the site.									

Yes	No	**Initial Level 1 Inspection – Basic Permit Information**
☐	☐	Is the development covered by a storm water permit issued by the ADEQ or EPA?
☐	☐	Is a copy of the NPDES/AZPDES Permit available on-site for review?
☐	☐	Is there a copy of the approved SWPPP Manual & Plan available on-site for review?
☐	☐	Is there a copy of the approved NOI available on-site for review?
☐	☐	Has a copy of the NOI been received by the city?
Yes	**No**	**Level 1 Inspection – Monthly or After a Rain Event of ½ Inch or More**
☐	☐	Has there been a rain event within the past 24 to 48 hours?
☐	☐	Are there locations of discharges of sediment or other pollutants from the site?
☐	☐	Are there locations of BMPs that are in need of maintenance?
☐	☐	Are there locations of BMPs that are not performing, failing to operate, or were inadequate?

Yes	No	Level 2 Inspection – After Significant Findings in a Level 1 Inspection
☐	☐	Does the SWPPP contain current information on owners/operators?
☐	☐	Are all operators in the development covered by a single SWPPP?
If no, provide NPDES/AZDES permit numbers for other operators working on common development.		
☐	☐	Has a Compliance Evaluation Report been completed within the past 7 days?
☐	☐	Is construction being conducted during seasonal dry period?
☐	☐	Do the material(s) storage areas show evidence of pollutant discharges?
☐	☐	Will any corrective action be needed on any control BMP's that are visually inspected?
☐	☐	Will a level 3 inspection be required?
☐	☐	Is there evidence of, or the potential for pollutants to enter into the drainage system?

Yes	No	Level 3 Inspection – After Significant Findings in a Level 1 or Level 2 Inspection
☐	☐	Are erosion BMPs listed in SWPPP manual being utilized?
☐	☐	Are sediment BMPs listed in SWPPP manual being utilized?
☐	☐	Are housekeeping BMPs listed in SWPPP manual being utilized?
☐	☐	Is construction operator/owner trying to take corrective action?
☐	☐	Will any corrective action be needed on any control BMP's that are visually inspected?
☐	☐	Will a follow up level 3 inspection be required?

Yes	No	Final Inspection – Yes to All = Post Construction Checklist for Any Future Storm Water Issues
☐	☐	Are all soil disturbing activities complete?
☐	☐	Temporary erosion and sediment control measures have been removed?
☐	☐	All areas of the construction site not covered by permanent pavement have been stabilized with vegetative cover with a density of 70% or more?

Notes:

		Date:	/ /
Inspector:			

APPENDIX 5-3

PRELIMINARY AND FINAL

DRAINAGE REPORT GUIDELINES

Preliminary and Final Drainage Report Guidelines

Guidelines for the Preparation of Preliminary and Final Drainage Reports Required for Proposed Development Within the City of Surprise, Arizona

SURPRISE
ARIZONA

1.0 INTRODUCTION

1.1 Purpose

This document was prepared for the City of Surprise (the city) as a tool for developers and engineers seeking construction permits for any proposed improvements within the city limits that require the preparation and submittal of accompanying 'preliminary' and 'final' drainage reports. This Drainage Report Guideline will serve as a reference document that defines the city's minimum standards and requirements for preliminary and final drainage design. Adherence to these minimum drainage requirements by the development and engineering community doing work within the city is imperative to mitigate the hazards associated with the potential for increased runoff that is inherent to the majority of new development.

1.1.1 Intent

The intent of this document is not to provide a comprehensive 'catch all' drainage design manual. This document assumes that the user is familiar with the basic concepts and industry best standard practice for hydrologic and hydraulic analysis and computations. Further, it is assumed that the user has a good understanding of the theory and science behind those subjects. Rather, the intent of this document is to convey to the user the minimum topics that a preliminary and final drainage report submitted to the City of Surprise should address. For example, regardless of the existence of offsite flow impacts to a particular project site, offsite flow should always be addressed and explained generally in the preliminary drainage report and then in detail for the final drainage report.

This document should not be expected to address all situations that may be relevant on specific project sites. It will merely provide a guide that will aid developers and engineers in the goal of meeting the basic minimum criteria for *any* drainage design conducted within the City of Surprise. Every project is different and may be associated with a set of drainage design challenges unique to its specific location not common to other projects. Although these issues may not be specifically addressed by this guideline, they must be identified and addressed by the preliminary and final drainage report(s) for that project. The 'Preliminary' and 'Final' Drainage Report(s) must be stamped, sealed, and signed by a registered Civil Engineer in the state of Arizona.

1.1.2 Objective

The objective of this document is to provide developers and engineers proposing projects within the City of Surprise with a 'preferred' format to follow when submitting both preliminary and final drainage reports. This document includes the following information:

- A section describing the minimum elements that must be included with any preliminary and final drainage report submitted to the City of Surprise for review and approval.
- A checklist to follow when preparing a preliminary drainage report submittal to ensure that the minimum content required for a comprehensive drainage review of a proposed development and preliminary plat is clearly presented.
- A checklist to follow when preparing a final drainage report submittal to ensure that the minimum content required for a comprehensive drainage review of a proposed development is clearly presented.

2.0 PRELIMINARY DRAINAGE REPORT SUBMITTAL

2.1 Minimum Elements Required

This section will briefly summarize the basic elements that should be addressed by all preliminary drainage reports submitted to the City of Surprise for review and approval. For a summary of the basic elements that should be addressed by all final drainage reports submitted to the City of Surprise for review and approval refer to section 3.0.

The following 'suggested' table of contents for preliminary drainage report submittals is not required. However, a similar report format that addresses each element listed will be the minimum expectation of the applicant or his/her representative by the city.

Note that a general discussion of items listed below is required for the preliminary drainage report submittals. At the preliminary drainage report submittal, the discussion of the 'suggested' items may be brief and general with the understanding that these items will be addressed in greater detail with the subsequent submittal of the final drainage report. It is important that the suggested items below are addressed at the preliminary plat stage for the proposed development to minimize the number of drainage issues that may otherwise not come to light until the project is much further along.

Several additional items (see section 3.0) that are not usually required for inclusion with the preliminary drainage report must be discussed in the final drainage report. In certain cases, it may be appropriate to include some of those items in the preliminary drainage report submittal. It is up to the developer/engineer to use his or her judgment when determining the appropriate contents of a preliminary drainage report. The following items should be addressed at a minimum:

1. Introduction

1.1. Project Description

1.1.1. Project Name & Address if known

1.1.2. Location & Topography

1.1.3. Purpose

1.1.4. Existing/On-Going Studies

1.1.5. Regional Drainage Plan

1.1.6. Site Location Relative to Known FEMA Flood Hazard Zones

2. Hydrologic Analysis

2.1. Off-Site Hydrology

2.1.1. Impact(s) to Proposed Project Site

2.1.2. Existing Land Use

2.2. On-Site Hydrology

2.2.1. Methodology and Criteria

3. Proposed Drainage Infrastructure

3.1. Conveyance of Runoff Through Project Site

3.2. Onsite Retention Requirements

3.2.1. Required Retention Volume

3.2.2. Provided Retention Volume

3.2.3. Retention Basin Ultimate Outfall

4. Special Issues or Considerations

4.1. 401/404 Permit

4.2. Floodplain Use Permit with FCDMC

5. Summary and Conclusions

6. References

TABLES

FIGURES

APPENDICES

EXHIBITS

Each of the elements listed above is briefly described below. Each element should include a brief discussion and may include some preliminary analysis if required to support/document any data shown within the text or on tables. If any of the elements listed above and described below are not applicable to a particular project site the developer/engineer should still include the element heading within the preliminary drainage report. A single sentence explaining why the element is not applicable to the specific project site must be provided. This is important since it indicates that the developer/engineer is generally aware of such elements and has addressed them as far as they need to. If an element is simply 'left-out' of the report, it is unclear whether it was considered and/or the reason or reasons it was deemed 'not applicable'.
If required, the appendix provided for the preliminary drainage report will contain detailed calculations and data sheets necessary to develop the summary tables.

Introduction – Every preliminary drainage report must include a short introductory section that describes the general area within which the project site is located, some 'context' for the project site and a brief summary of the overall area.

Project Description – This will include the specific project site location, a simple vicinity map (showing the project site relative to the overall region), topographic characteristics, hydrologic character of the area, the purpose of the report; any existing or past studies in, near or otherwise relevant to the project area; any existing regional drainage facilities, features such as irrigation canal, CAP, Railroad, and the location of the project site relative to known FEMA flood hazard

zones. At the preliminary level, the above items may be explained in general/broad terms. These and other elements will be described in much more detail in the final drainage report.

Project Name and Address if Known – Briefly state the name of the project and the address if known.

Location and Topography – A very brief description of the hydrologic character within which the project site is located (natural desert, mountain, alluvial fan, valley, foothills, etc.) as well as the major existing land uses (Industrial, Commercial, Lot Split & Subdivision).
This section should also include a description of the topography in terms of overall direction of flow. Any other major features such as existing washes or flood control channels should be noted as well.

Purpose – A brief statement as to the necessity for the drainage report. What is the improvement project that requires the preparation of the drainage report?

Existing/On-going Studies – This is a list of any past/on-going studies available within the vicinity of the project site that may have an impact on the site. These are usually relevant to offsite discharges impacting proposed project sites. These may include, but are not limited to, Flood Delineation Studies (FDS), Area Drainage Master Studies (ADMS), and Area Drainage Master Plans (ADMP). At the preliminary level, the report can list relevant studies as a 'bullet' list. The final drainage report will contain a more detailed description and summary of each study listed.

Regional Drainage Plan – This should be a very general description of regional drainage features and/or the existence of a regional drainage plan. At the preliminary report level, these features need only be acknowledged with a full discussion following in the final drainage report. It is important to be aware of such features early in the project as they impact ultimate outfall for proposed project sites and can provide a means of draining storm water stored within retention basins once the event has passed.

Site Location Relative to Known FEMA Flood Hazard Zones – This is very important to establish any known flood hazards that may exist around or on the project site. This information will be used as a basis for determining the need for the mitigation of known hazards through site improvements that could require a CLOMR/LOMR process. Regardless of the existence of a known flood hazard zone, a figure must be provided illustrating the overall project site superimposed onto the appropriate 'current' published Flood Insurance Rate Map (FIRM). The panel number and effective date of the FIRM must be visible on the figure. This information is very important at the preliminary level as it can have a significant impact on the proposed preliminary plat.

Hydrologic Analysis – This section will contain a brief description of the 'existing condition' hydrology, as well as the 'proposed condition' hydrology. The description will explain the methods, criteria and assumptions used to determine both preliminary onsite and offsite discharge rates necessary for the support of the preliminary plat. This section will also briefly

describe the detailed methodology, criteria and assumptions that will be used to develop the final drainage design.

Off-Site Hydrology – This will be a general description of the offsite discharges impacting the project site. This section of the report must contain a summary table of offsite sub basin area discharges and a corresponding concentration point that can be quickly and easily referenced on a figure (minimum 11"x17") within the report. Finally, the appendix will contain documentation for any calculations and computations used to develop the data contained within the summary table.

Impact(s) to Proposed Project Site– This section will briefly describe the potential impacts to the project site due to offsite discharges. If there are no impacts, this section will explain why.

Existing Land Use – This section is contained within the 'Off-Site Hydrology' section of the report. It will provide a general overview of the existing offsite land use.

On-Site Hydrology – This portion of the report will describe in general the nature of the onsite proposed land use and an approximation of the weighted roughness coefficient ("C" value) based on Table 3-2 of the Flood Control District of Maricopa County's (FCDMC) Drainage Design Manual, Hydrology.

Methodology and Criteria – A brief description of the methodology and criteria followed to develop any onsite peak flow rates necessary to support the preliminary plat. This section must reference the methods and criteria required by the City of Surprise. This section should explain in general terms the more detailed approach that will be used in the final drainage report.

Proposed Drainage Infrastructure – This is a very general discussion of the proposed drainage system that will be used within the project site to safely collect and dispose of excess runoff generated during 10, 50 and 100-year peak storm events. The detailed description and accompanying analysis will be presented in the final drainage report.

Conveyance of Off-site Runoff Through Project Site – As a sub-section of 'Proposed Drainage Infrastructure', this section will provide a general description of the proposed conveyances that will be detailed in the final drainage report. This section will give a summary of those conveyances as well as their expected operation during the 10, 50 and 100-year peak events per the City of Surprise requirements.

Onsite Retention Requirements – This section will explain the City of Surprise requirements for onsite retention including, freeboard, side slopes, ponding depths, drain time and means of draining the basin. The equation used to compute the required volume of retention onsite should be shown with all of the terms clearly labeled and defined within the text.

Required Retention Volume- This section should show the equation used to determine the required retention volume, define the terms and direct the reader to the appendix for detailed calculations and data documenting the computation of the required retention volume for the project site.

Provided Retention Volume- This section should show the equation used to determine the provided retention volume, define the terms and direct the reader to the appendix for detailed calculations and data documenting the computation(s). This section should provide the information necessary to show that areas designated for retention on the preliminary plat are sufficient given the basin geometry constraints (per City of Surprise requirements) and in light of the required volume computed in the previous section.

Retention Basin Ultimate Outfall – This section should provide a brief description of the ultimate outfall for the basin sites proposed on the preliminary plat. This section should describe (in concept) the way in which basin surcharges will be conveyed through the site. Such basin surcharge could be due to a non-design storm event that results in more volume intercepted by the basin than is provided by the basin.

Special Issues or Considerations – This section of the report should include an overview of any issues or considerations that could become significant during the preparation of the final drainage report and are unique to this project site. Such issues or considerations may include but are not limited to the following:

- 401/404 permit requirements
- Floodplain use permit

Summary and Conclusions – This section will provide a quick summary of the proposed preliminary drainage concept for the project site and make conclusions as to its operation and ability to support the proposed preliminary plat as well as meet the City of Surprise requirements.

References – This section will provide a set of references that will document any and all explanation, calculations, methodology, criteria, past & on-going studies, etc… that were contained within the text of the preliminary report. At a minimum these references should include a title, author and date.

TABLES – This portion of the table of contents will list all tables provided in the preliminary report and the corresponding page number.

FIGURES - This portion of the table of contents will list all figures provided in the preliminary report and the corresponding page number.

APPENDICES – This portion of the table of contents will list all appendices provided in the preliminary report and a brief description of their contents.

EXHIBITS – This portion of the table of contents will list all exhibits provided in the preliminary report and their location. At a minimum, every preliminary drainage report submitted MUST provide an onsite and offsite drainage exhibit.
The onsite drainage exhibit should be plotted at a size and scale appropriate for verification of any preliminary drainage sub basin areas, proposed retention/detention basin volumes, etc…

At a minimum, this exhibit must show project property boundaries, all existing structures, existing drainage patterns/features, existing contours and/or spot elevations, phase labels in the appropriate phase, proposed retention/detention basin locations, expected onsite flow patterns and flow arrows.
The offsite drainage exhibit may be at a smaller scale than that used for the onsite exhibit but must be easily readable. Any delineated sub basin areas necessary for the support of the proposed preliminary plat must be at a scale suitable for area verification using a standard planimeter. This exhibit must show the entire offsite area contributing to the discharge at the project boundary and must include all information necessary for verification of the developed flow rates used in the drainage report.

If the offsite discharges were developed under a separate study or provided for use with this project, the source of these discharges must be clearly referenced and specified within the report. In this case, the offsite drainage exhibit may be much less detailed and need only serve as a reference to the reader that will establish the geographic context within which the project site exists.

2.2 Preliminary Drainage Report Checklist

Figure 1.0 contains a checklist of the major elements associated with most preliminary drainage reports submitted in support of preliminary plats. If there are other relevant issues, concerns or requirements not addressed by Figure 1.0 of this document, they must still be addressed within the preliminary drainage report.

Figure 1.0
City of Surprise
Typical Elements of a Preliminary Drainage Report

	N/A	Not Applicable to this project
X		Item was addressed by report
X	X	Item addressed by others and referenced in this report

Project Location

Site Description		
		Location and topography
		Purpose
		Existing/on-going studies
		Regional Drainage Plan
		Site location relative to known FEMA Flood Hazard Zones

Hydrologic Analysis

Off-Site Hydrology		
		Impact(s) to proposed project site
		Existing land use

On-Site Hydrology		
		Methodology and criteria
		Existing land use
		Future land use

Proposed Drainage Infrastructure

On-Site Retention		
		Minimum 1 foot freeboard provided
		Maximum 3 foot ponding as measured from adjacent low top of curb
		Required retention volume computed with calculations documented in appendix
		Provided retention volume computed with calculations documented in appendix
		Retention summary table prepared
		Ultimate outfall for proposed retention basins

On-Site Drainage Exhibit		
		On-site drainage exhibit provided
		Scale suitable (1”=100’ min.)
		Existing features, topography, etc…
		Phase lines and proposed lots are labeled
		Proposed drainage sub-basin areas, proposed retention and detention basins are labeled
		Flow arrows

Figure 1.0
City of Surprise
Typical Elements of a Preliminary Drainage Report

	N/A	Not applicable to this project
X		Item was addressed by report
X	X	Item addressed by others and referenced in this report

Off-Site Drainage

Impacts To Others		
		Exhibit showing project site relative to off-site area and delineated off-site drainage areas with concentration points

General Site Considerations

Other Considerations		
		Project site meets minimum open space requirements
		401/404 Permit issues addressed
		Mitigation of known flood hazards addressed
		Historic drainage patterns and relevance to proposed project site discussed
		Existence of regional drainage facilities
		Existence and implications of a regional area drainage master plan in the vicinity of the propose project site
		Coordination with other development and/or agencies that may be impacted by project site
		Impact of on-going or completed drainage studies or plans implemented in the proposed project site
		Floodplain Use Permit - FCDMC

3.0 FINAL DRAINAGE REPORT SUBMITTAL

3.1 Minimum Elements Required

This section will briefly summarize the basic elements that should be addressed by all final drainage reports submitted to the City of Surprise for review and approval. The following 'suggested' table of contents is not required. However, a similar report format that addresses each element listed below will be the minimum expectation of the applicant or his/her representative by the city for final drainage report submittals.
Many of the elements listed below were included in the preliminary drainage report guideline above. Unlike the general/broad element discussions contained within the preliminary drainage report, those items addressed by the final drainage report must be presented at a much greater level of detail and will usually include extensive analysis with supporting data and calculations provided in an appendix and summarized on tables.

1. Introduction

1.1. Project Description

1.1.1. Project Name & Address if known

1.1.2. Location & Topography

1.1.3. Purpose

1.1.4. Existing/On-Going Studies

1.1.5. Regional Drainage Plan/Characteristics

1.1.6. Site Location Relative to Known FEMA Flood Hazard Zones

1.1.7. Reference to established Bench Mark, address location of any proposed On-site Temporary Bench Marks

2. Hydrologic Analysis

2.1. Off-Site Hydrology

2.1.1. Impact(s) to Proposed Project Site

2.1.2. Development of Off-Site Peak Discharges

2.1.3. Conveyance of Off-Site Discharge

2.1.4. Discharge at the entrance and exit points

2.1.5. Existing Land Use

2.2. On-Site Hydrology

2.2.1. Methodology and Criteria

2.2.2. Existing Condition Discharges

2.2.3. Proposed Condition Discharges

2.2.3.1.Future Land Use

3. Proposed Drainage Infrastructure

3.1. Conveyance of Runoff Through Project Site

3.1.1. Street Conveyance

3.1.2. Proposed Channel Conveyance

3.1.3. Proposed Storm Drain Conveyance

3.1.4. Inlet Sizing

3.2. Onsite Retention Requirements

3.2.1. Proposed Basin Geometry and Freeboard

3.2.2. Required Retention Volume

3.2.3. Provided Retention Volume

3.2.4. Dissipation of Stored Runoff

3.2.5. Onsite Retention Summary

3.2.6. Ultimate Retention Basin Outfall

4. Interim Condition Drainage Concept/

5. Special Issues or Considerations

5.1. 401/404 Permit

5.2. NPDES

5.2.1. SWPP

5.2.2. First Flush

5.3. Downstream Impacts of Proposed Improvements

5.4. Upstream Impacts of Proposed Improvements

5.5. Floodplain Use Permit with FCDMC

5.6. Drywell Registration with ADEQ

6. Summary and Conclusions

7. References

TABLES

FIGURES

APPENDICES

EXHIBITS

Each of the elements listed above is briefly described below. Note that although these descriptions may be brief, the actual element may require an extensive discussion and supporting analysis with calculations provided within the final drainage report. In contrast however, some of the elements listed above and described below may not be applicable to a particular project

site. In this case, the developer/engineer should provide the element heading within the report and then a sentence explaining why this is not applicable to the specific project site. This is important since it indicates that the developer/engineer is generally aware of these elements and has addressed them as far as they need to. If the element is simply 'left-out' of the report, it is unclear if it was considered and/or the reason or reasons it was deemed 'not applicable'.

Introduction – Every final drainage report must include an introductory section that describes the general area within which the project site is located, some 'context' for the project site and a brief summary of the overall area.

Project Description – This will include the specific project site location, vicinity map, USGS drainage map, aerial photo, topographic characteristics, hydrologic character of the area, the purpose of the report; any existing or past studies in, near or otherwise relevant to the project area; any existing regional drainage facilities, features such as irrigation canal, CAP, Railroad, and the location of the project site relative to known FEMA flood hazard zones.

Project Name and Address if Known – Briefly state the name of the project and the address if known.

Location and Topography – A very brief description of the hydrologic character within which the project site is located (natural desert, mountain, alluvial fan, valley, foothills, etc.) as well as the major existing land uses (Industrial, Commercial, Lot Split & Subdivision).
This section should also include a description of the topography in terms of overall direction of flow and existing approximate percent grade through the project site. Any other major features such as existing washes or flood control channels should be noted as well. A plan view figure should be provided at a scale sufficient for the reader to see the adjacent streets/features that will place the project site in a clear context of the region within which it exists.

Purpose – A brief statement as to the necessity for the final drainage report. What is the improvement project that requires the preparation of the final drainage report?

Existing/On-going Studies – This is a list of any past/on-going studies available within the vicinity of the project site that may have an impact on the site. These are usually relevant to offsite discharges impacting proposed project sites. These may include, but are not limited to, Flood Delineation Studies (FDS), Area Drainage Master Studies (ADMS), and Area Drainage Master Plans (ADMP).

Regional Drainage Plan/Characteristics – This should be a description of regional drainage features. Such features could be an engineered flood control channel or a major existing wash corridor. These features are important when considering ultimate outfall for proposed project sites as well as providing a potential means of draining proposed retention/detention basins using gated outlet/bleed pipes that may be opened after a storm event passes.

Site Location Relative to Known FEMA Flood Hazard Zones – This is very important to establish any known flood hazards that may exist around or on the project site. This information will be used as a basis for determining the need for the mitigation of known hazards through site

improvements that could require a CLOMR/LOMR process. Regardless of the existence of a known flood hazard zone, a figure must be provided illustrating the overall project site superimposed onto the appropriate 'current' published Flood Insurance Rate Map (FIRM). The panel number and effective date of the FIRM must be visible on the figure.

Reference to Established Bench Mark – This will include a discussion of any proposed onsite Temporary Bench Marks.

Hydrologic Analysis – This section will contain the detailed description of the 'existing condition' hydrology, the 'proposed condition' hydrology, and a detailed description of the hydrologic analysis with references to detailed calculations in the appendix. The description will explain the methods, criteria and assumptions used to determine both onsite and offsite discharge rates used for the design of the proposed drainage system within and around the project site.

Off-Site Hydrology – This will be a detailed description of the offsite discharges impacting the project site. This section of the report must contain a summary table of offsite sub basin area discharges and a corresponding concentration point that can be quickly and easily referenced on a drainage exhibit provided in the back of the report. Finally, the appendix will contain all detailed calculations and computations.

Impact(s) to Proposed Project Site– This section will explain the nature and extent of the impacts to the project site due to offsite discharges. If there are no impacts, this section will explain why.

Development of Off-Site Peak Discharges– This section will describe the methods, criteria and assumptions used to develop offsite discharges. If offsite discharges were developed by another study, that study should be referenced and documented in the appendix.

Conveyance of Off-Site Discharge – Explain how offsite discharges impacting the project site will be conveyed through and/or around the site.

Discharge of Entrance and Exit Points – This will be a discussion of the existing discharges along the proposed project site boundary. This discussion will establish a basis for the existing condition that a proposed development may not change unless the change is an improvement to the existing condition.

Existing Land Use – This section is contained within the 'Off-Site Hydrology' section of the report. This will provide a description of the existing offsite land use and (if required) an exhibit illustrating the existing ground cover, structures and discharges.

On-Site Hydrology – This portion of the final drainage report will explain in detail the nature of the onsite proposed land use, land use dimension and areas, roughness coefficient and weighted "C" value used based on Table 3-2 of the Flood Control District of Maricopa County's (FCDMC) Drainage Design Manual, Hydrology.

Methodology and Criteria – A detailed description of the methodology and criteria followed to develop the onsite peak flow rates. This section must reference the methods and criteria required by the City of Surprise.

Existing Condition Discharges – This section will provide the detailed discussion of the existing drainage condition sheet flows or concentrated washes ingress/egress if applicable. This section of the final drainage report must contain a summary table of onsite discharges and corresponding concentration points that can be referenced on a drainage exhibit provided in the back of the report. Finally, the appendix will contain all detailed calculations and computations.

Proposed Condition Discharges – This section will provide a detailed discussion of the proposed condition discharges. This section of the report must contain a summary table of onsite (proposed condition) discharges and a corresponding concentration point that can be referenced on a drainage exhibit provided in the back of the final drainage report. At a minimum, the summary table should include the following:

- Proposed concentration point and the Discharge at the entrance to the site must be labeled.
- Contributing sub basin area(s) ID and corresponding area of each and the Discharge at the concentration point must be stated. If there is more than one contributing area at a particular concentration point, provide a total summation of the individual areas. Footnote the table to direct the reader to the detailed calculation and data documenting the proposed condition discharges.
- The proposed discharge at the concentration point for the 10, 50 and 100-year storm events.

Finally, the appendix will contain all detailed calculations and computations. At a minimum, the 10, 50 and 100-year storm events must be analyzed.

Proposed/Future Land Use – This section is contained within the 'Proposed Condition Discharges' section of the final drainage report. This will provide a description of the proposed/future land use and if required an exhibit illustrating it. A paragraph should be added to explain how this proposed/future land use relates to the most recent version of the City of Surprise General Plan.

Proposed Drainage Infrastructure – This is a very detailed discussion of the proposed drainage system that will be constructed within the project site to safely collect and dispose of excess runoff generated during 10, 50 and 100-year peak storm events. Such systems may include or be a combination of local street conveyance, catch basins and storm drain or open channels.

Conveyance of Off-site Runoff Through Project Site – As a sub-section of 'Proposed Drainage Infrastructure', this section will provide the detailed description of the proposed conveyances within the project site. This section explains how these conveyances operate during the 10, 50 and 100-year peak events and illustrates that the water surface elevations associated with those return periods are at least 1 foot below the proposed adjacent finish floor elevations.

Street Conveyance **–** Should provide a summary table of all proposed streets within the development, the corresponding longitudinal slope, the estimated peak discharge within the street at the appropriate concentration point and the water surface elevation within the street relative to the proposed adjacent finish floor elevation. This section must demonstrate that the City of Surprise conveyance requirements are met for the 10, 50 and 100-year peak storm events. The concentration points shown in the summary table must be clearly labeled on a drainage exhibit provided in the back of the final drainage report. The final drainage report must address that each lot has an all weather access road.

Proposed Channel Conveyance **–** Provide a detailed Hydraulic Analysis using appropriate methodology. Provide a summary table of all proposed channels within the development (if applicable). The table must include flow distribution, and the estimated peak discharge within the channel at appropriate cross sections & concentration points. The summary table will also provide the discharge, velocity, depth, top width, bottom width, side slopes, "C" value, energy grade line and the water surface elevations along the channel relative to adjacent finish floor elevations. This section must demonstrate that the City of Surprise conveyance requirements are met for the 10, 50 and 100-year peak storm events for proposed channels.

Freeboard should be provided within the channels for the100-year peak storm event and a detailed discussion of the analysis of channel capacity should be documented with supporting calculations in the appendix. This discussion should explain the nature of the flow (subcritical, supercritical), the proposed channel lining, velocities, side slopes bank protection method and any effects due to backwater effect.

The concentration points shown in the summary table must be clearly labeled on a drainage exhibit provided in the back of the final drainage report.

Proposed Storm Drain Conveyance **–** This section will provide a summary table of all proposed storm drainpipe inlet and outlet elevations, within the development. The table will include the corresponding longitudinal pipe slopes, the estimated peak discharge within each pipe, the corresponding concentration point and the computed hydraulic grade line at each node along the proposed storm drain system as well as at each proposed inlet to the system. If applicable, clogging factors must be considered and addressed.

This section must explain the need for a storm drain system within the development. If required, spread calculations on arterial or collector streets should be provided to show that the proposed storm drain system is required at a particular location. Exceeding the City of Surprise street conveyance capacity requirements usually indicates the need for a storm drain system.

A detailed discussion of the methods, criteria and assumptions used to design the proposed inlets that will convey surface runoff to the proposed storm drain system should be provided in the 'Inlet Sizing' section below.

The concentration points shown in the summary table must be clearly labeled on a drainage exhibit provided in the back of the final drainage report.

Inlet Sizing – This section is a detailed discussion of the methods, criteria and assumptions used to design the proposed inlets within and around the project site that will convey surface runoff to the proposed drainage facilities such as storm drains, retention basins, channels, etc. A summary table of all proposed inlets should be included. At a minimum, this table should include the inlet label, the corresponding concentration point, the inlet type and size (scupper, curb-cut, catch basin, etc…) the design discharge, the calculated inlet capacity, the ponded water surface elevation at the inlet and the adjacent finish floor elevation(s). The table should be footnoted with a reference to the appendix for the detailed calculation and data sheets. This section must demonstrate that all of the City of Surprise requirements for inlet design are met.

The concentration points shown in the summary table must be clearly labeled on a drainage exhibit provided in the back of the final drainage report.

Onsite Retention Requirements – This section will explain the City of Surprise requirements for onsite retention including, freeboard, side slopes, ponding depths, drain time and means of draining the basin. The equation used to compute the required volume of retention onsite should be shown with all of the terms clearly labeled and defined within the text.
Proposed Basin Geometry and Freeboard – Briefly explain the proposed basin geometry including side slopes, ponding depths and freeboard.

Required Retention Volume- This section should show the equation used to determine the required retention volume, define the terms and direct the reader to the appendix for detailed calculations and data documenting the computation of the required retention volume throughout the project site.

Provided Retention Volume -This section should show the equation or equations used to determine the estimate for the amount of storage provided by proposed retention basins throughout the project site. The applicability of the equation based on the geometry of the proposed basin should be explained and the reader should be directed to the appendix for detailed calculations and data documenting the computation of the retention volume provided by each proposed retention basin. If applicable this section will also provide detailed explanation and appropriate references to any relevant calculations used to determine equalizer pipe sizes between two or more basins acting as a single facility.

Dissipation of Stored Runoff – This section will briefly explain the time it should take each proposed retention basin to drain following a storm event. The drain time of all proposed retention basins must be less than or equal to the 36-hour time limit per the City of Surprise requirements. If drywells are being used, there must be a reference in the text to detailed calculations and data in the appendix of the report showing the number of drywells required in each basin. Similarly, if some other method of bleeding the basin volume is used, this must be supported with calculations and data in the appendix and referenced in this section.

A summary table should be provided in this section showing the proposed retention basin label, the total volume retained within the basin, the total number of drywells proposed to dissipate the retained volume and the estimated time to drain. The table should provide a footnote directing the reader to the appendix for the detailed calculations and data used to estimate the number of

drywells and the corresponding drain times. The reader should be referred to the drainage exhibit in the back pocket of the report for the drywell locations within the proposed retention basins.

The table should also summarize any alternative method used to drain proposed retention basins and the corresponding drain time estimates. A footnote should be included to direct the reader to the appendix for the supporting calculations and data.

Onsite Retention Summary – This section will contain a summary table that clearly labels each proposed retention basin on the project site. The proposed retention basin labels should be clearly shown on the drainage exhibit provided in the back pocket of the final drainage report.

The proposed retention basin summary table must include but is not limited to the following:

- The proposed retention basin label.
- The individual labels of each drainage sub basin area contributing runoff to a proposed retention basin.
- The sum total of the individual drainage basin areas contributing runoff to the proposed retention basin.
- The computed runoff coefficient (weighted "C" value) for the total contributing area at a proposed retention basin.
- The rainfall intensity "I".
- The proposed bottom elevation of the retention basin, the proposed top elevation of the retention basin.
- The proposed high water surface elevation within the proposed retention basin.
- The adjacent finish floor elevations.
- The total storage volume required.
- The total storage volume provided by the retention basin.
- The proposed basin side slopes.
- The proposed surface area of the retention basin.
- Footnotes directing the reader to the appendix for detailed calculations and data documenting all of the data summarized within the table.

Ultimate Basin Outfall – This section should provide a brief description of each proposed retention basin and its corresponding ultimate outfall elevation and location. This section should describe where the overflow from a particular proposed basin would be conveyed. Such a basin surcharge could be due to a non-design storm event that results in more volume intercepted by the basin than is provided by the basin.

Interim Condition Drainage Concept – If the proposed development is going to be constructed in phases, how will drainage be handled in the interim condition? This section must address these issues and clearly show that all of the City of Surprise drainage requirements are met. All supporting calculations and data should be included in the final drainage report appendix. Any summary tables required to clearly show the results of any calculations necessary to demonstrate that the interim drainage facilities will work must be included in this section of the final drainage report. Avoid retention basins outside of the proposed site. However, if a temporary basin is required outside of the site, a letter of easement acknowledgement and approval is required from the property owner. The letter must state the intent, volume to be retained, and the estimated time the basin will be in temporary use.

Special Issues or Considerations – This section of the final drainage report should include issues or considerations unique to this project site that have not been adequately covered in the preceding sections of the report. Such issues or considerations may include but are not limited to the following:

- 401/404 permit requirements
- National Pollutant Discharge Elimination System (NPDES) Phase I (1990) and Phase II (1998)
    - Storm Water Pollution Prevention Plan - storm water runoff and impacts on water quality during construction
    - First flush considerations with proposed onsite detention
- Downstream impacts of proposed improvements
- Upstream impacts of proposed improvements
- Other: ADOT, ADEQ, FCDMC, MCDOT, ACDC, & SRP

Floodplain Use Permit with FCDMC – This section will address any situation where the proposed development/improvement would require the procurement of a floodplain use permit from the FCDMC.

Drywell Registration with ADEQ – This is a brief description of any drywells proposed in the drainage report and the registration of these elements with ADEQ per the City of Surprise requirements.

Summary and Conclusions **–** This section will provide a quick summary of the proposed drainage design for the project site and make conclusions as to its operation and ability to meet the City of Surprise requirements.

REFERENCES **–** This section will provide a complete set of references that will document any and all explanation, calculations, methodology, criteria, past & on-going studies, etc… that were contained within the text of the final drainage report. At a minimum these references should include a title, author and date.

TABLES **–** This portion of the table of contents will list all tables provided in the final drainage report and the corresponding page number.

FIGURES **-** This portion of the table of contents will list all figures provided in the final drainage report and the corresponding page number.

APPENDICES **–** This portion of the table of contents will list all appendices provided in the final drainage report and a brief description of their contents.

EXHIBITS **–** This portion of the table of contents will list all exhibits provided in the final drainage report and their location. At a minimum, every final drainage report submitted MUST provide an onsite and offsite drainage exhibit.

The onsite drainage exhibit should be plotted at a size and scale appropriate for verification of drainage sub basin areas, flow path lengths, proposed retention/detention basin volumes, etc… This exhibit should never be smaller than 1 inch equals 100 feet. The preferred scale is a scale that will result in the largest possible plot with the least number of sheets (match lines) required.

At a minimum, this exhibit must show project property boundaries, all existing structures, existing drainage patterns/features, existing contours and/or spot elevations, proposed slopes on streets, proposed curb and gutter lines, proposed phase lines with phase labels in the appropriate phase, proposed contours, proposed lots (numbered), proposed finish floor elevations, proposed pad elevations, proposed lot dimensions and grading, proposed top of curb and gutter elevations, proposed grade breaks, proposed drainage sub basin delineations and labels, proposed concentration point locations and labels, all proposed drainage infrastructure (see drainage infrastructure as defined above), proposed retention/detention basins, proposed drywells and locations, and any other information necessary for verification of the proposed drainage design concept documented within the final drainage report. In addition, this map should indicate the direction of flow within individual sub basins using spot elevations and flow arrows.

An ideal basis for this type of an exhibit is to overlay the proposed drainage information onto the proposed site-grading plan. This can then be used in the final drainage report to show all data required by the reviewer to easily and quickly verify the hydrologic and hydraulic calculations contained within the final drainage report.

A maintenance manual for the underground storage facilities and drywells, as described in Appendix 5-4, shall be included as an attachment to the Final Drainage Report.

3.2 Final Drainage Report Checklist

Figure 2.0 contains a checklist of the major elements associated with the most common drainage design concepts required for proposed development and documented within a final drainage report. If there are other relevant issues, concerns or requirements for engineered drainage facilities not addressed by Figure 2.0 of this document, they must still be addressed within the final drainage report.

Figure 2.0
City of Surprise
Typical Elements of a Final Drainage Report

	N/A	Not applicable to this project
X		Item was addressed by report
X	X	Item addressed by others and referenced in this report

Project Location[1]

Site Description		
		Location and topography[1]
		Purpose[1]
		Existing/on-going studies[1]
		Regional drainage plan[1]/Characteristics
		Site location relative to known FEMA Flood Hazard Zones[1]
		Reference to established bench mark, including on-site temporary bench marks

Hydrologic Analysis[1]

Off-Site Hydrology		
		Impact(s) to proposed project site[1]
		Development of off-site peak discharges
		Conveyance of off-site discharge
		Off-site peak discharge summary table for the 10-, 50-, and 100- year storms
		Discharge at the entrance and exit points
		Existing land use[1]

On-Site Hydrology		
		Methodology and criteria[1]
		Existing condition discharges
		Proposed condition discharges
		Existing land use[1]
		Future land use[1]
		On-site peak discharge summary table for the 10-, 50-, and 100- year storms

1. Element must be addressed in the preliminary drainage report submittal as well as the final.

Figure 2.0
City of Surprise
Typical Elements of a Final Drainage Report

	N/A	Not applicable to this project
X		Item was addressed by report
X	X	Item addressed by others and referenced in this report

Proposed Drainage Infrastructure[1]

Street Conveyance		
		Local street conveyance
		Arterial and collector streets – one 12 foot lane dry each direction, 10-year
		Street conveyance summary table

Channel Conveyance		
		Proposed channel conveyance (HEC-RAS)
		Proposed channel conveyance (normal depth)
		Proposed channel conveyance (freeboard)
		Proposed channel conveyance (erosion protection)
		Proposed channel summary table

Storm Drain Conveyance		
		Starting water surface elevation at outlet – document assumptions and analyze
		All appropriate losses have been applied
		Inlet calculations
		Water surface elevations at inlets meet requirements for 10-. 50-. And 100-year storms
		Proposed storm drain summary table
		Proposed inlet summary table

Culvert Sizing		
		Assumed tailwater condition analyzed
		Larger of inlet/outlet control used
		Headwater does not exceed maximum allowable
		Appropriate pipe material and headwall configuration
		Ponding at inlets meets requirements for 10-, 50-, and 100-year storms
		Proposed culvert summary table

1. Element must be addressed in the preliminary drainage report submittal as well as the final.

Figure 2.0
City of Surprise
Typical Elements of a Final Drainage Report

	N/A	Not applicable to this project
X		Item was addressed by report
X	X	Item addressed by others and referenced in this report

Proposed Drainage Infrastructure[1] (cont.)

On-Site Retention		
		Maximum side slope of 4:1, or explanation if different
		Proposed retention basin bleed time with calculations documented in appendix
		Minimum 1 foot freeboard provided[1]
		Maximum 3 foot ponding as measured from adjacent low top of curb[1]
		Required retention volume computed with calculations documented in appendix[1]
		Provided retention volume computed with calculations documented in appendix[1]
		Retention summary table prepared[1]
		Ultimate outfall for proposed retention basins[1]

On-Site Drainage Exhibit		
		On-site drainage exhibit provided[1]
		Scale suitable (1"=100' min.)[1]
		Existing features, topography, etc…[1]
		Phase lines[1], proposed lots[1], proposed finished floor elevations and proposed pad elevations are labeled
		Proposed slopes, curb and gutter elevations, proposed grading in basins and channels
		Proposed lot grading, proposed grade breaks, and longitudinal street grades
		Proposed drainage sub-basin areas[1], proposed retention and detention basins[1], concentration points, proposed drywell locations and other proposed infrastructure are labeled
		Flow arrows[1] and spot elevations provided
		Invert elevation, pipe lengths and any other information necessary to verify calculations contained within the report

1. Element must be addressed in the preliminary drainage report submittal as well as the final.

Figure 2.0
City of Surprise
Typical Elements of a Final Drainage Report

	N/A	Not applicable to this project
X		Item was addressed by report
X	X	Item addressed by others and referenced in this report

Proposed Drainage Infrastructure[1] (cont.)

Interim Condition Drainage		
		Interim condition infrastructure
		Interim condition retention basin sizing
		Interim condition drainage concept meets city requirements

Off-Site Drainage[1]

Impacts to Others		
		There are no impacts to downstream areas
		There are no impacts to upstream areas
		Exhibit showing project site relative to offsite area and delineated off-site drainage areas with concentration points[1]

General Site Considerations[1]

Other Considerations		
		Project site meets minimum open space requirements[1]
		401/404 Permit issues addressed[1]
		Mitigation of known flood hazards addressed[1]
		Storm water pollution prevention plan (SWPPP)
		First flush accounted for in proposed detention basins discharging to regional facilities
		Historic drainage patterns and relevance to proposed project site discussed[1]
		Existence of regional drainage facilities[1]
		Existence and implications of a regional area drainage master plan in the vicinity of the proposed project site[1]
		Coordination with other development and/or agencies that may be impacted by project site[1]
		Impact of on-going or completed drainage studies or plans implemented in the proposed project area[1]
		Floodplain Use Permit – FCDMC[1]
		Drywell registration with ADEQ[1]

1. Element must be addressed in the preliminary drainage report submittal as well as the final.

APPENDIX 5-4

UNDERGROUND RETENTION/DETENTION SYSTEMS

STANDARDS AND SPECIFICATIONS

Underground Retention/Detention Systems
Standards and Specifications
City of Surprise

General Discussion:

The use of underground storage to meet retention/detention requirements is discouraged by the City of Surprise (the city). Wherever possible, storm water storage shall be provided in depressed open areas with provision for emergency overflows. However, underground storage of the 100-year, 2-hour runoff volume requirement is allowed in commercial and industrial sites. The use of underground storage in other developments may be allowed by meeting the requirements specified herein.

The property owner of record shall be responsible for the design, performance, operation, and maintenance of underground storage facilities for on-site retention. Underground storage facilities are not to be located within public street right-of-way or utility easements.

The design, construction and maintenance of underground storage shall be in accordance with the following standards and specifications.

Approved Underground Retention/Detention Systems:

The system approved for use in the city is large diameter pipes with drywells, or an approved equivalent system.

Underground Retention/Detention System Requirements:

1. The following statements shall appear on all plans which include the use of underground storage facilities and disposal facilities:
    a. “All underground storage facilities and disposal facilities shown on this project shall be maintained by the owners. These underground storage facilities shall be modified, upgraded, or replaced with similar or other appropriate devices/measures by the owners when they cease to drain the water within a 36-hour period. Regular maintenance of the silting chamber is required to achieve the best operation of the drywell/underground percolation chamber(s).”
    b. “During site development, all drywells/underground percolation chambers shall be securely covered with filter cloth or other material to prevent the introduction of excessive sediment into the settling chamber.”
2. The storage facility shall be sized for the 100-year, 2-hour runoff volume, and the volume shall not be decreased for anticipated percolation volume during the storm duration.
3. An engineer registered in Arizona shall prepare a geotechnical report showing depth to groundwater and the depth of the proposed installation. Soil boring profiles shall be provided to at least ten feet below the bottom of the proposed storage facility and/or disposal facility, such as a drywell. Plans shall include the results of the soil investigation and shall provide data for the following parameters:
    a. Soil pH
    b. Resistivity in ohm-cm
    c. Chloride concentration in ppm
    d. Sulfate concentration in ppm

e. Moisture content

f. Soil Permeability in inches/hour

4. The facilities shall be designed for a 75-year life expectancy. The construction plans shall specify material type including lining and coating requirements. For pipe material, the methodology for determining the soil side service life shall be based on the *Pipe Selection Guidelines and Procedures,* February 1, 1996 with March 21, 1996 Revisions, Arizona Department of Transportation. For storage systems using materials not listed in these guidelines, the manufacturer needs to certify the 75-year life expectancy based on independent testing.

5. Traffic/load bearing capacity of the installation must be specified; for example, pipe gage and corrugation size for corrugated metal pipe and D-Load for reinforced concrete pipe. Storage structures shall be designed for an HS-20 loading. For pipes, the loading shall be based on the "Fill Height Tables" contained in the *Pipe Selection Guidelines and Procedures,* February 1, 1996 with March 21, 1996 Revisions, Arizona Department of Transportation, which can be found at: http://azdot.gov/highways/roadway_engineering/roadway_design/guidelines/manuals/pdf/roadwaydesignguidelines.pdf. Open "Appendices" and "Appendix A". For other types of storage systems, an engineer registered in Arizona shall provide calculations or manufacturer certification (based on independent testing) stating that the product meets HS-20 loading requirements.

6. A detailed drawing of how the installation will drain into the outfall structure, such as drywell/percolation chamber, storm drain system, drainage channel, or natural wash shall be provided. The system must drain completely within 36 hours.

7. Access to underground storage facilities shall be secured with a bolted grate or solid cover to prevent unauthorized entry.

8. A watertight storage facility may be required, if the subgrade soil's bearing capacity is significantly affected by saturation such as with expansive clays or karst soils. Specify watertight manufactured joints and provide end walls for pipe per manufacturer(s) recommendation with a detailed drawing. An alternative solution would be an impermeable liner to create a watertight chamber system. An engineer registered in Arizona shall prepare a geotechnical report stating whether a watertight storage system is required.

9. Connection details are required for manhole shafts, end walls, inlet and outlet pipe connections, and end structures.

10. A minimum of two inspection locations into each storage unit shall be provided. 48 -inch minimum manhole shafts at each access point shall be provided. A fixed ladder must be installed at each inspection location. A 30-inch manhole frame and cover can be used at grade with a concrete collar where subject to wheel loads.

11. Provide a backfill detail including material and compaction requirements. For circular pipes, particular care shall be given to the area under haunches and to the springline of the storage pipe, which shall be backfilled with 3/8" minus crushed aggregate or aggregate base course (ABC). Provide a geosynthetic fabric wrap around the limits of the aggregate or ABC bedding per MAG specification 796.2.2, and Table 796-2, Class A, so as to not allow infiltration of fines into the aggregate or ABC after completing backfill.

12. An engineer registered in Arizona shall provide calculations showing that failure of the underground structure will (a) not jeopardize adjacent overhead power structures or adjacent building structures proposed for the development and/or (b) not collapse soil beyond the property boundaries. In lieu of calculations, the designer may assume that the plane of failure is a 1:1 angle of repose from the outside edge of the underground structure plus two feet. For circular pipes, the outside edge of the structure is defined as the springline of the pipe. Structures shall be designed to resist uplift pressures.

Disposal of Storm Water:

Underground retention/detention systems are required to drain within a 36-hour period by infiltration through a drywell, percolation through the bottom of each storage unit or by gravity flow into a drainage system, such as a storm drain, drainage channel, or natural wash.

Drywells shall comply with the Arizona Department of Environmental Quality (ADEQ) publication *Guidance for Design, Installation, Operation, Maintenance, and Inspection of Drywells* and the additional requirements listed below:

1. Drywells shall be constructed by an ADEQ licensed contractor and registered by the same contractor with ADEQ. The contractor is also responsible for submitting a drilling log for the drywell to ADEQ. The approved drywell registration shall be submitted to the city by the developer or his engineer at the time As-Built Plans are submitted. A tabulation showing drywell number, registration number, and percolation rate (both tested and design) shall be added to the Grading Plan coversheet before submitting As-Built Plans.
2. An engineer registered in Arizona shall provide certification that the drywell(s) has been installed in accordance with plans, specifications and Arizona Department of Environmental Quality requirements as contained in the ADEQ publication *Guidance for Design, Installation, Operation, Maintenance, and Inspection of Drywells.* This certification along with drywell drilling logs shall be submitted to the City of Surprise upon completion of the drywell installation. A copy of the application for registration by ADEQ of the proposed drywell shall be submitted prior to approval of the grading plans.
3. Drywells can be designed with a maximum disposal rate of 0.1 cfs per well and the construction requirement that the drywells penetrate a minimum of ten feet into a permeable stratum. However, if a higher disposal rate is desired and/or the ten-feet penetration requirement is not met, then a percolation test must be performed on the drywell before acceptance. To allow for degradation, calculation of the retention time in the storage facilities shall be based on 50% of the tested percolation rate. No degradation is required if the maximum disposal rate is set at 0.1 cfs per well and the well penetrates a minimum of ten feet into a permeable stratum. The maximum allowable design rate, based on 50% of the tested percolation rate, is 0.5 cfs. Drywell disposal rate shall not be considered in design calculations in order to reduce the size of the storage facilities.
4. All drywells shall be dual chamber drywells, which is the MaxWell Plus® or equivalent. Single chamber drywells will not be accepted. Additional requirements for the design and installation of drywells are:
    a. The preferred location for the drainage system is at right angles to the sides of the storage facility. Drywells cannot be drilled in backfill material, and therefore, a

minimum offset distance must be maintained. This is normally five to ten feet beyond the over-excavation needed for the storage facility.

b. Both the interceptor and drywell chambers shall be precisely located and identified, including rim and invert elevations.

c. The practical depth limitation for either chamber is 27 feet. Required distance between chamber centers based on depth of chamber is:

   i. Chamber Depth = 0 to 8-feet: 16-feet center to center

   ii. Chamber Depth = 8 to 12-feet: 20-feet center to center

   iii. Chamber Depth > 12 feet: 22-feet center to center

5. Multiple drywells shall be located a minimum of 30 feet apart (center to center), unless waived by the City Engineer or designee. Drywells shall not be located within 20 feet of an active septic system nor within 100 feet of an active water well.
6. All drywells receiving storm water directly from areas containing fuel or oil storage and dispensing facilities must have oil-water separators with replaceable petrochemical absorbent material installed.

Maintenance Standards:

Privately owned storage facilities should be maintained according to the following.

1. The property owner of record shall be responsible for the design, performance, operation, and maintenance of underground storage facilities for on-site retention. Drywells/percolation chambers that cease to drain a project area within a 36-hour period shall be replaced/refurbished.
2. An engineer registered in Arizona shall prepare a maintenance manual for underground storage facilities and drywells. This manual shall be included as an attachment to the approved Final Drainage Report. The manual shall contain the name, address, and telephone number of the selected maintenance company, maintenance schedule (frequency of inspection), ADEQ's inspection checklist and any other necessary inspection lists and requirements, such as manufacturer's lists and requirements. It shall also contain a blank table for documentation of necessary maintenance and upgrades recommended by the inspections. The documentation shall include inspection dates and repair dates.
3. Underground storage facilities inspections shall be performed annually or whenever ponding remains after a storm. The drywell facility owner shall document inspection of drywells utilizing ADEQ's inspection checklist and shall keep these inspections on file. A new drywell/percolation chamber shall be installed if an inspection reveals that a drywell/percolation chamber is no longer effective and cannot be returned to effective use.
4. Drywell/sedimentation chamber maintenance shall occur when inspection shows:

   a. Ten percent of the drywell capacity is filled with sediment, for drywells in paved areas. Sediment has accumulated to three inches or more inside the sedimentation chamber in paved areas.

b. Twenty-five percent of the drywell capacity is filled with sediment for drywells in landscaped areas. Sediment has accumulated to three inches or more inside the sedimentation chamber in landscaped areas.

c. Drainage has increased beyond 36 hours.

d. A non-storm water discharge has entered the well/sedimentation chamber.

e. Upon change of ownership of the well/sedimentation chamber.

5. Drywell/sedimentation chamber maintenance shall include:

a. Removal of dirt and debris.

b. Replacement of filter fabrics and petrochemical absorbent material (if any).

c. Cleaning of screens.

d. Opening of liner weep hole.

e. Purging of accumulated silt out of the aggregate fill by jetting, surging, or pumping.

CHAPTER 6 – WATER AND RECLAIMED WATER STANDARDS

6.1 GENERAL INFORMATION

The purpose of this document is to provide guidance and standards for construction of the City of Surprise (city) potable water (distribution and transmission) and reclaimed water systems. The following guidelines and standards are in addition to the Integrated Water Master Plan (IWMP). Any discrepancies between these standards and those in the IWMP shall be brought to the city's attention and resolved by the city. Refer to Chapter 10 for additional information regarding inspection procedures.

1. The potable water system guidelines and standards apply to the City of Surprise water service area only, which is shown online at www.surpriseaz.gov. The reclaimed water system guidelines and standards apply to the City of Surprise water service area only, unless the availability of reclaimed water has been negotiated in a Development Agreement. For development occurring within a service area of another water service provider, contact the appropriate water service provider to obtain their required guidelines and standards.
2. Potable, raw, and reclaimed water lines shall be collectively referred to as water lines unless the type of water is specifically identified. Potable water is water that meets or exceeds the federal drinking water standards. Raw water is water direct from its source prior to any treatment. Reclaimed water is the effluent water that has been treated at a water reclamation facility and meets the state standards for Grade A+ reclaimed water.
3. All water systems shall be designed according to these standards and those of the Maricopa Association of Governments (MAG). These standards shall prevail in the case of any discrepancies between these standards and the MAG standards.
4. Any deviation from these standards and the MAG standards require prior written approval from the City of Surprise following the Engineering Standards Modification Requests explained in Chapter 1 of this document.
5. The city water system lines are categorized into three basic categories: service lines, distribution lines, and transmission mains. A service line is connected to the distribution system and provides potable or reclaimed water to the customer. A distribution line distributes potable or reclaimed water to the service lines. A transmission main conveys raw water from the raw water source to a water treatment facility or reclaimed water from the water reclamation facility to a reclaimed water distribution facility.
6. Public water lines not located in the right-of-way shall be dedicated to the city in an exclusive easement. The minimum width of an easement for a single line shall be 20 feet. Each additional line requires an additional 10 feet in the width of the easement. The line shall be centered in the easement unless otherwise specified by the city.
7. All water lines shall be disinfected and tested as detailed in Engineering's Standard Operating Procedure for Disinfection of New or Repaired Water Connections which is based on ADEQ's Engineering Bulletin #8. City staff will conduct inspections for the operational and testing procedures.

6.2 POTABLE WATER SOURCE

A potable water source is a single point of withdrawal from a well, canal, turnout structure, reservoir, or other related structure. The Water Resource Management Director or designee shall review the potable water source for approval.

6.3 POTABLE WATER QUALITY

Refer to the city's Water and Wastewater Design Guidelines and Standards and Drinking Water Technology Assessment Report for potable water quality requirements.

6.4 FACILITIES

The Water Resource Management Director or designee shall approve the location and specifications for all water supply facilities, booster stations, well and reservoir sites. Site locations shall be level and free from all riverbeds, streambeds, washes, and other features that would diminish the use of the site. See the City of Surprise IWMP and Water and Wastewater Design Guidelines and Standards and Drinking Water Technology Assessment Report for specific design requirements.

6.5 DESIGN CRITERIA

1. Refer to the IWMP for the average day demand for various usages. These water design factors shall serve as a minimum guideline to aid in sizing water infrastructure. If the engineer knows that the facility being designed has unique water demands or that it will require a greater capacity than that determined based on the design factors presented here or in the IWMP, these factors shall be accounted for in the design.
2. Fire flow demands must be considered in the water system design. Refer to the IWMP for the fire flow, storage, pipe sizing, and system pressure requirements related to fire flow demands.
3. A Water Master Plan Report is required to be submitted to the Public Works Department for all residential and commercial developments.
4. A Reclaimed Water Master Plan Report is required to be submitted to the Public Works Department as required in the IWMP.
5. The Water Master Plan Preparation Guide and Reclaimed Water Master Plan Preparation Guide are available on the Engineering Development Services page on the city's website at http://www.surpriseaz.gov.
6. All distribution lines and transmission mains shall be designed to meet the design criteria identified in the IWMP.
7. Pressure reducing valves, if necessary, are subject to Water Resource Management Director or designee prior review and approval.
8. Potable water lines and reclaimed lines in major arterial streets shall have a minimum diameter of 16 inches and those in collectors shall have a minimum diameter of 12 inches. Distribution lines in other locations shall have a minimum diameter of 8 inches. These are minimum standards and the city may require larger sizes. All deviations from this standard must be approved by the City of Surprise.

9. Commercial sites shall be designed as a private water system. It shall be a main line to serve potable, fire, and possibly irrigation demands with at least two points of connection with the offsite potable water system and the proper backflow prevention devices.

10. Public water lines should be located in the street such that they are not under sidewalks and so that they are located a minimum of 2.5 feet from the nearest edge of the curb.

11. Public water lines and infrastructure shall not be located in retention/ detention basins.

12. All “dead-end” transmission lines and potable water lines shall be terminated with a flushing pipe according to MAG Standard Detail 390, Type B.

13. All “dead end” reclaimed water lines shall be terminated with a flushing pipe according to City of Surprise Standard Detail 6-23.

14. The restraint system design for joint restraint, bends, and fittings shall be submitted to the city for review and approval. The minimum requirement is conformance with MAG Standard Details 302-1, 302-2, 303-1, 303-2, 380, and 381.

6.6 RECLAIMED WATER SYSTEM

1. Reclaimed water systems shall be designed as pressurized water distribution systems, except where differences are noted in this document, other applicable standards, or in regulations. All reclaimed water lines must meet the requirements of ADEQ Section R18-9-602.

2. Reclaimed lines shall be tested using potable water. The city’s Construction Water Guidelines detail the process for obtaining water. A test plan and diagram demonstrating the required air gap and test procedure will be submitted to and approved by the City of Surprise prior to conducting the test.

3. A direct connection between reclaimed water, potable water, or sewer lines will not exist under any condition. The only approved connection between the systems will be an approved air gap.

4. Reclaimed water lines shall not be placed into service until all applicable reclaimed water permits, approvals, and user agreements are completed and on-site reclaimed as-built plans are received by the City of Surprise. All potable connections must be physically disconnected prior to connection to the reclaimed water system. Reclaimed meters will only be set when an approved backflow preventer is in place and the pipe is installed up to the meter box on both sides of the meter. Valves in the city’s reclaimed water system shall only be operated by City of Surprise Operators.

5. All valves, air relief valves, pressure reducing valves, pumps, pump control valves, meter box lids, meter box interiors, and any other appurtenances for the reclaimed water system shall be painted purple (Pantone No. 512) or have purple color integrated into the material. All mechanical equipment appurtenant to the reclaimed water system shall also be painted purple. All flanged side outlets, drain valve assemblies, blow-off valve assemblies, sampling taps, and air or vacuum release valves shall have an attached sign reading “Reclaimed Water – Do Not Drink.”

6. Signage may be required for areas irrigated by reclaimed water. Specifications and requirements shall be in accordance With Arizona Administrative Code R-18-9-602 and R18-9-704.

6.7 PIPELINE MATERIALS

All standard pipe materials shall comply with MAG standard specifications and details except as modified below:

1. Standard materials and details for all pipes less than 12 inches in diameter shall be, at a minimum, class 200.
2. PVC pipe may be utilized for potable water and reclaimed water mains that are less than 12 inches in diameter as outlined in the most recent version of AWWA C900.
    a. PVC pipes used for potable water shall be blue in color.
    b. PVC pipes used for reclaimed water shall be purple (Pantone No. 512) in color.
3. DIP shall be utilized for potable, reclaimed, or transmission water mains that are 12 inches or more in diameter. Other materials may be considered and approved by the Water Resource Management Director or designee.
4. Where ductile iron pipe is used, all pipes shall be polyethylene-wrapped and all fittings shall be encased in a polyethylene tube and installed in accordance with AWWA C105 and C600 unless directed otherwise by the city.
    a. Polyethylene wrap for potable water lines shall be blue in color and labeled “Caution: Potable Water Line”
    b. Polyethylene wrap for well transmission lines shall be black in color and labeled “Caution: Raw Water Transmission Main”
    c. Polyethylene wrap for reclaimed water lines shall be purple (Pantone No. 512) in color and labeled “Caution: Reclaimed Water – Do Not Drink”

6.8 FIRE SERVICES

1. Fire hydrants can only be installed on reclaimed water systems with the approval of the Water Resource Management Director or designee.
2. This section applies to fire hydrants on the potable water system only.
3. Public fire hydrants shall be located outside of street improvements but within the right-of-way. General spacing for fire hydrants is as follows:
    a. 500 feet maximum in a single-family residential development and not more than 400 feet hose lay from the center of any structure.
    b. 300 feet maximum in a multi-family residential development.
    c. 300 feet maximum in commercial/industrial areas.
    d. 500 feet maximum on arterial streets, parkways, and collector streets without homes fronting the street.

e. 500 feet maximum (250' staggered on each side of the roadway) for divided arterial streets, parkways, and collector streets without homes fronting the street.

f. Fire hydrants shall not be installed on any portion of a dead end line that is more than 400 feet from its supply source.

g. Fire hydrants shall be located between one foot and six feet from the back of curb on all streets.

h. All fire hydrant locations for land uses other than single family residential shall match the approved site plan.

4. Arizona Department of Environmental Quality (ADEQ) Bulletin 10 shall apply to all city water lines.

5. The only acceptable Dry Barrel fire hydrant models and manufacturers per City Water Resource Management Department are: Mueller "Centurian", Clow "Medallion", Waterous "Pacer WB67-250", and Watermaster "5CD250" with the typical "T" design and two 2 ½" National Standard Thread (NST) orifices and one 4 ½" NST orifice, installed with either a horizontal or vertical shoe. The only acceptable Wet Barrel fire hydrant model and manufacturer is Clow "800 Series" with two 2 ½" National Standard Thread (NST) orifices and one 4 ½" NST orifice.

6. Fire hydrants shall be painted yellow. (Enduratone, Series 1029, Safety Yellow or approved equal)

7. Fire hydrants located outside of city right-of-way shall be private and shall follow the same guidelines as public fire hydrants.

8. Blue retro-reflective pavement markers shall be used as a method of identifying fire hydrant locations. Retro-reflective pavement markers shall be 911A-blue, Fire Lite, Amerace Corporation, Signal Products Division, or approved equal. For proper placement, refer to MAG Standard Detail 122.

9. Service taps are prohibited on any waterline that is designed primarily to service fire sprinklers and/or fire hydrants.

10. Fire sprinkler lines shall be located such that maintenance activity will not disrupt normal access to the community. The owner shall be responsible for the sprinkler line up to and including the tap and sleeve coming off of the city main. Backflow prevention assemblies are required per Section 6.15.

11. Fire sprinkler system shall be installed if fire flows do not meet the requirements per the IWMP or as required by applicable building codes.

12. A City of Surprise Civil Permit is required for the installation of underground fire lines and all inspections and testing must be performed by the Water Resource Management Director or designee.

13. Private fire lines shall be marked with blue #12 AWG locate wire located one foot above the top of pipe from the fire line backflow preventer to the building riser.

6.9 DEPTH AND SEPARATION OF POTABLE AND RECLAIMED LINES

1. Minimum cover over top of the pipe shall be consistent with MAG Standard 610; 36 inches deep for all potable and reclaimed water lines smaller than 12 inches and 48 inches deep for lines 12 inches and larger and for mains located in major streets. In the City of Surprise water service area, this depth shall be measured from top of pipe to top of finished grade.
2. The proposed depth shall be noted clearly on each plan sheet. Any changes in depth required to avoid conflicting utilities, etc., shall be noted.
3. Reclaimed water lines that are in conflict with potable water lines shall dip below the potable water line and shall comply with the separation and protection criteria in MAG Standard Details 404-1, 404-2, and 404-3 and Sections 610.5, 615.3, and 616.3 of the MAG Standard Specifications. See City of Surprise Details 3-01 through 3-07 for standard cross sections and utility locations.

6.10 AIR RELEASE

1. Air release valves, vacuum release valves, or other suitable means of air control shall be installed at the high points in a line or where extensive changes in line slope are present. Metal cages, lockboxes, or an approved equal shall be installed for all air relief valves.
2. All air relief assemblies and cages on the reclaimed water system shall be painted purple (Pantone No. 512), and the valve shall be labeled “Reclaimed Water-Do Not Drink.”
3. Refer to City of Surprise Details 6-21 and 6-22 for air/vacuum valve assembly details.

6.11 VALVES

1. All gate valves shall be resilient seated AWWA C509 solid wedge gate, and they shall open left.
2. All valves shall be located per City of Surprise Detail 6-01 if installed at an intersection. If in a mid-block location, they shall be in line with the property line extension.
3. Butterfly valves shall not be permitted on lines less than 24 inches in diameter without the written approval of the Water Resource Management Director or designee. Manholes are to be installed at all butterfly valve locations per City of Surprise Standard Detail 6-03, and they shall be labeled “Water” for potable water valves, “Reclaimed” for reclaimed water valves, and “Raw Water” for well transmission lines. All valves on reclaimed water lines shall be painted purple (Pantone No. 512).
4. Valve boxes for potable water valves shall be installed per MAG Standard Detail 391-1, Type C only.
5. Valve boxes for reclaimed water lines shall be square. Lids shall have the words “Reclaimed Water” on the top in raised 1-inch letters. See City of Surprise Standard Detail 6-24.

6. Valve boxes for raw water transmission mains and non-potable water lines shall be round and in accordance with MAG Standard Detail 391-1, but with the writing on the cover reading “WATER” replaced with “NON POTABLE WATER.” The letters of the writing shall be 1 inch high and shall be raised by 1/8 inch.

7. Debris caps shall be installed per MAG Standard Detail 392. Debris caps shall be colored blue for potable water lines, black for raw water transmission lines, and purple (Pantone No. 512) for reclaimed water lines.

8. Debris caps shall be locking debris caps for both potable water and reclaimed water valves.

9. The maximum spacing of valves on potable and reclaimed water lines in industrial, commercial, and multi-family districts shall be 500 feet. In single-family residential districts, the maximum spacing shall be 800 feet. Refer to City of Surprise Detail 6-01 for valve placement locations.

10. All valves located outside of paved areas shall be identified by a Carsonite continuous glass fiber and a resin-reinforced CUM-375 Composite Marker or approved equal installed ten feet offset from the valve centerline, but not outside of the dedicated right-of-way or easement limits. The marker shall be colored blue for potable water valves, black for raw water transmission valves, and purple (Pantone No. 512) for reclaimed water valves. The installation of the marker in an alternate location shall follow the Engineering Standards Modification Requests found in Chapter 1 and be approved in writing by the Public Works Department.

6.12 SERVICE LINES AND METERS

1. The following applies to both potable and reclaimed water systems:

   a. The water meter make, model, and manufacturer shall be determined by the City of Surprise and shall meet the requirements specified in Standard Details 6-05 and 6-07.

   b. For installations with multiple meters, volume and pressure behind the meters shall equal volume and pressure before the meters, as required for the structure.

   c. Service lines shall be made of Type K copper with a minimum diameter of one inch from within the right-of-way to the meter. There shall be one meter per service line.

   d. Irrigation systems, excluding systems on single family residential lots, shall have a separate service line and meter.

   e. All irrigation lines, 1 inch or greater, within the right-of-way shall be shown on the water plans.

   f. The developer shall install water services except the setting of the meters.

   g. Meters shall be located within the right-of-way. The city shall be responsible for the water service line up to and including meters in the right-of-way.

h. Cross-access easements shall be granted to the city as necessary for maintenance purposes and reading of meters on private water systems.

i. Meters shall not be located in parking lots, service driveways, residential driveways, or in areas of concrete or asphalt paving.

j. Meters shall not be fenced in or enclosed and must be accessible at all times. If a meter is to be installed in a landscaped area, the meter service shall be installed so that any runoff flows away from the meter installation.

k. Only brass compression fittings shall be used when joining water service pipes. Sweated joints shall not be allowed within the city right-of-way.

l. Only double-strap brass saddles are to be used for water service connections to the main line.

m. Both wet taps and dry taps are permitted within the city; however, size-on-size wet taps are not permitted.

n. A minimum horizontal separation of three feet is required between all taps.

o. Locate water service at least 3 feet from property line of lot. Location should not conflict with driveways or sewer tap. Curb stop to be 18 inches behind and 8 inches below finished sidewalk.

p. In cases where driveways may conflict with normal placements of water and/or sewer services, developers may propose alternative locations. However, in no case will the water services be closer than 3 feet or the sewer services closer than 6 feet to the property lines.

2. The following applies to reclaimed water systems only:

   a. Reclaimed meters will not be installed without the complete removal of all connections, including temporary connections, to the potable water system. As-built plans and all required permits and inspections also shall be completed and submitted to the city prior to the installation of the meter.

   b. Sampling/flushing taps must be installed once every mile on reclaimed water lines. The associated sample station shall be a Safety-Guard Technologies sample station or approved equal. The sampling station shall be tapped directly into the main line. See City of Surprise Detail 6-17A.

   c. For reclaimed water service lines, the copper pipe shall be wrapped with purple (Pantone No. 512) polyethylene tape and labeled “Reclaimed Water – Do Not Drink.”

   d. Reclaimed water meter lids and box interiors shall be purple (Pantone No. 512) in color and have a meter tag attached to the meter reading “Reclaimed Water – Do Not Drink.”

3. The following applies to potable water systems only:

   a. There shall be one service line and one meter per residential lot and commercial building and/or individual owner, including multi-family housing. Certain uses will require separate meters.

b. A water quality sampling station shall be installed from a separate service line in each quarter (1/4) section of new developments and shall be a Safety-Guard Technologies sample station or approved equal. Refer to Detail 6-17B. Sampling stations shall be placed within the City right-of-way or in a water/public utility easement. Location shall be approved by the City prior to installation. Sampling stations and easements shall not be placed on private residential property or connected to a residential unit service line. Sampling stations may be installed within a landscape tract within a water/public utility easement or right of way.

6.13 PIPE BEDDING, BACKFILL, AND MARKER BALL REQUIREMENTS

1. All pipe installed within the city must be properly bedded. The bedding shall extend from the bottom of the excavation to one foot above the pipe. The bedding shall consist of Aggregate Base Coarse (ABC).
2. All pipes having a diameter of 12 inches or greater require initial bedding under the pipe. Initial bedding under the pipe is required in all cases where rocks larger than 1½ inches in diameter are encountered on the trench bottom.
3. Refer to MAG Section 601.4 and MAG Detail 200-1 for trench excavation, backfilling, and compaction specifications.
4. In cases where Controlled Low Strength Material (CLSM) backfill is used to backfill a trench, all service lines that may cross the trench shall be encased in a conduit. The size of the conduit shall be two times greater than the diameter of the service line. Conduit material shall be SDR 40 PVC.
5. Marker balls shall be installed on all potable water, reclaimed water, and transmission main lines at all fittings and every 100 feet if the distance between fittings is greater than 100 feet. Marker balls shall be tested prior to installation. Potable and transmission marker balls shall be blue. Reclaimed water marker balls shall be purple. Refer to the City of Surprise Standard Detail 6-25.
6. All lines shall be marked with blue #12 AWG locate wire located one foot above the top of pipe.
7. All lines shall be marked with marking tape located one foot above the top of the pipe.
    a. Marking tape for potable water lines shall be blue in color and labeled “Caution: Potable Water Line”
    b. Marking tape for well transmission lines shall be red in color and labeled “Caution: Raw Water Transmission Main”
    c. Marking tape for reclaimed water lines shall be purple (Pantone No. 512) in color and labeled “Caution: Reclaimed Water – Do Not Drink”

6.14 CONSTRUCTION WATER

The city issues potable and non-potable construction water use permits. Refer to the City of Surprise Construction Water Guidelines available online at http://www.surpriseaz.gov.

6.15 BACKFLOW PREVENTION DEVICES

1. All potable services and reclaimed water irrigation services require city approved backflow prevention devices to be installed as near to the public system as practical.
2. On any premises where reclaimed water is used, all potable water supplies shall be equipped with a RP backflow preventer.
3. Backflow prevention devices shall be installed directly downstream of the water meter.
4. For private water or reclaimed systems, RP backflow preventers shall be installed at the entrance to the private system.
5. Backflow preventers on the reclaimed system shall be tested using equipment dedicated to reclaimed water only. The same equipment cannot be used on backflow preventers on the potable water system. All reclaimed backflow preventers shall be painted purple and shall have a sign affixed stating “Reclaimed Water – Do Not Drink.”
6. Backflow prevention assembly shall be protected by cages, screen walls, or guard posts as specified in City of Surprise Engineering Development Standard Details 6-14 and 6-16, and MAG Detail 140.
7. A backflow prevention assembly will be required on fire service lines as shown in City of Surprise Standard Detail 6-11 and the USC Manual of Cross Connection Control. The maximum length without a backflow prevention assembly shall be 50 feet from the tap to the riser.
8. All Proposed backflow devices shall meet new EPA low-lead standards and shall be on the approved list by the University of Southern California, Foundation for Cross-Connection Control and Hydraulic Research (USC-FCCCHR).

6.16 SITE WATER MODEL REQUIREMENTS

For individual sites, a water model must be submitted for review and approval by the City of Surprise. All water models must meet the requirements of the Water Model Report Format Guidelines found in Appendix 6-1 of this document.

6.17 NEW OR REPAIRED WATER LINE/SYSTEM TESTING

The contractor shall request the sampling and/or testing no later than 48 hours prior to the time when test or samples are to be taken. After the line/system is constructed and tested, it shall not sit idle no longer than two weeks from approval without written approval by the city or all new testing and sampling shall be required.

1. Pressure Test
    a. All water mains must conform to MAG SECTION 611.1 for pressure and water tightness testing.
2. Chlorination And Bacteriological Test
    a. All disinfecting of water mains must conform to MAG SECTION 611 unless noted otherwise below.
    b. Preliminary Flush and Chlorine Residual:

i. Following the pressure test, all mains 12 inches and smaller shall be flushed prior to chlorination with water pressure and outlets available.

ii. It is the contactors responsibility to provide the appropriate dosage greater than 50 ppm and the city to verify it. Means and method to obtain this level is solely upon the contactor.

iii. All mains shall be chlorinated so that a chlorine residual of not less than 25 ppm remains in the water after 24 hours standing in the pipe.

c. Flush:

i. Following chlorination all treated water shall be flushed until the replacement water throughout the pipeline can be proved, by laboratory testing, comparable to the water served from the existing system. Prior to sampling for laboratory testing the residual chlorine throughout the length of the pipeline shall be reduced to 2.0 ppm or less.

d. Sampling and Testing:

i. City shall take a bacteriological sample at each sampling riser as specified by MAG 611.2.11 once it is determined that the residual chlorine is 2.0 ppm or less.

ii. City shall take a second bacteriological sample after the water line has sat undisturbed for 24 hours.

iii. Satisfactory water quality shall continue for a period of one day (24 hours) as noted by laboratory examination of these samples.

e. The original chlorination procedure shall be repeated until satisfactory results are obtained.

APPENDIX 6-1

WATER MODEL

REPORT FORMAT GUIDELINES

WATER MODEL REPORT FORMAT GUIDELINES

1. Describe model used.
2. Assumptions
    a. Pump curves obtained from fire flow tests. *(Flow tests are to have been performed within the previous six months from date of report)*
    b. Criteria used in the model and fire flow requirement (provided by COS Fire Department)
    c. Results/Discussion – proposed facilities are adequate to serve development based on hydraulics, etc…
3. Summary/Conclusions
    a. Discuss how the objective of the report has been met. (i.e. Proposed facilities will serve the proposed development in accordance with established criteria.)
    b. List all major facilities required and phasing as applicable.
4. Appendices
    a. Water modeling results organized by:
        i. Average Day
        ii. Maximum Day
        iii. Peak Hour
        iv. Maximum Day plus Fire Flow
    b. The following information is to be included for the above scenarios:
        i. Junction/Node Report – node label, elevation, demand, hydraulic grade line in feet and pressure in (lbs./in^2).
        ii. Pipe Report – pipe label, nodes, length, diameter, Hazen-Williams "C" value, discharge, velocity, headloss and headloss gradient.
        iii. Pump Report – pump label, elevation, discharge, discharge pump grade and pump head.
        iv. Valve Report – valve label, elevation, diameter, valve status, discharge and hydraulic grade line.
        v. Reservoir Report – reservoir label, elevation, hydraulic grade line and outflow.
        vi. A separate fire flow report for the maximum day plus fire flow scenario to be submitted. The fire flow report is to show the following information for all nodes: node label, satisfies fire flow constraint, needed fire flow, available fire flow, total flow available, residual pressure, minimum system pressure and minimum system pressure node.
5. Exhibit for peak hour, average day and maximum day exhibits are required. Exhibits to include the following:

a. Pipes and nodes labeled

b. Pressure at nodes

c. Major Roadways labeled

d. Pipe size shown

e. Major contour lines shown

6. Figures, exhibits, tables and spreadsheet tabulations to be placed in the body of the report.

CHAPTER 7 – SEWER SYSTEM DESIGN STANDARDS

7.1 GENERAL INFORMATION AND REQUIREMENTS

This section of the City of Surprise Engineering Development Standards explains the required standards to be followed when designing a sanitary sewer system project within the City of Surprise (city). Refer to Chapter 10 for additional information regarding inspection procedures.

1. These guidelines and standards apply to the City of Surprise sewer service area only. A map defining this service area is available online on the city's website at www.surpriseaz.gov.
2. All developments, including single-family residences, are required to connect to the city's sewerage system. Individual and on-site disposal/septic systems are not allowed within the city's annexed boundaries. Exceptions are made only with the prior written approval of the Water Resource Management Director or designee.
3. A Wastewater Master Plan shall be submitted for all commercial and residential developments and industrial projects that are to connect to the city's sanitary sewer system. The master plan shall identify the demand that the new development or project will impose on the system, provide a model of the proposed sewer system, and a resulting report, analyze the feasibility of the city's sanitary sewer system ability to service the new development, and identify any improvements necessary to maintain the sanitary sewer system's service standards. The master plan shall be submitted at the beginning of the development review process. See the City of Surprise Wastewater Master Plan Preparation Guide on the Engineering Development Services page on the city's website at http://www.surpriseaz.gov.
4. All developments shall provide for all categories of sewer lines required to provide sewer service for both the individual development and the ultimate build-out area according to the city's Integrated Water Master Plan (IWMP).
5. Public wastewater lift stations are discouraged and are allowed only under unusual circumstances with the prior written approval of the Water Resource Management Director or designee, following the Engineering Standards Modification Request Procedures described in Chapter 1, Section 1.5. When a lift station is the only means by which a property may be serviced, the developer is responsible for building the lift station, bonding the operation and maintenance of the lift station for a period of 20 years, and for replacing the lift station after that initial 20-year period.

7.2 TYPES OF SANITARY SEWER LINES

The City of Surprise sewerage system consists of the following five types of sanitary sewer lines as determined by use.

1. Building Sewer – Conveys sewage from a single building to a lateral sewer or the building connection.
2. Lateral Sewer – Also referred to as the building connection in the SUDC Chapter 58. Collects sewage from building sewers at the property line and conveys it to the sewer tap of a branch or main sewer.
3. Branch Sewer – Collects sewage from lateral sewers and conveys it to a main or trunk sewer. Receives sewage from more than one public sewer from a relatively small area.
4. Main Sewer – Collects sewage from two or more branch sewers as tributaries.

5. Trunk Sewer – Conveys sewage from many tributary main or branch sewers over large areas to water reclamation facilities. Also known as interceptors.

7.3 MATERIALS OF SANITARY SEWER LINES

Standard sewer pipe materials have been specified within the City of Surprise for all sewer lines. Sewer lines shall consist of polyvinyl chloride (PVC) solid wall plastic sewer pipe and shall conform to the requirements of ASTM D-3034, SDR-35 or C900. Other materials can be used only with the authorization by the Water Resource Management Director or designee. When requesting alternative material, the applicant shall provide proof that the proposed material is equivalent or superior in performance to PVC. This includes but is not limited to providing material specifications (or cut sheets) and ASTM information for city approval. All sewer lines shall comply with MAG standard specifications Section 745, except as modified below:

1. Private on-site sewer lines shall be constructed of materials and at slopes defined in the International Plumbing Code as adopted by the City of Surprise.

7.4 DESIGN CRITERIA OF SEWER LINES

1. All sewer lines within the city shall be designed according to the standards set forth in ADEQ Bulletin 11, City of Surprise IWMP, A.R.S. R18-9-E301.4.01.D.2, and MAG Standard Specifications and Details.
2. Under gravity flow conditions, the system will be designed with a velocity between two feet per second when flowing full and nine feet per second. Under pressurized conditions, the system will be designed with a velocity between three and eight feet per second. This criteria is identified in the city's IWMP.
3. The minimum allowable sewer line size in a public street is eight inches in diameter; however, a six inch diameter sewer line is permitted for the first 400 feet of a dead-end sewer line with no potential for extension if all other design criteria are satisfied.
4. All sewers will be designed to give mean velocities, when flowing full, of not less than two (2) feet per second. All velocity and flow calculations will be based on the Manning Formula using an "N" value of 0.013. The slopes will be the minimum for the size indicated. Exceptions to these minimum slopes will be made at the upper end of lateral sewers serving less than thirty (30) houses. Said sewers will have a minimum slope of 0.76 percent. Where lateral sewers serve less than ten (10) houses, the minimum slope will not be less than one (1) percent. The following table lists minimum slopes for various sewer sizes:

Table 7-1 – Minimum Slopes by Sewer Diameter

Sewer Diam. (inches)	Minimum Slope (%)	Sewer Diam. (inches)	Minimum Slope (%)
8	0.33	18	0.11
10	0.24	21	0.092
12	0.19	24	0.077
15	0.14		

5. Curved sewers shall have a minimum 500-foot radius. Only eight-inch and larger mains shall be curved with prior written approval of the Water Resource Management Director or designee.

7.5 LOCATIONS OF SEWER LINES

1. All rights-of-way shall be dedicated to the city prior to commencing construction. The locations of sanitary sewer lines within rights-of-way will depend on the classification of the road, and the lines shall be located according to the guidelines shown in the City of Surprise Standard Details 3-01 through 3-07.
2. All sewers shall be parallel to property lines or centerlines, or as close to parallel as possible.
3. The minimum horizontal clearance between a sewer line and another underground utility shall be six feet measured from the outside of each pipe.
4. Prior to the acceptance of any construction, all exclusive sanitary sewer utility easements must be dedicated to the city. The minimum width for a single sanitary sewer line easement is 20 feet. Each additional line requires an additional 10 feet of easement. Sanitary sewer lines shall be centered within the easement unless prior written approval to locate the sewer line elsewhere has been provided by the Water Resource Management Director or designee.
5. Sewer lines shall not be placed beneath retention/detention basins.

7.6 DEPTH AND SEPARATION OF SEWER LINES

1. The minimum depth of cover shall be six feet for all sewer main and trunk lines. In the City of Surprise sewer service area, this depth shall be measured from top of pipe to top of finished grade.
2. Where the cover is less than six feet (due to topography such as canals, washes, etc.), a six-inch thick, one-sack concrete cap shall be constructed in place over the sewer line. This cap shall extend not less than two feet to either side of the barrel of the pipe and shall extend at least five feet beyond the limits of the canal, wash, etc.
3. Wastewater, potable, and reclaimed line separation and protection shall be in accordance with MAG Standard Details 404-1, 404-2, and 404-3, Sections 610.5, 615.3, and 616.3 of the MAG Standard Specifications and City of Surprise Standard Details 3-01 through 3-07.

7.7 PIPE BEDDING AND MARKER BALL REQUIREMENTS

1 The pipe bedding and backfill for sewer line construction shall conform to MAG Specifications 601 and 615, except as modified below.

   a. All sewer lines installed within the City of Surprise shall be bedded from the bottom of the excavation to one foot above the pipe with 100% ABC material, as outlined in MAG Specification 702. The initial bedding under the pipe is required for all pipes with a diameter of eight inches or larger and in all cases where rocks larger than 1½ inches in diameter are encountered along the trench bottom.

2 Marker balls shall be green and installed at all sewer line fittings and every 100 feet if the distance between fittings is greater than 100 feet.

3 All lines shall be marked with marking tape located one foot above the top of the pipe. Marking tape for wastewater lines shall be green and labeled “Caution: Sanitary Sewer Line” or approved equal.

4 All marker balls and marking tape shall be installed per City of Surprise Standard Detail 7-03.

7.8 SEWER SERVICE TAPS

1. For all projects requiring only a sewer tap, an application form is required for permit. The application form is located in Appendix 7-1.
2. All tie-ins to the active sanitary sewer system shall be made only after the completion of the new work and specific approval has been received from the Water Resource Management Director or designee.
3. The minimum tap sizes shall be set based on the land use being served by the lateral as shown in Table 7-2.

Table 7–2 Minimum Sewer Tap Sizes

Tap Function	Tap Size (inches)
Residential Lot	4
Commercial Lot	6
Multi Family Lot	6

4. All sanitary sewer taps within the city shall be performed per MAG Standard Details 440 and 441.
5. All taps shall be made at a 45 degree angle in the direction of the flow and enter the top or side of the pipe.
6. The minimum separation between sewer service taps shall be three feet.
7. The preferred sewer tap location is center of lot.
8. Taps eight inches or larger in diameter or those to a sewer line 12 inches or larger in diameter must be installed directly to a manhole.
9. A backflow prevention valve shall be installed on a service tap if the lowest finished floor elevation is below the upstream manhole rim elevation.
10. Metallic detector tape shall be installed on each individual sewer tap per City of Surprise Standard Detail 7-03. Marking tape shall be green and labeled: “CAUTION: SANITARY SEWER LINE”. Marker balls shall be placed directly above all lateral stub ends and taps.
11. All sewer taps into manholes shall be dimensioned from the property line.
12. In cases where driveways may conflict with normal placements of water and/or sewer services, developers may propose alternative locations. However, in no case will water services be closer than 3 feet or sewer services closer than 6 feet to property lines.

7.9 SEWER MANHOLES AND CLEANOUTS

The City of Surprise has established the following requirements for the materials, type, and spacing for both manholes and cleanouts within the sewer system.

7.9.1 Materials of Manholes

All manholes within the City of Surprise shall be per MAG Standard Specifications Section 625 except as modified below.

1. All manholes shall be constructed of either cast-in-place concrete or pre-cast concrete.
2. No steps shall be permitted in City of Surprise manholes.
3. All manholes installed within the city outside of paved areas shall be identified by a Carsonite continuous glass fiber and resin-reinforced green CUM-375 Composite Marker installed ten feet offset from the manhole centerline, but not outside of the dedicated right-of-way or easement limits. The installation of the marker in an alternate location requires prior written approval from the Water Resource Management Director or designee.

7.9.2 Spacing of Manholes and Cleanouts

1. Table 7-3 below outlines the maximum allowed spacing between manholes.

Table 7–3 Maximum Manhole Spacing

Pipe Size (diameter in inches)	Maximum Spacing (feet)
8 to 12	400
15 to 24	500
>24	600

2. A cleanout may be installed in the place of manholes at the end of lines no more than 100 feet from the last manhole. Cleanouts are not permitted on sewer pipes eight inches in diameter and larger.

7.9.3 Manhole Locations

In addition to the spacing defined under section 7.9.2, manholes are required at the following locations:

1. All changes in grade or slope.
2. All changes in pipe size.
3. All changes in alignment.
4. All pipe intersections other than service connections less than eight inches in diameter.
5. All service connections eight inches in diameter and larger.
6. Manholes shall not be located in washes or retention/detention basins

7.9.4 Manhole Design Criteria

1. The sizing of manholes is based on the diameter of the sewer line connected to the manhole. Table 7-4 below presents minimum manhole diameters.

Table 7–4 Minimum Manhole Diameters

Pipe Size (diameter)	Manhole Diameter (inches)	Manhole Cover Size (inches)
8 to 12	48	24
≥ 15	60	30

2. If the sewer line is deeper than 10 feet below land surface, a 60-inch manhole diameter is required.
3. Service inverts shall be a maximum of 12” above the outlet main crown elevation.
4. Each manhole shall have no more than 4 entrances including the inlet and outlet connections and 2 service connections.
5. Manholes constructed on the boundaries of subdivisions or improvement districts shall include full-line size stubs with shaped inverts. These stubs shall be installed in the direction appropriate for future connections.
6. Manholes containing a through sanitary sewer line creating a change in direction greater than 30 degrees shall have a minimum drop of 0.20 feet across the manhole. A through line with a change in direction less than 30 degrees shall have a minimum drop of 0.10 feet across the manhole. The lines shall intersect at an angle of no more than 90 degrees.
7. If the sewer lines contained in the manhole are not the same diameter, then the crown of the upstream pipe shall always be higher than the crown of the downstream pipe.
8. Lateral sewer connections to a branch sewer may have a maximum drop of 12 inches from flow line to flow line without a drop connection.

7.10 WASTE CONTROL FROM COMMERCIAL DEVELOPMENTS AND MULTI-FAMILY RESIDENTIAL

1. Grease, oil, lint, or sand interceptors shall be required for laundries, restaurants, service stations, auto repair shops, car washes, and other facilities when the city determines that they are necessary for the proper handling of liquid wastes containing grease, oil, any flammable wastes, sand, or other harmful ingredients in excessive amounts.
2. All interceptors shall be of a type and capacity approved by the city and shall be 24-hour accessible for cleaning and inspection.
3. Grease and oil interceptors shall be constructed of impervious materials capable of withstanding abrupt and extreme changes in temperature. They shall be of substantial construction, watertight, and equipped with easily removable covers. When bolted covers are required, they shall be gastight and watertight.
4. Where installed, grease, oil, and sand interceptors shall be maintained in continuously efficient operation by, and at the expense of, the owner at all times and records for the past 12 months shall be kept on-site for the city’s review. Maintenance shall be performed at a minimum of every 90 days or as determined by the City.
5. Hair traps are required for grooming facilities.
6. Interceptors are required in the following commercial facilities, but not necessarily limited to, as required by the SUDC and the Water Resource Management Director

or designee. Interceptor sizing and capacity shall be per calculations by an Engineer registered in the State of Arizona. The minimum size of an interceptor for restaurants shall be at least 750 gallons (2,500 gallons max).

Table 7–5

Restaurants	All types, Fast food chains, Pizza delivery, Sandwich shops, Bakeries
Service Stations	Auto repair, Car washes, Fuel stations
Hair trap required business	Pet Grooming, Salons, Laundries
Other	Any other facility deemed necessary for potential discharge by the City of Surprise Environmental Manager.

7. All photo processing facilities, dental offices, and x-ray processing facilities shall be equipped with a metals recovery unit.

7.11 WASTE CONTROL FROM INDUSTRIAL DEVELOPMENTS

All industrial facilities shall complete an Industrial Pretreatment Preliminary Survey. After review of the Preliminary Survey, the Water Resource Management Department may require the further completion of a Pretreatment Permit Application & Industrial/Commercial User Survey. Both documents can be obtained from the Environmental Division of the Water Resource Managenent Department or www.surpriseaz.gov.

7.11.1 Preliminary Treatment Facilities

1. Where necessary and as determined by the city, any user of the sewer system shall provide, at their expense, such preliminary treatment as may be necessary to reduce objectionable characteristics or constituents to within the maximum limits provided in the SUDC Chapter 58.
2. Plans, specifications, and any other pertinent information relating to proposed preliminary treatment facilities shall be submitted for the approval of the Water Resource Management Director or designee.
3. The approval of the plans and inspection of construction shall not relieve the owner from complying with the discharge limitations set forth in the Surprise City Code. The city shall enforce Federal pre-treatment requirements as set forth in the Code of Federal Regulations.

7.11.2 Control Vault / Monitoring Manhole Requirements

1. All industrial facilities shall install an industrial waste control vault/monitoring manhole to facilitate the observation, measurement, and sampling of the process waste from that facility. Such a control vault/monitoring manhole, when required, shall be 24-hour accessible and constructed in accordance with plans approved by the city. The control vault/monitoring manhole shall be installed and maintained by the owner at his/her expense. The sampling vault shall be installed on the owner's property close enough to the public right-of-way to allow 24-hour access by city personnel and within the limits of the manufacturer's requirements. After the installation is complete, the owner shall provide the city's Water Resource

Management Department with the keys necessary to access the vault. See City of Surprise Standard Detail 7-02.

2. All concrete used to construct the vault's floor, walls, and top slab shall conform to MAG Standards Specifications, Class A, and its minimum compressive strength at 28 days shall be 3,000 psi.
3. All concrete used for the vault's grout fillet inside the structure shall conform to MAG Standard Specifications, Class C, and its minimum compressive strength at 28 days shall be 2,000 psi.
4. All steel reinforcement in vaults shall be in the form of deformed bars, Grade 60, billet steel conforming to A.S.T.M. Specification A-615.
5. Flume size shall be based upon minimum and maximum flow rates and velocities to ensure free-flow conditions. Maximum flow shall not exceed 100% of the maximum capacity of the selected flume size. A minimum flow depth of 0.5 inches should exist during the minimum actual flow.
6. The flume floor elevation shall be high enough, relative to the downstream conditions, to prevent submergent flow (50% submergence is acceptable at maximum flow). The flume shall be installed level with the floor both longitudinally and transversely in the converging section.
7. Upstream flow should be wave-free, non-turbulent, symmetrical, and uniform in velocity (one fps minimum to three fps maximum) for a length of at least ten times the flume throat length in the approach channel. Bends in the outlet or inlet pipe will not be permitted for a distance of 25 pipe diameters upstream and downstream.
8. It shall be the owner's responsibility to properly maintain the flume in accordance with the manufacturer's recommendations to ensure the accuracy of the flow measurement.
9. Monitoring manholes shall be constructed according to MAG Standard Detail 420, for "48" Diameter Pre-Cast Concrete Sewer Manhole."
10. A sanitary sewer manhole cover shall be used for monitoring manholes. See City of Surprise Standard Detail 7-01.
11. Excluding the monitoring manhole, all manhole sections shall be sealed with both "ramneck" mortar and cement mortar.
12. Manholes shall be constructed per MAG Specification 625.

7.11.3 Industries Required to Install Control Vaults in the Building Sewer

Industries included in, but not necessarily limited to, Table 7-6 below shall install a control vault in the building sewer.

Table 7–6 Industries Required to Install Control Vault in the Building Sewer

Adhesives manufacturing	Food Processing	Paint formulating
Aluminum forming	Foundries (metal molding and casting)	Pesticide chemical manufacturing
Any Industry Requiring Pre-Treatment	Glass manufacturing	Petroleum refining
Asbestos manufacturing	Grain mills	Pharmaceutical manufacturing
Battery manufacturing	Hospital	Porcelain enameling
Carbon black manufacturing	Ink formulation	Printing and publishing
Coil coating	Inorganic chemical manufacturing	Pulp, paper, and paperboard manufacturing
Copper forming	Iron and steel manufacturing	Rubber manufacturing
Dye Manufacturing or Processing	Laboratories	Soap and detergent manufacturing
Electrical and electronic components manufacturing	Laundries	Steam electric power generation
Electroplating	Leather tanning and finishing	Sugar processing
Feedlots	Mechanical product manufacturing	Tars and asphalt paving and roof material manufacturing
Ferroalloy manufacturing	Metal finishing	Textile mills
Fertilizer manufacturing	Nonferrous metal manufacturing	Timber product processing

7.12 SEWER LINE CONSTRUCTION

All construction of wastewater lines within the city shall comply with applicable MAG Standards Section 615, City of Surprise Standard Specifications, and ADEQ Engineering Bulletin No. 11.

7.13 SEWER LINE INSPECTION

All newly installed branch, main, and trunk sewers in the right-of-way or an easement shall be inspected by closed circuit television methods acceptable to the city. Any defects discovered during televised inspection shall be corrected at no cost to the city. After the correction of defects has been completed, affected sewer sections shall be re-televised at no cost to the city. DVDs of all televised inspections shall be provided to the city prior to final acceptance of the sewers.

APPENDIX 7-1

SEWER TAP PLAN
PERMIT APPLICATION

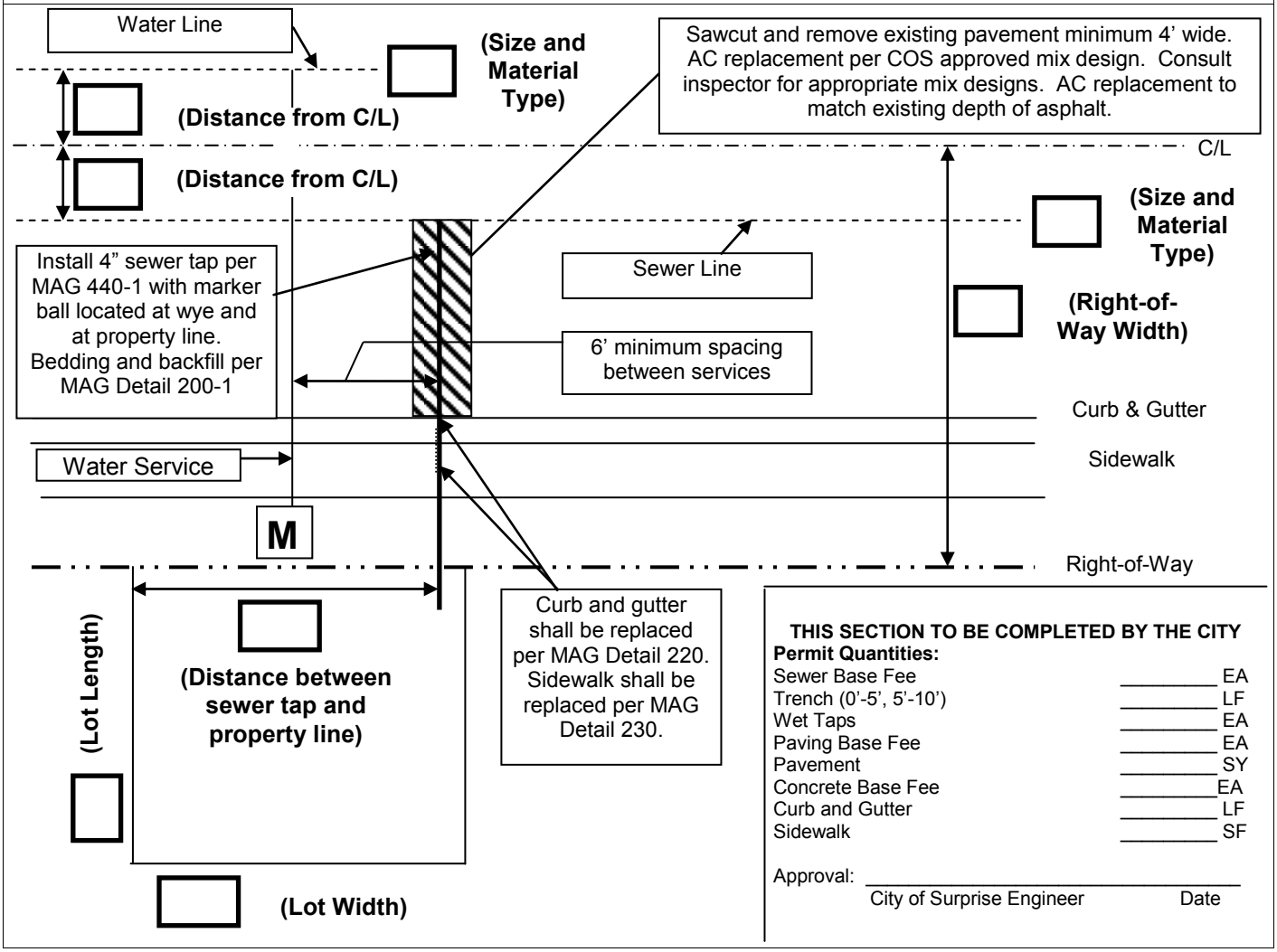
PUBLIC WORKS DEPARTMENT
Engineering Services
16000 N Civic Center Plaza
Surprise, Arizona 85374
Office: (623) 222-6150
Fax: (623) 222-1701
Web Site: www.surpriseaz.gov

CITY OF SURPRISE SEWER TAP PLAN – PERMIT APPLICATION

Property Information			
Owner's Name:		Date:	
Site Address:		Zip Code:	
Phone:		APN #:	

Site/Construction Plan:

☐ **Boxes to be completed by applicant. Contact City of Surprise (COS) Public Works Department for utility and right of way information.**



THIS SECTION TO BE COMPLETED BY THE CITY

Permit Quantities:

Sewer Base Fee	_____ EA
Trench (0'-5', 5'-10')	_____ LF
Wet Taps	_____ EA
Paving Base Fee	_____ EA
Pavement	_____ SY
Concrete Base Fee	_____EA
Curb and Gutter	_____ LF
Sidewalk	_____ SF

Approval: _____
City of Surprise Engineer Date

Submit 2 copies of this application to Engineering Services

CHAPTER 8 – LANDSCAPING AND IRRIGATION STANDARDS

8.1 GENERAL INFORMATION

This section of the City of Surprise Engineering Development Standards explains the required standards for landscape and irrigation systems in the City of Surprise.

1. Landscape plans are to be submitted to the Community Development Department for review and approval. Final approvals will be contingent on approval by the Community Development, Public Works Engineering, and Public Works Landscape Maintenance Division.

2. All irrigation lines, 1 inch or greater, within the right-of-way shall be shown on the water plans. A permit is required for this work and is subject to inspection by the City of Surprise civil inspector.

3. Only plants on the Arizona Department of Water Resources (ADWR) Phoenix Active Management Area Low Water Use Drought Tolerant Plant List are to be used within city limits.

4. The following lists of **single-trunk** trees are on the city's approved list for areas in public right-of-way, including medians. All other trees must have prior approval from the Community Development Planning Division and Public Works Landscape division:

    - Willow acacia (Acacia Salicina)
    - Palo Blanco (Acacia willardiana)
    - Southern Live Oak (Quercus virginiana)
    - Texas Mountain Laurel (Sophora Secundiflora)
    - Desert Willow (Chilopsis Linearis)
    - Ash (Fraxinus Greggii)
    - African Sumac (Rhus lancea)
    - Chineese Pistache (Pistacia Chinensis)
    - Mesquite Thornless (Chilean)*
    - Ironwood (Olneya Tesota) *
    - Palo Verde (Parkinsonia Aculeata /florida)*
    - Palo Verde Desert Museum*

    *Only in medians and approved on a case-by-case basis only

5. All trees will be measured and have a minimum caliper size as defined in the Arizona Nursery Association's Container Grown Tree Guide. In no case will the caliper be less than 2 inches (measured 18 inches from the ground). The height of the tree shall be a minimum of 7 feet.

6. The Community Development Planning Division and Public Works Landscape division may select and tag trees at the nursery location and will review at project site prior to installation.

7. All medians are to be decomposed granite, unless otherwise approved; and shall be finish graded to slope from the curb line to the plants. Median noses less than 3-foot wide are to have 1 1/2" – 3" decomposed granite (pit run rock) mix.

8. Decomposed granite (DG) shall be 1/2" or 3/4" screened material (depending on availability of desired color). The preferred color of decomposed granite in the City of Surprise right-of-way will be Madison Gold (or approved equal), however in some cases, approved colors may vary based on surrounding areas. All DG shall ultimately be approved by the Community Development Planning Division. Note on Plans: Contractor must submit decomposed granite samples for City approval prior to ordering.

9. Tree root barriers are required per Detail 8-14 when trees are within three feet of sidewalks, curbs, pavement or walls.

10. All trees are to be located a minimum of 12 feet from the walls for well sites, water supply facilities, lift stations, and water reclamation facilities.

11. Sight visibility triangles/lines shall be shown on landscape improvement plans (refer to Detail 4-01 and 4-02).

12. Trees located in medians may be allowed a minimum of seven feet from the curb. Trees must be centered in medians less than 14' wide.

13. All landscaping shall be located a minimum of five feet from any fire hydrant, water meter, or vault.

14. Landscaping, at full growth, shall not impede pedestrian or vehicular traffic. All landscaping shown on plans shall be shown mature size.

15. Trees cannot be removed from the right-of-way without written authorization from the Public Works and Community Development Departments.

16. The type, color, and size of brick pavers that may be used for city medians in the City of Surprise Right-of-Way shall be approved by the Community Development Planning Division. Paver Type shall be per Table 8.1 or approved equal. If approved, a Controlled Low Strength Material (CLSM) per MAG Section 728, one half (1/2) sack, shall be placed as a base in all paver locations. The minimum thickness of the CLSM shall be six (6) inches.

Table 8-1 – Approved Brick Pavers

Manufacturer (or approved equal)	Type	Color	Dimensions
AZ Block 2000	Valencia Holland	Sunset Blend	4" X 8"
Pavestone	Holland Stone	Antique Terra Cotta	4" X 8"
Superlite Block	Holland	Sedona Blend (4) and Charcoal (1) 4:1 Ratio	4" X 8"

8.2 IRRIGATION SYSTEMS

1. Utility boxes, meters, vaults, etc. are to be located in the right-of-way or utility easement along the sides of the roads and never in the median. However, irrigation valve boxes may be located in the median planting area.
2. Developers shall use only irrigation equipment that is compatible with the existing equipment. The developer shall refer to the City of Surprise for the approved list of equipment. Equipment manufactured by Hunter Industries, is compatible with the city's inventory and Hunter equipment, or an approved equal, shall be used. Solar controllers are preferred and shall be DIG, Leit series, post mounted solar controller or an approved equal.
3. All controllers, meters, etc. must be enclosed by locking protective covers and screened from view.
4. The line separation requirements of Chapter 6 apply to all lines.
5. All irrigation systems will be installed with purple pipe.
6. Marking tape labeled as "Reclaimed Water" is required on irrigation systems that use or may use reclaimed water in the future.
7. Purple marker balls shall be installed on all irrigation mainlines four inches and larger within the public right-of-way at all fittings and every 200 feet if the distance between fittings is greater than 200 feet.
8. Landscape areas that are to be maintained by the city shall have separate water meters and electric or solar controllers, as approved by the City.
9. A city approved backflow preventer is required for irrigation services, for potable water, non-potable water and reclaimed water and shall meet EPA low lead standards.
10. All irrigation mainlines and laterals shall be Schedule 40; all risers, tees, and other fixtures shall be Schedule 80 in the right-of-way. All irrigation mainlines in the right-of-way shall be sleeved. The minimum sleeve size is 5 inches.

8.3 IRRIGATION SYSTEMS SUPPLIED BY RECLAIMED WATER

These comments are applicable to irrigation systems that are supplied by reclaimed water or may be supplied by reclaimed water in the future.

1. Reclaimed water shall not be used to irrigate landscaping located in 404 washes or structures or any landscaping that may ultimately runoff or drain to a 404 wash or waters of the US (i.e., open channels, catch basins, and retention/detention facilities).
2. All irrigation systems will be installed with purple pipe.
3. Marking tape labeled as "Reclaimed Water" is required on irrigation systems that use or may use reclaimed water in the future.
4. The reclaimed irrigation system shall be separate and independent of any drinking water system. Cross connections between potable water and reclaimed water are not permitted.

5. All valve boxes and risers shall be labeled as “Reclaimed Water – Do Not Drink.”

6. Drinking fountains shall be protected from the spray or misting of reclaimed water.

7. The line separation requirements of Chapter 6 apply to all lines.

8. The irrigation system shall be designed to minimize runoff, pooling, and ponding.

9. The system shall be designed to eliminate overspray.

10. Hose bibs on reclaimed water systems are prohibited.

11. Cross connection testing shall be completed prior to connection to the reclaimed water system. A reclaimed water meter shall not be installed and the irrigation system shall not be connected to a reclaimed water line without first conducting a cross connection test. See section 8.4 for Cross Connection Testing Requirements.

12. As-built plans shall be submitted to the city prior to connection to the reclaimed system. Any modifications to the landscape design shall be provided to the city.

13. All irrigation mainlines and laterals shall be Schedule 40; all risers, tees, and other fixtures shall be Schedule 40 in the right-of-way. All irrigation mainlines in the right-of-way shall be sleeved. The minimum sleeve size is 5 inches.

8.4 CROSS CONNECTION TESTING REQUIREMENTS

1. A cross connection testing plan shall be developed for the specific property and shall be sealed by a Professional Engineer or Landscape Architect actively registered to practice in the State of Arizona.

2. The testing plans shall include the following:

    a. A description of the property to be tested and the location of the property.

    b. A detailed procedure for the cross connection testing to demonstrate that the non-potable water system is separate and not connected to the potable water system. The procedure shall be developed based on the conditions at the site and will need to include specific meter and valve information.

    c. A list of all water taps to be tested.

    d. A site-specific field log sheet.

    e. Copy of the as-built building plans showing the potable and non-potable water system and all water meters and taps on the property.

    f. Copy of the as-built irrigation plans showing the potable and non-potable irrigation lines, valves, and controllers.

3. The testing plan shall be submitted to the City of Surprise Water Resource Management Department, Environmental Division for review and approval prior to implementation.

4. The City of Surprise Water Resource Division shall be notified of the date, time, and location where the test will be conducted. City of Surprise staff or their representative may observe the testing at any time.

CHAPTER 9 – CONSTRUCTION PLANS

9.1 GENERAL REQUIREMENTS

1. All construction plans shall be in accordance with City of Surprise requirements in conjunction with the Maricopa Association of Governments' (MAG) Uniform Standard Specifications for Public Works Construction, and Uniform Standard Details for Public Works Construction, Latest Editions, herein after referred to as "MAG Standard Specifications", and "MAG Standard Details", respectively, and shall utilize English units of measurement.
2. Sheet Size – Construction plans shall be prepared on 24 inch by 36 inch sheets, with a minimum one and one-quarter (1.25) inch left border and a minimum one (1) inch border on top and bottom borders and a minimum three-quarter (0.75) inch on the right border (See Details 2-01, 2-02 and 2-03).
3. Scale – The scale of construction plans shall depend on the type of submittal. In general, the scale shall be appropriate to produce legible and easily readable plans; and the chosen scale shall provide full plan and profile layouts with no intermediate break lines per sheet. Plan and profile layouts shall use a horizontal scale of one (1) inch equals twenty (20) feet (1" = 20') and a vertical scale of one (1) inch equals two (2) feet (1" = 2') or use a horizontal scale of one (1) inch equals forty (40) feet (1" = 40') and a vertical scale of one (1) inch equals four (4) feet (1" = 4'). Alternate plan scale may be proposed by the developer and will be considered by the city on a case by case basis. See Section 9.2 for the scale of the final plat.
4. Lettering – Use a minimum lettering and numbering size of three-sixteenths (3/16) inch for manually drafted plans. Use 12-point minimum font size letters, numbers, and symbols for mechanically drafted plans. All lettering, numbering, and line work must be uniform and legible.
5. North Arrow – Drawings shall be prepared with the direction of north shown toward the top of the sheet or toward the right side of the sheet whenever possible. The north arrow shall be prominently located with a notation indicating the scale of the drawing.
6. Notations – Orient all notations to read upward or to the right, except where approved by the city.
7. Vicinity Map – Construction plans shall include a small vicinity map showing the relationship of the proposed development to the nearest arterial and major collector streets. All significant street alignments within the vicinity map are to be identified. The orientation of the vicinity map must agree with the orientation of the map drawing, but the vicinity map does not need to be drawn to any particular scale. The vicinity map shall be up to date and current with existing conditions.
8. Reproducibility – Plans shall be of sufficient quality for microfilming/scanning, i.e. line work, lettering, and numbering shall be easily read when reduced by 50%.

9. Seal/Signature – All typing, signatures, stamps, and seals must be clearly legible, and not smeared. Copies of this information are acceptable only on plans that are still in the review process. All plans shall be prepared, signed, dated, expiration dated, and sealed by professionals actively registered to practice in the State of Arizona, as follows:

    a. Landscape and irrigation plans sealed by a Professional Landscape Architect actively registered to practice in the State of Arizona.

    b. Final plat map sealed by a Registered Land Surveyor actively registered to practice in the State of Arizona.

    c. All other drawings, engineering drawings, and final maps submitted for approval sealed by a Professional Engineer actively registered to practice in the State of Arizona.

10. Construction plans shall include:

    a. A symbol legend both proposed and existing;

    b. An abbreviation legend both proposed and existing; and

    c. An items and quantities table

11. Legal Description – The legal description shall include a development name, the quarter section(s) in which the development is located, and a complete legal description of the development's boundaries. An example legal description follows:

    "A condominium development in part of the SE quarter of Section 18, Township 3 North, Range 1 West of the Gila and Salt River Base and Meridian, Surprise, Arizona".

12. Plans for Review/Approval - Plans submitted to the City of Surprise for interim and final review shall be blue line or black line prints on bond paper. A digital copy of the plans shall also be submitted to the City of Surprise in AutoCad format.

13. As-Built Drawings – As-built drawings shall be twenty-four (24) inches by thirty-six (36) inches with red ink used to indicate as-built changes to the original plan sheets. After construction is complete, the construction plans shall be updated to reflect as-built conditions. A digital copy of the plans shall be submitted to the City of Surprise in PDF format. Any changes to the original design CAD files must be submitted in AutoCAD format. See Chapter 10 for specific digital as-built requirements.

14. APPENDIX 9–1 contains checklists for preparing type specific uniform plan sets.

9.2 FINAL RECORDED PLAT SUBMITTAL FORMAT

The final recorded plat submittal format shall be in accordance with the Maricopa County Map Recordation Criteria and the following:

- Sheet size of 24" by 36"
- Final plat clearly and legibly drawn in black ink
- Any text at minimum font of 12 point
- Dedication language
- Name of subdivision at top center of each sheet
- General location of subdivision by section, township, range, city, county, and state entered under the name of the subdivision
- Date of preparation
- North arrow
- Vicinity map including area within 1/2 mile of site
- Developer/owner
- Signature block including notarization
- Signed and sealed by a Registered Land Surveyor in the State of Arizona including expiration date
- Engineering Scale
- Margins of 2" on the left hand side and 1/2" margins all other sides
- Notation of the total acreage of the subdivision and total number of lots (in lower right corner of plat)
- Boundaries in heavy solid line including reference to section or quarter section lines and all dimensions for irregularly shaped lots
- Bearing, distances, and curve data of all perimeter boundary lines. Curve data will show a minimum of three elements of the curve
- Curved boundaries have sufficient data to allow re-establishment of curves on the ground all non-tangent curves will show a reference bearing to the center of the curve
- Location and description of point of beginning and its proper reference to monument boundary survey
- Location and a detailed description of all monuments, either found or set
- Monuments set during the survey, including road centerline monuments, will be stamped or tagged with the Registration Number of the Surveyor responsible for their placement.
- Parcels completely or partially surrounded by subdivision indicated at "EXCEPTED" and common boundary identified

- Location and layout of lots, blocks, tracts, streets, alleys, easements, and other public grounds within and adjoining plat including dimensions to one-hundredths of feet, bearings, curve data to include, as minimum, radius, length, and delta angle. In addition, non-tangential curves require the inclusion of radial bearings
- Lot numbers and addresses for each lot
- Minimum lot width and average lot width
- Rights of way and easements clearly labeled and named to specify approved use including the instrument establishing the encumbrance
- Final water and/or sewer and drainage easements and properties dedicated to the city
- Boundaries of any floodplain including "404 areas"
- Source of the Basis of Bearing
- Certificate of Assured Water Supply note (if the plat is subdividing 6 or more lots)

APPENDIX 9–1

CHECKLISTS

FOR THE

PREPARATION OF UNIFORM PLAN SETS

SURPRISE
ARIZONA

CHECKLIST
FOR

Grading and Drainage Plans

General Requirements

- Plans shall be on twenty-four (24) inch by thirty-six (36) inch sheets. Refer to details 2-01 through 2-03.
- Symbols shall be per MAG Standard Specifications and Details supplemented by City of Surprise details.
- Orientation of each plan sheet shall be shown by a north arrow and scale of drawing. North arrow to up or to the right where possible.
- Scale shall be per City of Surprise Standard 9.1(3).
- A cover sheet is required on plans of more than one (1) sheet.
- Each sheet shall be identified by sheet number and project name in a title block, and match lines where applicable.
- Provide cross section at all streets and at all property lines through all retention facilities.
- All sheets shall have an Arizona Civil Engineer's registration seal with original signature, date, and Engineer's seal expiration date.
- Original plan sheets shall be sufficiently clear to allow legible prints to be reproduced from microfilm. The size of lettering and symbols shall be per City of Surprise Standard 9.1(4).
- Provide Blue Stake logo and phone number on each sheet.
- Provide City of Surprise Engineer's General Notes, Grading Notes, and other notes as applicable, as found within the Supplemental Standard Details of the City of Surprise Engineering Development Standards.
- The plans shall be submitted to other agencies (City of El Mirage, Maricopa County, EPCOR, Maricopa Water District, etc.) for their review if the improvements impact any of their right-of-way or utilities or if the project is within their service area.
- A Geotechnical report, signed and sealed by a Professional Engineer actively registered to practice in the State of Arizona shall be provided for reference.
- Any project with a disturbed soil area of one (1) acre or greater, or is a part of a common plan of development or sale that will ultimately disturb one (1) or more acres, requires a separate Storm Water Pollution Prevention Plan (SWPPP) and all associated documents (see Engineer and Plan Review Permitting and Application Packet).

- Compliance with the Arizona Department of Environmental Quality (ADEQ) requirements for construction sites under the Arizona Pollutant Discharge Elimination System (AZPDES) requirements under the General Permit for Discharge from Construction Activities to Waters of the United States, the "AZPDES Construction General Permit" AZG2008-001. Owners, developers, engineers, and/or contractors are required to prepare all documents required by this regulation, including but not limited to: the Storm Water Pollution Prevention Plan (SWPPP), the Notice of Intent (NOI), and the Notice of Termination (NOT). Copies of all requirements, forms, and guidance are available from ADEQ, 1110 West Washington St., Phoenix, AZ 85007, (www.azdeq.gov), and from the Flood Control District of Maricopa County (FCDMC) "Drainage Design Manual, Erosion Control", available at FCDMC, 2801 West Durango, Phoenix, AZ 85009, (www.fcd.maricopa.gov).
- Provide a drainage report per City of Surprise guidelines.
- Refer to City of Surprise Underground Retention Guidelines and City of Surprise Drainage Report guidelines for additional information.
- Identify all existing and proposed FEMA floodplain/floodway limits.

Cover Sheet

- Provide a project title block with name and address of project. Include a reference to the project's location by township, range, and section.
- Provide the Developer's and Engineer's name, address, and phone number.
- Provide a City of Surprise Engineer's approval line as follows:

  THIS SET OF PLANS HAS BEEN REVIEWED FOR COMPLIANCE WITH CITY REQUIREMENTS PRIOR TO ISSUANCE OF PERMITS. THE CITY NEITHER ACCEPTS NOR ASSUMES ANY LIABILITY FOR ERRORS OR OMISSIONS. THIS COMPLIANCE APPROVAL SHALL NOT PREVENT THE CITY ENGINEER FROM REQUIRING CORRECTIONS OF ERRORS OR OMISSIONS IN PLANS FOUND TO BE IN VIOLATION OF LAWS OR ORDINANCES.

  _____

  CITY OF SURPRISE ENGINEER *DATE*
- Provide a key map with street names, lot, tract, and parcel numbers, sheet numbers, and phase limits and numbers if applicable.
- Provide Benchmark – NAVD 88 Datum. Benchmark information in the City of Surprise can be found on www.surpriseaz.gov by clicking on city Departments, then on IT/GIS, then on Geodetic Survey Control Map.
- Provide a vicinity map.
- Provide a legend.
- Provide a project quantities table.
- Provide a Utility conflict coordination table with name of utility company, contact person, and date of response.
- Provide an As-Built certification statement and signature line.
- Provide legal description of the project site.
- Provide current FEMA flood zone designation and Firm Panel reference
- Provide the Basis of Bearing

Plan Sheets

- Show existing and proposed top of curb, gutter, and sidewalk elevations (both sides) and pavement crown elevations along project frontage at extension of lot lines, or every one-hundred (100) feet, (whichever is less).
- Provide a minimum of two (2) monument ties.
- Show and label low curb and high curb elevations.
- Show all existing utilities and drainage facilities, including private or M.W.D. irrigation within and adjacent to the property boundaries. All utilities shall be dimensioned from street monument lines.
- Provide rim and invert elevations on all manholes and catch basins.
- Show all existing and proposed storm drain with pipe length, slope and invert elevations.
- Show all permanent erosion control measures with area of installation.
- Provide finished floor elevations of all proposed buildings.
- Show details at property lines, fences, berms, etc. Also show improvements and finish floor elevations on adjacent property to the proposed development.
- Show all existing and proposed easements, dedications, right-of-way, streets, and alleys with dimensions and offsets. Streets shall be identified by name. Streets, alleys, and easements shall be dimensioned at least once and at all breaks. Monument line of streets shall be shown.
- All abutting lots shall be identified by lot number, tract, and subdivision or shown un-subdivided.
- Dimension all property boundaries, both perimeter and interior lines.
- Provide location of all proposed and existing utilities, structures, paving and other topographic features affected by construction.
- The proposed grading should be designed with slopes and topographic features which match the natural grade and boundary area to minimize erosion and sediment transport on to city streets or neighboring properties.
- Phased developments shall indicate interim slopes and grades to match proposed work to existing conditions.
- Grading Plans showing existing natural washes shall also show existing conditions including the longitudinal section line and grade of the wash flow line (the thalweg) at fifty (50) foot intervals. Show distances between banks and elevations at fifty (50) foot intervals.
- Provide the extreme storm outfall location and elevation.
- Show side slopes, bottom elevation, high water elevation, outfall elevation, location and direction, volume provided, and volume required for all retention/detention basins.
- Provide existing contours or spot elevations, drainage arrows and grade breaks to indicate drainage patterns. Also indicate all one-hundred (100) year flows from contributing offsite drainage areas.
- Provide spot elevations every one-hundred (100) feet on adjacent properties sufficient to depict existing conditions affecting drainage of property to be filled.
- Separate offsite plans with drainage facilities should be submitted with grading and drainage plans unless those details are shown on the grading plan.
- Any retaining wall in excess of forty-eight (48) inches as measured from the finish grade, any six (6) foot nominal height wall where the maximum exposed height is in excess of seven (7) feet, all proposed retaining walls which support a surcharge load, and any combination of screen wall in excess of six (6) feet attached to a retaining wall in excess of forty-eight (48) inches as measured

above must be reviewed and approved by the Building and Safety staff for conformance with the International Building Code (I.B.C.), Latest Edition.

- Site retaining walls, where the finish grade differential is less than or equal to forty-eight (48) inches, and the combination retaining wall/screen wall where the screen wall is six (6) feet in height or less, and the aggregate height is ten (10) feet or less, require the structural details be placed on the civil plans. Particular attention shall be applied to the structural connection between the retaining wall and the screen wall.
- Show accessible parking spaces. Provide grade arrows to verify that the slope in parking lot accommodates disabled access requirements, by not exceeding two percent (2%). Show on-site ramps to the building with slope arrows showing the area near accessible parking or on ramps to building.
- Existing irrigation supply ditches and/or irrigation tailwater ditches on this site, or in the right-of-way adjacent to this site, must be replaced with an underground pipeline, or abandoned subject to the approval of the irrigation company and/or downstream users. Limits of construction and scope of work shall be shown on the plan.
- Dry well details and specifications including brand, type, material, dimensions (depth and diameter), rim elevations, horizontal distance between chambers and invert elevations of all pipes and outlets.

Revision of Approved Plans

- Plans submitted for revision shall clearly show the revision, by clouding, and a number inside a delta, showing the number of the revision. This number shall be provided in a revision block, with the date of the revision, and a description of the revision. A new City of Surprise Engineer's approval line and text shall be provided, with the delta shown, on the previously approved cover sheet.
- The revision shall bear a new Engineer's seal.

SURPRISE
ARIZONA

CHECKLIST
FOR

Paving Plans and Water & Sewer Plans

General Requirements

- Plans shall be on twenty-four (24) inch by thirty-six (36) inch sheets. Refer to details 2-01 through 2-03.
- Symbols shall be per MAG Standard Specifications and Details supplemented by City of Surprise details.
- Orientation of each plan sheet shall be shown by a north arrow and scale of drawing. North arrow to up or to the right where possible. Scale shall be per City of Surprise Standard 9.1(3).
- A cover sheet is required on plans of more than one (1) sheet.
- Each sheet shall be identified by sheet number and project name in a title block, and match lines where applicable.
- Provide a typical section for each street showing pavement structure and depth, including all construction in the right of way. Depth of pavement structure shall be a minimum as provided in City of Surprise Standard Table 3.2, or per the Geotechnical Report, whichever is greater.
- All sheets shall have an Arizona Civil Engineer's registration seal with original signature, date, and Engineer's seal expiration date.
- Original plan sheets shall be sufficiently clear to allow legible prints to be reproduced from microfilm. The size of lettering and symbols shall be per City of Surprise Standard 9.1(4).
- Provide Blue Stake logo and phone number on each sheet.
- Provide all applicable City of Surprise Notes as found within the Supplemental Standard Details of the City of Surprise Engineering Development Standards.
- A separate street light plan shall be submitted, under separate cover, to the City of Surprise Public Works Department for review.
- A separate traffic signal plan shall be submitted, under separate cover, to the City of Surprise Public Works Department for review.
- A separate signage and striping plan shall be submitted to the City of Surprise Public Works Department for review.
- The plans shall be submitted to other agencies (City of El Mirage, Maricopa County, EPCOR, Maricopa Water District, etc.) for their review if the improvements impact any of their right-of-way or utilities or if the project is within their service area.

- A Geotechnical report, signed and sealed by a Professional Engineer actively registered to practice in the State of Arizona shall be provided for reference.
- Any project with a disturbed soil area of one (1) acre or greater, or is a part of a common plan of development or sale that will ultimately disturb one (1) or more acres, requires a separate Storm Water Pollution Prevention Plan (SWPPP) and all associated documents (see Engineer and Plan Review Permitting and Application Packet).
- Compliance with the Arizona Department of Environmental Quality (ADEQ) requirements for construction sites under the Arizona Pollutant Discharge Elimination System (AZPDES) requirements under the General Permit for Discharge from Construction Activities to Waters of the United States, the "AZPDES Construction General Permit" AZG2008-001. Owners, developers, engineers, and/or contractors are required to prepare all documents required by this regulation, including but not limited to: the Storm Water Pollution Prevention Plan (SWPPP), the Notice of Intent (NOI), and the Notice of Termination (NOT). Copies of all requirements, forms, and guidance are available from ADEQ, 1110 West Washington St., Phoenix, AZ 85007, (www.azdeq.gov), and from the Flood Control District of Maricopa County (FCDMC) "Drainage Design Manual, Erosion Control", available at FCDMC, 2801 West Durango, Phoenix, AZ 85009, (www.fcd.maricopa.gov)
- Should the City of Surprise require right-of-ways for streets, tapers, or temporary turn-arounds, right-of-way documents shall be required. If this right-of-way is not included on plat or map of dedication, it will need to be dedicated by a separate instrument. Contact the City of Surprise IT/GIS Department at 623-222-7500 for additional information.

Cover Sheet

- Provide a project title block with name and address of project. Include a reference to the project's location by township, range, and section.
- Provide the Developer's and Engineer's name, address, and phone number.
- Provide a City of Surprise Engineer's approval line as follows:

> *THIS SET OF PLANS HAS BEEN REVIEWED FOR COMPLIANCE WITH CITY REQUIREMENTS PRIOR TO ISSUANCE OF PERMITS. THE CITY NEITHER ACCEPTS NOR ASSUMES ANY LIABILITY FOR ERRORS OR OMISSIONS. THIS COMPLIANCE APPROVAL SHALL NOT PREVENT THE CITY ENGINEER FROM REQUIRING CORRECTIONS OF ERRORS OR OMISSIONS IN PLANS FOUND TO BE IN VIOLATION OF LAWS OR ORDINANCES.*
>
> _____
>
> *CITY OF SURPRISE ENGINEER* *DATE*

- Provide a key map with street names, lot, tract, and parcel numbers, sheet numbers, and phase limits and numbers if applicable.
- Provide Benchmark – NAVD 88 Datum. Benchmark information in the City of Surprise can be found on www.surpriseaz.gov by clicking on city Departments, then on IT/GIS, then on Geodetic Survey Control Map.
- Provide a vicinity map.
- Provide a legend.
- Provide a project quantities table.

- Provide a Utility coordination table with name of utility company, contact person, and date of response.
- Provide an As-Built certification statement and signature line.
- Provide the Basis of Bearing.
- Provide the amount of impervious surface area in square feet (including roof, parking lot, sidewalks, etc.) for all developed areas (excluding single family residential lots) including apartments, schools, commercial properties, HOA common facilities, etc.
- Provide the amount of total annual estimated water demand for the development, including building and common area landscaping, as established by the adopted Integrated Water Master Plan (in the form of equivalent dwelling units (EDUs)).

Plan and Profile Sheets (Paving)

- Provide profiles of existing and proposed grade at centerline, left and right flow line and top of curb. If there is a median show both sides of the median, top of curb and pavement, in the profile in place of the centerline profile.
- Provide a minimum of two (2) ties for centerline stationing to existing monuments.
- Provide construction notes and callouts for all items depicted on the plan.
- Provide all concrete work: curb and gutter, sidewalk, driveways, ramps etc.
- Provide all sidewalks and ramps per PROWAG and ADA requirements.
- Compaction shall comply with MAG Specifications and City of Surprise supplements to MAG.
- Provide existing washes and flood plains with designations.
- Provide all existing and proposed utilities and drainage facilities in the plan and the profile.
- Provide all existing and proposed easements, dedications, right-of-way, streets and alleys with dimensions and offsets.
- All abutting lots shall be identified by lot number, tract, and subdivision, or shown unsubdivided.
- Phased developments shall indicate interim slopes and grades to match proposed work to existing conditions.
- Provide vertical and horizontal control information, including line and curve data, slope, elevations, designations (PRC, BCR, ECR, PC, PT, etc.) and grade breaks, in the plan and the profile.
- Provide existing contours on plan view.
- Provide pavement cross slopes (see City of Surprise Table 3-2).
- Provide the storm drain system including all structures, valley gutters, and pipes. Include drainage arrows for flow line of street. Provide invert and rim elevations, slope, and profiles of pipes, scuppers, headwalls, manholes and spillways.
- Provide true length, in profile, at back of curb for all horizontal curves.

Plan and Profile Sheets (Water & Sewer)

- All existing and proposed structures, paving, topographic features, and utilities with size and material shall be shown in plan and profile.
- Provide sewer, water main, and irrigation (1 inch or greater) locations, dimensioned from centerline, showing pipe size, length, and material.
- Rim and flow line elevations shall be shown for all manholes and cleanouts.

- Proposed finished grades at centerline of sewer shall be shown in the profile with a solid line. Existing grades at centerline of sewer shall be shown in the profile with a dashed line.
- A profile is required for all sewer lines that are within the city ROW or an easement dedicated to the city.
- Maximum spacing between sewer manholes shall be per City of Surprise Standard Table 7-3.
- Cleanouts shall be per City of Surprise Standard 7.9.2(2).
- Pavement replacement shall be per MAG Detail 200-2.
- Trench backfill shall be per MAG Detail 200-1.
- The minimum separation between water and sewer and protection requirements shall be per MAG Standard Details 404-1, 404-2, and 404-3 and per Section 610.5, 615.4 and 616.3 of the MAG Standard Specifications.
- The minimum easement width for sewer mains is twenty (20) feet.
- The minimum easement width for water lines is twenty (20) feet.
- Water service and sewer service locations shall be per City of Surprise Standards, Chapters 6 and 7.
- Show all streets, alleys, rights-of-way, and easements with names and dimensions.
- Show total lineal feet of sewer pipe between manholes, calculated from center to center of manhole. Show calculated slopes. Velocity shall be between two (2) and nine (9) feet per second (fps). Round pipe lengths to the nearest whole foot.
- Label all connections to sewer lines and taps to water lines with method of connection specified.
- Size of sewer manholes shall be per City of Surprise Standard 7.9.4.
- A profile is required for water pipes that are 12 inches in diameter and larger.
- Provide station and offset from centerline and identify all valves, pipe fittings, fire hydrants, and manholes.
- Provide station for service connections (water and sewer) and specify all water meters as either a domestic or irrigation water meter.
- Locate water valves per City of Surprise Detail 6-01.
- Provide fire hydrant specifications including type, depth of cover to finished grade and elevations of bottom of flange.
- Mechanical restrained joints or blocking shall be per MAG Standard Details.
- When replacing existing sidewalk, curb and gutter, show and label existing and proposed concrete. Construct sidewalk ramps to accommodate access per PROWAG and ADA requirements. One-half (1/2) sack slurry backfill is highly recommended.
- Tunneling under curb and gutter should not be shown on the plans. Plans should indicate removal and replacement of the curb when crossing under the curb. The field inspector will determine if tunneling is acceptable based on the condition of the curb. Tunneling under sidewalks is not acceptable.
- Special detail required for connection to RCP. No new manhole on RCP.
- The minimum cover over any water or reclaimed water line shall be according to City of Surprise Standard 6.9.1.
- Provide spot elevations or contours sufficient to depict existing conditions affecting the placement of the water or sewer line.

Revision of Approved Plans

- Plans submitted for revision shall clearly show the revision, by clouding, and a number inside a delta, showing the number of the revision. This number shall be provided in a revision block, with the date of the revision, and a description of the revision. A new City of Surprise Engineer's approval line and text shall be provided, with the delta shown, on the previously approved cover sheet.
- The revision shall bear a new Engineer's seal.

SURPRISE
ARIZONA

CHECKLIST
FOR

Street Light Plans

General Requirements

- Plans shall be on twenty-four (24) inch by thirty-six (36) inch sheets. Refer to City of Surprise Engineering Standards, Supplemental Standard Details for sheet details.
- Street lighting levels shall be designed according to the Illuminating Engineering Society (IES) of North America's American Standard Practice for Roadway Lighting Manual, Latest Edition.
- Symbols shall be per Arizona Public Service (APS) Standard Specifications and Details supplemented by City of Surprise details.
- Orientation of each plan sheet shall be shown by a north arrow and scale of drawing (graphically represented). North arrow orientated up or to the right where possible. Scale shall be per City of Surprise Standard 9.1(3).
- A cover sheet is required on plans of more than one (1) sheet.
- Each sheet shall be identified by sheet number and project name in a title block, and match lines where applicable.
- All sheets shall have an Arizona Professional Engineer's (Electrical) registration seal with original signature, date, and Engineer's seal expiration date.
- Original plan sheets shall be sufficiently clear to allow legible prints to be reproduced from microfilm. The size of lettering and symbols shall be per City of Surprise Standard 9.1(4).
- Provide all applicable City of Surprise Notes as found within the Supplemental Standard Details of the City of Surprise Engineering Development Standards.
- Provide Blue Stake logo, phone number, and information on each sheet.
- The plans shall be submitted by the applicant to other utilities / agencies (City of El Mirage, Maricopa County, EPCOR, Maricopa Water District, etc.) for their review if the improvements impact any of their right-of-way / easements if the project is within their service area.

Cover Sheet

- Provide a project title block with name and address of project. Include a reference to the project's location by township, range and section.
- Provide the Developer's and Engineer's name, address, and phone number.
- Provide a key map with street names, lot, tract, and parcel numbers, sheet numbers, and phase limits and numbers if applicable.

- Provide a vicinity map.
- Provide a detailed legend.
- Provide a Utility conflict coordination table with name of utility company, contact person, and date of response.
- Include the following general note regarding street light energy and maintenance costs:
  THE ELECTRICAL / MAINTENANCE COSTS OF ALL STREET LIGHTS ON LOCAL AND COLLECTOR STREETS (TYPICALLY THE 100 WATT / 9,500 LUMEN AND THE 150 WATT / 16,000 LUMEN FIXTURES) ARE TO BE PAID BY THE ADJACENT DEVELOPMENT'S STREET LIGHT IMPROVEMENT DISTRICT (SLID). THE ELECTRICAL / MAINTENANCE COSTS OF ALL STREET LIGHTS ON ARTERIAL STREETS (TYPICALLY THE 250 WATT / 30,000 LUMEN FIXTURES) ARE TO BE BILLED TO THE CITY OF SURPRISE'S ENERGY BILL.
- Provide an items / quantities tabulation specifying the quantities / sizes of street lights that are to be paid for by Street Light Improvement District (SLID) and how many are to be added to the City of Surprise's Energy Bill.

Plan Sheets

- Provide centerline stationing at a scale not to exceed one (1) inch equals forty feet (1" = 40').
- Label each proposed street light location by centerline station and horizontal offset.
- Provide a minimum of two (2) ties for centerline stationing to existing monuments.
- Show all existing utilities and drainage facilities, including private or M.W.D. irrigation within and adjacent to the property boundaries. All utilities shall be dimensioned from street monument lines.
- Show all existing and proposed right-of-way / easements / roadway dimensions, curb, gutter, sidewalk, drainage facilities, utilities, fire hydrants, mail box locations, etc. along the project frontage. Streets, alleys, and easements shall be dimensioned at least once and at all breaks. Monument line of streets shall be shown.
- Identify all existing or proposed streets / intersecting streets by name. Also, identify all existing or proposed intersecting driveways.
- Reference each proposed street light location by centerline station and horizontal offset.
- All street light designs are to be according to the Illuminating Engineering Society (IES) of North America's American Standard Practice for Roadway Lighting Manual, Latest Edition. Each project is to be designed according to their individual circumstances taking surrounding land uses (residential, commercial, industrial, schools, parks, entertainment centers, etc.), potential for pedestrian / bicyclist conflicts, vehicular traffic volumes, roadway design / alignment (curved, knuckles, etc.) potential for turning movement conflicts (intersections and driveways), etc. into design consideration.
- Call out the use of APS approved External Back-Light Shields where lights are proposed adjacent to residential rear or side yards.
- Phased construction plans shall clearly define the limits / quantities per phase and any proposed temporary construction required for phased development.

- All abutting lots shall be identified by lot number, tract, and subdivision or shown as being un-subdivided.

Photometric Sheets

- State whether illuminance or luminance method was utilized. Provide veiling luminance calculations as required.
- Provide separate photometric values for each intersection, for average spacing on streets, and for worst case (maximum spacing) on streets.
- All street light designs are to be according to the Illuminating Engineering Society (IES) of North America's American Standard Practice for Roadway Lighting Manual, Latest Edition. Each project is to be designed according to their individual circumstances taking surrounding land uses (residential, commercial, industrial, schools, parks, entertainment centers, etc.), potential for pedestrian / bicyclist conflicts, vehicular traffic volumes, roadway design / alignment (curved, knuckles, etc.) potential for turning movement conflicts (intersections and driveways), etc. into design consideration.
- Design shall include existing and possible future streetlight location information for streets adjacent to and across from proposed project.

Revision of Approved Plans

- Plans submitted for revision shall clearly show the revision, by clouding, and a number inside a delta, showing the number of the revision. This number shall be provided in a revision block, with the date of the revision, and a description of the revision.
- Provide originally approved photometric values and the proposed revision's photometric values.
- The revision shall bear a new Professional Engineer's (Electrical) seal.

SURPRISE
ARIZONA

CHECKLIST
FOR

DRY UTILITY PLANS

- Project title block with name, project number, address/location, date, sheet number.
- Project contact name and phone number.
- Project Scope of work to include but not limited to; total trench length, total directional bore length, overhead vs. underground installation, quantities of known concrete or asphalt repair and replacement, number of poles removed and or installed, and number and location of all utility potholes for depth of existing utilities.
- Vicinity map with north arrow.
- Index of plan sheets if more than one plan sheet.
- Key map if more than one plan sheet.
- Match line if more than one plan sheet.
- Blue Stake symbol on all plan sheets.
- Legend of existing and proposed utility installations and associated infrastructure repairs.
- Engineering scale and north arrow.
- Monument/center line of the street.
- Property/lot lines.
- All Street names within the project scope of work.
- Dimension of existing & proposed Right-Of-Ways (ROW) from monument/center line of the street.
- Dimension of Easements (public & private) – PUE, Drainage easement, AAWC easement, etc. Private easements should have recordation information or property owner approval.
- General Notes for Dry Utility Construction. This can be found on our City web site, under Public Works Department, Engineering Development Services (2012 Engineering Development Standards).
- Proposed dry utility lines are to include size, material type and dimension from ROW or PUE.
- Proposed power poles are to include type and location (station and offset).
- Proposed potholes are to include stations and offsets.
- Trench and bore limits with dimension from ROW or easement line.
- Trench and bore detail shall include depth, width, conduits/pipes.

- Existing/proposed equipment (switching cabinets, transformers, pedestals, utility vaults, manholes, handholes, gas valves, etc.).
- Existing/proposed water/sanitary/storm/irrigation lines are to include size, material type and dimension from monument line.
- Existing/proposed edge of pavement, curb, gutter, sidewalk, ramp, building, drainage structure/channel, street lights, traffic signals.
- Dimension of edge of pavement, back of curb, back of sidewalk from monument/center line of the street.
- Floodplain/Floodway limits.
- Station and offset of street lights (typically from APS plans) must be verified with approved Street Light plans.
- Additional approval from the list below may be required, depending on the scope and limits of work:
    - FCDMC, MCDOT, ADOT, BNSF, MWD, adjacent cities, EPCOR or any private utility companies.

CHAPTER 10 – CONSTRUCTION INSPECTION GUIDELINES

10.1 GUIDELINES

1. GENERAL

a. A pre-construction meeting shall be held prior to the start of construction.

b. In order to keep nighttime noise at acceptable levels, permitees shall not conduct work between the hours of 9 P.M. and 5 A.M. in residential zones per the SUDC.

c. Certain times throughout the year a limit will be placed on the time, type, and locations of traffic restrictions. This may include areas around schools during school hours, areas around major shopping areas during the holiday shopping season (November 15 to January 2), and any road that is used to travel to and/or from the Surprise Recreation Campus during sporting and special events. This includes but is not limited to the annual baseball spring training season. Refer to the City of Surprise Temporary Work Zone Traffic Management Policy for further information.

d. The maximum slope allowed within the city right-of-way is 4:1 unless noted otherwise on approved drawings.

e. The City Engineer or designee will actively enforce temporary safety construction fencing for excavations and trenches in residential zone construction areas, and near schools (where there may be a problem with trespassing children). The contractor shall abide by OSHA regulations for public safety, including, but not limited to 29 CFR, Part 1910, and Part 1926, as well as other applicable standards including Section 107.08 of the Arizona Department of Transportation (ADOT)'s regulations. Fencing shall consist of wire mesh fabric and shall be securely anchored to approved steel posts located six feet apart, center-to-center, with a minimum height of six feet.

f. Prior to the start of any excavation or trenching, the developer shall submit a detailed plan to the City Engineer or designee for approval.

g. Contractors have a duty to perform work in strict accordance with plans and specifications whether or not the City of Surprise inspects the work. The presence of a City of Surprise official does not legally relieve the Contractor of the responsibility to comply with all plans and specifications. Some judgment is required to verify that the Contractor's work is reasonably close to conformity.

h. Haul Permit Information: Contractors hauling fill or excavation materials where the haul exceeds 5,000 cubic yards using unpaved on-site haul roads or where the haul lasts longer than ten working days shall submit a Control Plan to mitigate dust and tracking problems and present the proposed haul routes and a schedule of the operation. The Control Plan shall be submitted to the Public Works - Engineering Services Division for review prior to County Permit submittal to ensure that all elements of the planned operation are covered.

i. Prior to the start of any on-site grading or paving operations, the contractor shall have an approved set of grading plans, all applicable permits from city, county, state, and federal agencies and any financial assurance. The contractor shall also notify the city at least 24 hours prior to the commencement of work by calling (623) 222-6150. Additional instructions concerning grading and paving inspections may be provided at that time by the City Engineer or designee.

j. All construction operations encroaching into the right-of-way shall be subject to periodic and final inspection by the City of Surprise for compliance with all permit requirements, as well as applicability to city, county, state and federal laws. Permittee must notify the City of Surprise Public Works Department Engineering Development Services Division at (623) 222-6150 at least 48 hours prior to beginning permitted construction work in the right-of-way. Requests for city Civil inspections must be made 24 hours in advance.

k. Permitting:

    i. All city approved plans are valid for 180 days from plan approval date. All permits must be issued within 180 days or plans will expire and re-approval will be required along with any associated fees.

    ii. Permits are valid for 180 days from date of issuance. Upon good faith of continued construction and at the discretion of the City Engineer, a one-time request for extension of permits may be requested at no additional fee. This request must occur prior to permit expiration. This extension will be granted for an additional 180 days.

    iii. If permits are allowed to expire or construction has not begun within the first 180 days of permit issuance, an additional fee shall be required for an extension of permits in the amount of one half the original permit fee.

2. **PAVING**

a. The city may order that load tests be performed to determine the suitability and adequacy of the trench backfill, paving subgrade, and base course. Such tests shall be performed with a vehicle loaded to approximately 18,000 pounds per axle. Movement or settlement shall be cause for rejection of the work.

b. Refer to Maricopa Association of Government (MAG) Section 310.4 and Table 310-1 for corrective action for ABC related to plasticity deficiency types III and IV.

c. Refer to MAG Section 321.10.2 and Table 321-4 for corrective action when the asphalt cement content is not within a +/- 0.40% tolerance of the mix design target value. Reference MAG Section 321.10 for corrective action for asphalt deficiencies.

d. The city may require additional density testing on an as-needed basis.

e. The developer shall provide correlation testing documentation for all sand cone and nuclear testing in the final submittal packet.

f. Asphalt thickness test cores shall be per MAG Specifications Section 321.14.

g. Stamped asphalt is not approved for use in public right-of-way unless approved by the City Engineer.

h. Asphalt mix design for streets within the public right-of-way shall be C-3/4"-inch base course with either C-3/4-inch or D-1/2-inch surface course, with minimum lift thickness per MAG Section 710 and maximum lift thickness of 3 inches.

3. **CONCRETE**

a. If a sidewalk is constructed adjacent to a curb, streetlights and power poles shall be located behind the sidewalk by a minimum of one foot. Other items must clear the vertical projection of the back edge of the sidewalk by a minimum of one foot.

b. For concrete placements, curb pavement cuts shall extend at least two feet beyond the face of the gutter. A "T"-top may be required for areas that do not meet slope requirements or for pavement that requires reworking due to defects.

c. Home builders who elect to use their own contractors to add the roll curb or vertical curb driveway approaches not shown on plans between the detached sidewalk and the back of curb or to perform R & R repairs or any concrete changes that encroach on the City of Surprise right-of-way are required to follow MAG and City of Surprise specifications, and the contractors must be licensed to perform work in the city. This will include obtaining a permit, notifying the city, and performing soil compaction and material testing as required by the city. Failure to do so may be grounds for rejection and removal of all concrete placements.

d. A pre-inspection and replacement of concrete curbs, aprons, and driveways shall be performed prior to paving where workmanship appears to be of poor quality, flow lines are in question, or excessive ponding of water is verified.

e. Subgrade compaction testing shall be performed for all concrete structures.

f. All compactions shall be per MAG Standard Specification 301.3.

g. Refer to MAG Section 725.8 for concrete tests and deficiencies. Concrete represented by a strength test of at least 95% of the required 28-day compressive strength for either standard cylinder or drilled core specimens are acceptable.

h. All concrete <u>replacement</u> or repairs shall be Class A (3000 pounds per square inch). No site batch concrete is allowed unless approved by the City Engineer or designee for emergency use.

i. Liquid membrane forming compound shall conform to MAG Standard Specification 726.2. This shall be 1600 City White or ADOT White cure and shall be applied on all concrete in the city right-of-way.

4. **UTILITIES**

a. Separation and protection of crossing water and sewer lines shall be in accordance with MAG Standard Details 404-1 through 404-3 and sections 610.5, 615.4 and 616.3 of the MAG Standard Specifications.

b. Prior to the start of pressure testing or disinfection of potable water or reclaimed water lines, the contractor shall submit a detailed plan to the Water Resource Management Director or designee for approval.

c. Backflow preventer letter of certification and all associated documentation shall be required prior to the certificate of occupancy.

d. All chemicals used for disinfection shall be approved by the National Sanitation Foundation (NSF).

e. Sanitary sewer service taps shall meet the requirements of MAG Detail No. 440-1 and MAG Standard Specification Section 615.8

f. After the pipe has been tested, inspected, and accepted for service and the manhole has been adjusted to the final grade, it shall have white latex-based insecticide approved by the Environmental Protection Agency applied to it. The application inside of manholes is performed for the top eight feet, or when less than eight feet deep, the entire manhole should be sprayed from the bench to the top finish grade, including adjusting rings. The rate of application shall be sufficient to provide a minimum two-mil dry film thickness per coat, and two coats shall be applied. Insecticide certification is required, and the insecticide must be applied by a licensed Pest Control Applicator.

g. Irrigation lines shall be flushed when the line is under repair.

5. **STORM DRAIN**

a. Storm drain pipes shall be sawcut when trimming to their final shape and length with a smooth edge. This is per manufacturer recommendations and helps to prevent damage and cracking, allowing for watertight joints.

b. Storm drain inspection results required per MAG 618.4 for all public installations.

6. **AS BUILT**

a. Improvements shall not be accepted until as-built plans have been submitted and approved by the city and all other agencies' permit requirements have been met.

b. The paving contractor is responsible for obtaining water and sewer as-built plans before the start of construction to determine the location of all utility rims and covers that must be adjusted to the finish grade.

c. Reproducible as-built plans certified by the developer's Registered Engineer or Registered Land Surveyor shall be submitted to the city and approved prior to the issuance of a building "Certificate of Occupancy".

d. Right-of-way construction releases and building certificates of occupancy will not be released for any type of accepted construction until certified as-built plans have been submitted to and approved by the city.

e. An “As-Built Certification” statement on the cover sheet of the as-built plans shall be signed and sealed by a Registered Professional Engineer or a Registered Land Surveyor. The Certificate shall be in all capital letters and shall read “I HEREBY CERTIFY THAT THE “AS-BUILT” MEASUREMENTS AS SHOWN HEREON WERE MADE UNDER MY SUPERVISION OR AS NOTED AND ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF”.

f. The City of Surprise assumes no responsibility for the accuracy of the as-built information, which is provided only as a public record.

g. As-built plans shall be submitted in a digital file in “PDF” format and on a reproducible bond copy (size 24 inches x 36 inches), and they shall be of a quality that allows microfilming.

7. AS BUILT CAD DATA SUBMITTAL

a. The City of Surprise reserves the right to refuse CAD Drawings that are not conforming with the as-built CAD Data Submittal Requirements between the consultant and the city.

b. A disc containing AutoCAD drawings files, through release 2010, will be required. Compact Disc will be labeled with the Project Name and City of Surprise Submittal Number. No data compression should be utilized.

c. Disc Folder Structure and CAD Sheet Naming Convention

   i. Create a folder with the Project Name or Review Number. Within the Project folder create subfolders and name them Water, Sewer, Paving, Grading and Drainage, Storm Drainage, and Xref. Then copy the corresponding CAD (*.dwg) files into the appropriate subfolders.

   ii. Example:

   - 🗁 Project Name, Submittal Number, and Review Number
     - 🗀 Water
     - 🗀 Sewer
     - 🗀 Paving
     - 🗀 Grading and Drainage (use GD to abbreviate Grading and Drainage Sheets)

- 🗀 Storm Drainage (use SD to abbreviate Storm Drainage Sheets)
- 🗀 Fonts (if applicable)
- 🗀 Xrefs (if applicable)

d. Model Space / Paper Space

   i. All CAD as-built line work is to be created in model space.

   ii. CAD work in paper space is for Page Layout, Title Block, Notes, Legend, and other text.

e. Coordinates System and Units

   i. CAD drawings site/civil base models supplied will be created in relation to its geographic location. Use either the Arizona State Plane Coordinate system, FIPSZONE 0202, North American Datum 1983, or, preferably, the Maricopa County Low Distortion Projection (MCLDP). The parameters for the MCLDP can be obtained from the City of Surprise Chief Land Surveyor.

   ii. Units: International Feet (0.3048 meters) will be used to ensure consistency with the current City of Surprise files.

f. Geodetic Ties

   i. All CAD drawings (model space) will be referenced to (at least) two accepted geodetic control points which must be part of the City of Surprise Bench Mark control project, Maricopa County Geodetic Densification and Control Survey (GDACS) control network (published through MCDOT), or any approved (via City of Surprise Survey Division) monumented survey control.

g. X References

   i. The City of Surprise would prefer that X references NOT be used to help expedite the as-built process.

   ii. If X references are used, all X referenced drawings will need to be placed in one common directory (subfolder titled Xref) and the subdirectory tree structure will need to be sent accordingly. Further, each drawing will need to be opened prior to sending to verify the X references will load properly.

h. References Information

   i. Ensure that all non-related CAD structures such as empty layers, unused blocks, line types, dimension styles, plot styles, text styles, shapes, etc. are purged from the files. As-builts will not be accepted without adherence to this standard.

i. Fonts

   i. The use of standard AutoCAD fonts and shapes is required. Non-standard fonts and shapes must be transmitted with the drawings in the original file format in a separate Fonts subdirectory.

j. Blocks

i. All blocks or symbols will include a single point feature. If block attributes are used, the block attributes structures and block nesting should be included in the transmittal. Microsoft Word may be used to create such list if preferred. ANSI text files are also acceptable.

10.2 GENERAL REQUIREMENTS FOR INSTALLATION OF UNDERGROUND UTILITIES

1. Trench excavation, backfill, and compaction shall be done in accordance with City of Surprise Trench Specifications and Acceptance requirements. See Section 10.3 of this document.
2. Trenches across streets shall be completely backfilled within three working days after pipe laying and shall not remain open for longer than ten working days. Steel plates, when used to bridge across a trench, shall be milled and tack-welded. See MAG Detail No. 211 for standard trench plating detail. The City Engineer or designee may also require welding for multiple plates.
3. Water consolidation by jetting, when used for trenching, shall be accomplished with a 1-1/2-inch pipe of a length sufficient to reach the bottom of the lift with an adequate length of hose attached and a water pressure of no less than 30 PSI. Lifts shall not exceed six feet of loose material. The backfill shall be leveled, the trench shall be saturated, and the material shall be jetted to:
   a. Within one foot of the pipe if the lift is six feet or less from the top of the pipe, or
   b. At least one foot into the previous multiple lifts.
4. All jetting shall be accomplished transversely across the trench, offset to the jetting locations on the other side of the trench. The entire lift shall be leveled and completely saturated, working from top to bottom.
5. All Trenches under, or within 2 feet of, any existing or proposed pavement, curb, gutter, or sidewalk shall be backfilled, compacted, and surface replaced per MAG Standard Specification 601, and MAG Standard Details 200-1 and 200-2. When CLSM is used as backfill the minimum cure time prior to placement of ABC or paving shall be 24 hours for ½ sack CLSM and 12 hours for 1 sack.
6. All trench cuts, pavement replacement, and slurry seal shall be as follows:
   a. Parallel trenches 50 feet or more in length shall be a minimum of four feet wide to allow for the use of paving machines.
   b. The edge of each trench shall be sawcut, neat, straight and shall extend one foot minimum beyond each side of the trench (“T”-top), according to MAG Section 336 and Detail 200.
   c. Pavement replacement for two-course paving shall require a minimum of one foot of surface course sawcutting, milling, and tacking. For one-

course paving of two inches or less, the pavement shall be removed and replaced.

d. A polymer-modified slurry seal Type II shall be applied in accordance with MAG Section 336.2.4 to all cuts for the length of one block where the total pavement cut length is greater than 300 feet.

e. The thickness of the pavement and aggregate base shall be consistent with the thickness of the existing pavement and base, but shall not be less than that shown in Chapter 3, Table 3-2.

f. The asphalt replacement mixes for pavement cuts shall be C-3/4-inch base course with either C-3/4-inch surface course or D-1/2-inch surface course.

g. Trench pavement replacement less than 50 feet in length may be done using a single mix on residential streets.

h. The base course mix for collector and arterial street trenches over 50 feet in length shall be C-3/4-inch. The C-3/4-inch mix has a minimum design lift thickness of 2-1/2-inch. The finish course mix shall be D-1/2-inch with a minimum design lift thickness of 1-1/2-inch per MAG Table 710-1.

i. If the existing AC distance from the edge of curb to the "T"-top of the trench is less than 24 inches, it shall be removed or milled for replacement.

j. All of the above shall be as directed by the city.

7. All concrete replacement for utility trenching or repairs shall be Class A (3000 pounds per square inch). No site batch concrete is allowed unless approved by the City Engineer or designee for emergency use.

8. It is required that all roadway crossings of lines be directionally bored under the pavement if it is less than two years old. If pavement less than two years old is required to be cut to install an underground utility, approval by the City Engineer or designee shall be required and an "early cut fee" may be assessed per the SUDC, Permit and Plan Review Fees for Cutting Street Pavements. Water boring is not permitted under a paved roadway without an additive such as Bentonite.

9. Potable and Raw Water Line Inspection when located within the City of Surprise service area: the city shall inspect and approve all safety, trenching, bedding, pipe installation, backfill, and compaction. The City Engineer or designee shall also confirm the pipe material, size, and color meets the specifications detailed in Chapter 6 of this document. Minimum water pipe pressure class for the City of Surprise is 200, DR=14. The City of Surprise shall inspect and approve all pressure testing, disinfections, and operational tests.

10. Potable and Raw Water Line Inspection when located within EPCOR service area: the city shall inspect and approve all safety, trenching, and compaction. EPCOR shall inspect and approve all bedding, pipe installation, pressure testing, disinfections, and operational tests.

11. Reclaimed Water Line Inspection: the city shall inspect and approve all safety, trenching, bedding, pipe installation, backfill, and compaction. The city shall confirm the pipe material, size, and color meets the specifications detailed in Section 6 of this document. Minimum reclaimed water pipe pressure class for the City of Surprise is 200, DR=14. The City of Surprise shall inspect and approve all pressure testing, disinfections, and operational tests.

10.3 TRENCH SPECIFICATIONS AND ACCEPTANCE REQUIREMENTS

10.3.1 Documents Required for Trenching in the City of Surprise Right-of-Way

1. Each primary geotechnical testing technician performing work on-site must be certified in his or her respective area of testing (soils, concrete, pavement, etc.). A trainee must work under a certified technician and shall be certified no later than six months from the date of beginning work in the City of Surprise. The employing geo-technical testing company shall supply documentation to the Public Works Department for each certified technician.
2. It is mandatory that each geotechnical testing company performing tests be required to notify the City Engineer or designee of any failed test involving backfill and compaction associated with the trench and appurtenances on the day of the failed test. Verbal updates are permitted. The tester shall discuss any concerns with the city and review the specifics of the test documentation.
3. In new residential construction projects, concrete placement shall not begin until all sewer, water, and dry utility trench backfill has passed compaction testing and the results are provided to the city. These may be copies of the testing technician's field reports presented on company letterhead.
4. The Engineer of Record shall verify, by actual field measurements, that sewer manhole stationing and invert elevations as well as potable water, reclaimed water, and stormwater, and sewer pipe size, materials, alignment and minimum slope, are consistent with the approved design drawings and revisions. They also shall verify that all sewer lines have passed all required sewer tests and certify that the City of Surprise-owned water, reclaimed water, stormwater and sewer lines are in substantial conformance with the relevant MAG and City of Surprise specifications. They also shall verify that all installed water, reclaimed water, storm water, and sewer lines are in conformance with the plans and specifications and that the water, reclaimed water, stormwater, and sewer lines are accurately reflected on as-built mylar drawings. The Engineer of Record shall verify that backfill material and compaction within the City of Surprise right-of-way for potable water, reclaimed water, storm water, and sewer trenching has been tested and verified by the geotechnical engineering consultant in accordance with standard industry practices as well as MAG and City of Surprise specifications.
5. The Engineer of Record or a designee shall provide the quality control (QC) and the City Engineer or designee shall provide the quality assurance (QA) for the project. Any field discrepancies or conflicts shall be brought to the

attention of the city. All water line testing is to be performed by the City of Surprise.

10.3.2 Specifications for Trenching Within the City of Surprise Right-Of-Way

1. All contractors performing work in the City of Surprise are required to have an Occupational Safety & Health Administration (OSHA)-certified competent person on site to provide and review the correct trench safety requirements.
2. The vee'ing or benching of trenches shall be performed only in soils that will not safely support hydraulic trench shoring, trench shields, or boxes. Additional testing will be required where vee'ing or benching is to be performed.
3. All utility pipe zones shall be 100% ABC material per Section 702 of MAG Specifications Table 702-1 for Aggregate Base and shall be placed per the appropriate utility section of this document.
4. Maximum backfill lift depths shall be as shown below. Mechanical backfill and density testing lift depths of up to two-foot increments shall require a documented manufacturer's equipment recommendation and/or approval with field trial tests with the city.

Compaction Technique	Max. Depth of Backfill Lift (feet)
Mechanical	1
Water jetting	6

5. All trench backfill around existing manholes and structures that require reworking outside of the existing pavement but under the proposed pavement and within two feet of the back of the curb shall have 100% ABC, placed to the full depth of the trench above the pipe zone. This shall not apply to new residential construction outside of the proposed area.

10.3.3 Trench Testing Requirements

1. The city may require additional compaction testing on an as-needed basis.
2. Additional exploratory excavations or potholes as directed by the city may be required for any main or service trench.
3. An additional proctor test shall be required where any compaction test result is greater than 4% of the maximum dry density.
4. The nuclear gauge shall be calibrated against the sand cone a minimum of once every ten tests. The City Engineer or designee shall be notified of any failures on a daily basis, whether they be soil, concrete, or asphalt test failures.
5. All correlation testing documentation for all sand cone and nuclear gauge testing shall be provided in the final submittal packet.

6. Soil samples taken to determine the standard proctor for trench backfill and compaction shall be taken directly from the trenched spoil piles as a representation of the blended soil types from the excavation process.

7. Significant compaction test failures shall be retested using a sand cone. Any resulting failure will be reworked before any retesting is performed.

8. All dry utility roadway crossings shall be compaction tested, selected at random or as directed by the city.

9. 25% of all service trenches shall be compaction tested in each parcel per lift, selected at random. Wherever a failed service test occurs, the closest two service trenches shall also be tested and shall not be included as part of the 25% requirement.

10. All sewer manhole bases shall be compaction tested.

11. All structures (including sewer manholes) shall be tested at 95% compaction densities as near to the structure as possible, at random locations, one test per each two-foot lift increment. These tests are separate from the required one test per 500 feet of trench.

12. Minimum trench compaction densities as listed in MAG Specifications Section 601, Table 601-2 are to be modified. Modify Type II to be 90% except in pipe zones and water and sewer trenches, including service lines and areas around structures, where the density shall be 95%.

13. Moisture control for mechanically-compacted trenches using non-granular soil shall be determined by standard proctor test AASHTO T99 or ASTM D698, and shall not deviate more than -1% or +3% from optimum moisture levels unless otherwise noted on the approved geotechnical report.

14. All trench backfill with lifts of up to two-foot increments (requires City Engineer or designee approval) shall be compaction tested so that half of all testing occurs in the lower half of each lift.

15. Additional testing shall be required where vee'ing or benching of trenches is performed. For every 500 feet of trench length, testing shall be performed on every lift for every eight feet of width or fraction thereof. Tests shall be at staggered depths and random locations throughout the length of the 500 feet of trench.

16. Before testing begins in any parcel and when requested, a schedule of proposed testing based upon mainline trench (sewer, water, dry utility, etc.) total footage and depth, number of manholes or structures, and number of service trenches shall be provided to the city.

17. All sewer, potable water, reclaimed water, and stormwater service trenches and underground utilities that extend into the Public Utility Easement (PUE) in new residential construction shall be backfilled full depth to a compaction density of 90% or to meet the right-of-way requirements.

18. Homebuilders and contractors should be aware that sewer service lateral backfill on private property outside of any PUE requires compaction density testing to 90% per MAG Standards. Density inspection in such areas shall be performed.

10.3.4 Trench Warranty

1. Where significant trench failures occur as determined by the City Engineer or designee, an extended warranty period of two additional years shall be given. These two years are in addition to the required two-year standard warranty period. The boundary of the extended warranty (four years) shall cover an entire street, block parcel, or project, depending upon the amount, degree of failure (depth & width), and location.
2. The method of repair shall depend upon the gravity of failure of each settlement. For smaller settlements, the method shall incorporate the removal of all loose, unstable, and water-saturated material. The entire settled area shall be probed for voids during the excavation to determine the extent of removal. The removal area shall extend a minimum of one foot into hard and compact soil around the entire perimeter of the excavation. The backfill shall consist of 100% ABC compacted to a minimum of 95% and tested in one-foot lifts. For larger and deeper settlements, the same process of removal shall be followed except 1/2 or one sack CLSM per MAG Specification Section 728 shall be required for full depth backfill. The surface replacement shall be per MAG Standard Detail 200, “T” top or as modified by City Engineer or designee. An experienced soils testing technician must be on site during the investigation and the removal of material to visually inspect and direct the removal of all unsuitable material and test it as needed. The backfill shall not begin until approved by the city.
3. When it is found that the geotechnical testing frequency or methods employed are inadequate, the City Engineer or designee shall have the option of imposing an extended warranty period during which further testing would be prohibited.

10.4 UTILITY PERMIT PROCEDURES AND REQUIREMENTS FOR UTILITIES WITH FRANCHISE AGREEMENTS

The utility companies that are under a franchise agreement with the City of Surprise include, but limited to Arizona Public Services (APS), Cox Communications, Southwest Gas (SWG), and EPCOR. The following are the requirements and procedures for a utility permit under the franchise agreement.

10.4.1 Pavement Cut Surcharge Fee

Per the City of Surprise Municipal Code, Section 42-41, the City of Surprise can impose surcharge fees for cutting asphalt. The city can waive these fees for those franchise utilities in agreement with the City of Surprise or as determined appropriate by the city.

10.4.2 Mandatory Begin Work Notification

A notification to begin work for all permits must be requested via phone (623-222-6150) or email (engineering.info@surpriseaz.gov) to the Public Works Department a minimum of 24 hours in advance of the beginning of the work. The following information shall be

included: utility company/permit holder name, subcontractor name, permit number, contact phone numbers for the utility company/permit holder and subcontractor, work location, type of work, beginning and end work dates, and any traffic restrictions required.

10.4.3 Traffic Restriction and Barricading Requirements

See special provisions for traffic control in Chapter 4, Section 4.2 of this document.

10.4.4 Arizona BlueStake, Inc. and Overhead High Voltage Safety

Requirements for requesting marking, relocation to avoid damage to existing utilities during excavation, and safety for working near overhead high voltage shall be followed. See Arizona Revised Statutes (A.R.S.) Title 40 – Public Utilities and Carriers, Article 6.3, Underground Facilities, and Article 6.4, High Voltage Power Lines and Safety Restrictions.

10.4.5 Construction Standards for Excavations (OSHA)

The requirements of the "Construction Standards for Excavations" (29 CFR Part 1926.650-.652, Subpart P) and latest revisions, as promulgated by the Industrial Commission of Arizona, Arizona Division of Occupational Safety and Health (OSHA) shall be followed.

10.4.6 General Inspections

1. Trench excavation, backfilling, and compaction shall be done in accordance with City of Surprise Trench Specifications and Acceptance requirements as published on the city website at http://www.surpriseaz.gov/.
2. CLSM 1/2 or one sack per MAG Specifications Section 728 shall be required for pavement cuts and any undermining of concrete curb, aprons, etc.
3. Pavement replacement shall be in accordance with City of Surprise Standard Details.
4. The asphaltic concrete pavement mix design shall be City of Phoenix, C-3/4-inch or D-1/2-inch 5.0 oil for arterials and collectors and C-3/4-inch or D-1/2-inch 5.5 oil for residential streets.
5. All other work shall be done in accordance with MAG Specifications and Details or with the City of Surprise Engineering Development Standards.
6. All areas where landscaping, irrigation, sidewalk, curb and gutter, aprons, pavement, signage, potable water, reclaimed water, storm water, sewer, drainage, street lighting, traffic signals, etc. are damaged or disturbed and said damage or disturbance is the fault of the persons performing the permit work, must be repaired and/or replaced in kind, with all costs paid for by the utility company, subcontractor, or the permit holder.
7. All below ground repairs and installations must be inspected and approved prior to backfilling. Failure to comply will result in exposing the area for proper inspection.
8. Any damage to public or private utilities shall be reported promptly to the utility owner suffering the damage. The responsibility to report all damages rests with the permit holder or subcontractor performing the work.

9. The utility company/permit holder or subcontractor shall monetarily compensate the City of Surprise for any damage that cannot be repaired or replaced in kind, such as mature landscaping and items no longer in production or of a historical nature.

10. All survey monuments shall remain undisturbed. Should a survey monument be disturbed, a Registered Land Surveyor must resurvey and certify that the new monument is set according to the existing vertical and horizontal controls, with all costs paid for by the utility company/permit holder or the subcontractor.

11. Damaged traffic loop detector wire cannot be spliced. The entire loop must be replaced by a contractor chosen by the City of Surprise with all costs paid for by the utility company/permit holder or the subcontractor.

10.4.7 Dry Utility Blanket Permits

1. The City of Surprise issues an annual Emergency/Maintenance Repair Permit to each utility company for work in the right-of-way valid from January 1st to December 31st of each year. Emergency permits are to be used only when the facilities of a utility company have been interrupted and immediate repair is necessary. Examples of a facility interruption include gas leaks, power outages, electrical faults, downed wires and poles, cut cables, and situations where the utility company suffers a loss of service, or those which pose a health or safety risk to the public. **Notification of such situations to the City of Surprise Public Works Department is mandatory.** The notification shall be made during normal working hours as each case becomes known or the following normal workday morning for night or weekend emergencies. The City of Surprise Police Department/Fire Department should be contacted immediately for night or weekend emergencies.

2. The City of Surprise also issues an annual Routine Construction Permit to each utility company for work in the right-of-way that are also valid from January 1st to December 31st of each year. Blanket permits are issued for work involving routine maintenance to each utility company's facilities and appurtenances, i.e. manholes, vaults, cabinets, equipment, poles, wires, etc. Minimal trenching less than 150 feet is also allowed under this permit type. The city shall require traffic control for repair work.

10.4.8 Warranty of Work

1. All work, whether performed under a standard emergency permit or a blanket City of Surprise permit, where public facilities are disturbed or damaged and require either repair or replacement, shall carry a warranty against defective workmanship and materials.

2. The warranty period for each permit involving repair or replacement work shall be two years from the date the construction work associated with the permit is signed off by the city.

10.4.9 Permit Close Out

The utility company/subcontractor or permit holder shall notify the city when all work associated with each permit is completed and a final walk out shall be scheduled. Once all punch list items have been completed, the utility company/subcontractor or permit holder shall notify the city that the permit is complete. When both parties agree that the punch list items are complete, the permit will be signed, thereby beginning the warranty period.

10.4.10 Default Notice

Failure to comply with these requirements could result in a work stoppage, rejection of the work, or permit revocation.

10.5 INSPECTION PROCEDURES FOR SUBSTANTIAL COMPLETION AND FINAL APPROVAL OF PROJECTS

10.5.1 Inspection Guidelines

1. The City Engineer or designee shall conduct the inspection walk out.
2. Inspections performed for final easement and off-site construction shall follow the same guidelines as those noted herein.
3. On-site civil inspections shall be performed for grading and drainage, potable water main lines, sewer main lines eight inches and larger, all lines with manholes, all reclaimed water lines, and all underground fire lines, including fire department connections (FDC), where the City of Surprise has issued a permit. On-site sewer mains with manholes must meet the same testing and insecticide requirements as those for off-site construction. On-site sewer mains shall remain plugged until approved by the city. Check for track outs, dust control and safety. Notify contractor regarding citizen's complaints.
4. The city shall inspect and approve all safety, trenching, bedding, pipe installation, materials, and backfill for on-site fire lines.

10.5.2 Pre-Walk Requirements

1. Appendix 10-1 includes checklists of the general construction items that are most frequently encountered during inspection. Additional items on the approved plans, but not included in the appendix, shall also be included in the walk out.
2. Developers/contractors shall contact the City of Surprise Public Works Department Engineering Development Services at (623) 222-6150 to request a project walk out if the City Engineer or designee cannot be contacted.
3. At least a one-week window between the request and the actual walk out should be expected to allow for scheduling conflicts.
4. Requests for walk outs in the field through the City Engineer or designee will be accepted.
5. All curbs, gutters, sidewalks, and streets shall be swept clean by the permit holder and shall be free of dirt and debris. One hour before scheduled walkout all pavement and gutters shall be completely watered, in order to sufficiently check grade and find high and low points, at no expense to the city.

10.5.3 Substantial Completion Walk

1. Substantial completion walks shall take place at the time of completion of all public works-related construction per approved plans and revisions. This includes but not limited to the completion of grading, sewer, storm water, potable water, reclaimed water, dry utility, storm drain, concrete, paving, signage and striping, signals, and operational streetlight work. Landscaping is not required to be completed to its final condition, although all landscape services must be in place.
2. At least two representatives from the city shall be present at each project walk out to successfully complete the walk.
3. All contractors with work that includes major construction items (asphalt, concrete, sewer, potable water, reclaimed water, storm water etc.) to be inspected during the residential walk out should have a representative present at the time of the walk out. Personnel from the appropriate utility contractor shall be on-site to remove/replace sewer manhole covers and valve caps to allow the inspection of each manhole and valve.
4. The developer/contractor shall be responsible for supplying the paint (white in color) to be used to mark the punch list items during the walk.
5. Each punch list item will be marked with a painted number so that it can be seen after the punch list item has been completed. All punch list items shall be correlated to the closest lot number and street and copied to a project map for submittal to the city prior to start of construction of said punch list items.
6. Items marked during the project walk shall be documented in a punch list.
7. Punch list verification walks shall be scheduled solely and directly with the City Engineer or designee assigned to the project.
8. When it is found that the project to be walked out has not met substantial completion or cleaning and watering requirements for street water testing, the walk out shall be canceled and rescheduled only after it is determined that sufficient corrections have been made.
9. The city shall have the option to require a re-walk if there is no removal and replacement activity for more than 30 days from the last inspection walk.

10.5.4 Required Documentation for Certificate of Occupancy

1. The Contractor should allow for at least a two-week window before the C of O is expected to allow for corrections to all punch list items.
2. The C of O will not be issued until the project has been completed per plans, and all required documentation has been submitted including but not limited to:
    a. A completed punch list signed off by the City Engineer or designee.
    b. Approved, certified 4-mil mylar as-builts including but not limited to grading, drainage, sewer, potable water, reclaimed water, storm water, signal, signing, pavement marking and paving work. Two paper as-builts shall be required for potable water, reclaimed water, storm water and sewer work within the City of Surprise's service area. As-built preparations shall be in accordance with Chapter 9.

c. A complete geotechnical testing packet, in a signed pdf format, for all required testing performed by the project geotechnical testing agency, covering all items in streets, sewer, potable water, reclaimed water, dry utilities, and storm drain work.

d. Sewer, potable water, and reclaimed water pressure testing results.

e. Sewer manhole vacuum testing certification.

f. Sewer manhole insecticide certification.

g. Sewer videos with operator notes (and any repeat videos).

h. Asphalt concrete pavement SS1H fog seal certification.

i. Certification of backflow prevention assembly test for all backflow prevention devices.

j. Copy of Drywell Registration.

k. Final retention basin volume certification sealed by a registered Professional Civil Engineer.

l. A complete list of street names, number of blocks, length of each block, and total area in square yards (SY) per block.

m. Approval to Construct (ATC) and Approval of Construction (AOC).

3. A temporary C. of O. may be signed when the project is complete in a manner so that all safety concerns have been addressed, as this will allow for the stocking of shelves and the training of personnel.

10.5.5 Council Acceptance

After the conditional walk-out and upon the completion of all punch list items and submittal of all required documentation, the issuance of a substantially complete letter will begin the Council acceptance process. The Public Works Department, Engineering Development Services Division will place the recently substantially completed infrastructure construction on a City of Surprise regular council agenda. This typically takes up to 90 days. Prior to Council acceptance, the Warranty Financial Assurance is required to be posted per the SUDC. If the assurance is not posted, the item for council acceptance will be removed from the agenda until such assurance is posted.

10.5.6 Warranty Period

After Council approves the acceptance of infrastructure, a warranty period of two years officially starts. Council Acceptance is the date in which the warranty period begins. During that period the applicant is responsible for all corrections, errors, or poor workmanship of the infrastructure and any maintenance if applicable.

10.5.7 Warranty Walk

The warranty walk shall take place approximately one to three months prior to the two-year warranty period expiration and it is the responsibility of the applicant to contact the city to schedule the warranty walk. Housing must be substantially completed or a Certificate of Occupancy (C. of O.) hold must be placed on the remaining housing until final inspection of adjacent ROW improvements for residential construction. The warranty financial assurance will not be released until the warranty walk out has taken

place, all punch list items for the warranty walk are resolved, and the final completion letter has been issued. An extended warranty shall be required where it is found that the workmanship or materials are not performing per accepted standards, i.e., excessive trench settlement, subgrade failure, premature asphalt or concrete deterioration, pipe failure, etc.

10.5.8 Release of Warranty Financial Assurance

Once the warranty walk is complete and items addressed in the walk are resolved and all associated documents submitted, the city will issue a warranty completion letter. This letter will authorize the release of warranty financial assurance and mark the completion of the project.

APPENDIX 10-1

CHECKLISTS

FOR

PROJECT WALK OUT

CITY OF SURPRISE
CHECK LIST (Pre-burial)
(Additional Requirements May Be Required by the city)

- Verify proper pipe material
- Verify pipe wrap
- Verify line size
- Pipe installation
- Verify marker tape and marker ball installation
- Verify separation requirements described in Chapters 5, 6 and 7.

CITY OF SURPRISE
WALK OUT CHECK LIST (Post-burial)
(Additional Requirements May Be Required by the city)

- Sidewalk, gutters, & streets cleaned
- Streets water-tested for drainage & ponding before and after R & R
- Concrete R & R (as marked)
- Asphalt repaired (as marked)
- Asphalt crack-sealed at valley gutters, frame/cover edges, and all pavement cuts
- Sewer manholes cover frame adjusted
- Sewer manholes sealed & vacuum tested
- Sewer manholes plugged or unplugged (as needed)
- Sewer manholes painted with white EP, an insecticide, up to eight (8) feet down from the top
- Sewer lines have had mandrel, pressure test, and hydrovac performed
- Reclaimed water valves installed and adjusted at grade
- Reclaimed valve box cover frames adjusted at grade
- Reclaimed valve boxes cleaned
- Proper shape of valve covers
- Reclaimed water locking debris caps installed
- Reclaimed water lines pressure tested and disinfected
- Reclaimed sample stations installed and properly labeled “Reclaimed Water”.
- Reclaimed flush valves installed and properly labeled “Reclaimed Water”.
- Reclaimed signage installed
- Reclaimed air relief valves installed, properly labeled “Reclaimed Water”, and set
- Reclaimed reduced pressure backflow prevention devices installed and properly labeled as “Reclaimed Water”.
- Reduced pressure backflow prevention devices are installed on the potable water connection for all properties that are also served by reclaimed water.
- Monuments installed and punched
- Riprap installed & dressed up
- Scuppers & catch basins cleaned up
- Scuppers & catch basins have had all exposed steel painted
- Bollards installed & painted
- Parkways graded
- Temporary barricades installed (as needed)
- Streetlights installed
- Street name and regulatory signs installed with correct spelling
- Street striping & stop bars installed (as required)
- Fire hydrant reflectors installed
- Fire hydrants adjusted to grade
- Trash racks installed on storm drain pipes eighteen (18) inches and larger
- Dry wells installed and set to correct elevations per approved drawings
- Proper wording on all valve covers and manhole covers (Water, Reclaimed Water, Sanitary Sewer, Storm Drain)

CITY WATER SERVICE AREA ONLY

- Potable water meter boxes installed & adjusted to grade
- Potable water valve box cover frames adjusted to grade
- Potable water valve boxes cleaned
- Potable water locking debris caps installed
- Potable water air relief valves installed and set
- Potable water sampling stations installed
- Potable water lines pressure tested and disinfected
- Backflow prevention devices installed
- Nonpotable water line valves installed and adjusted and properly marked "Nonpotable water"
- Nonpotable water lines pressure tested and disinfected

APPENDIX 10-2

CHECKLISTS

FOR

CONDITIONAL AND FINAL PROJECT APPROVAL

CITY OF SURPRISE
CONDITIONAL AND FINAL PROJECT APPROVAL CHECKLISTS
(Additional Requirements May Be Required by the city)

- Grading and Drainage (including drainage structures)
  - All drainage devices such as swales, interceptor ditches, pipes, catch basins, protective berms, barrier walls, channels, and box culverts or other measures designed for conveyance of or protection from storm runoff are in place according to the approved plans.
  - Emergency storm drain outfalls are in place per the approved plans.
  - All housing/building pads are in place and free of debris, and finished grade elevations have not been overly disturbed.
  - All curbs, gutters, and pavement are built with acceptable vertical elevation and horizontal stationing tolerances (justify with as-built review).
  - All retention/detention basins and dry wells are in place and accounted for and are built within plan elevation and area tolerances (justify with as-built review).
  - All drywells, pipes, and catch basins have been inspected for silting and have been cleaned, where necessary, prior to acceptance.
  - All drywell grates, access barriers, trash racks, and bollards are in place and painted as required.
  - All handrails are in place and painted as required.
  - No catch basin throat openings exceed six (6) inches in height, and all catch basin grates are bicycle-safe.
  - All catch basin and scupper opening lengths and stationing are per the approved plans (justify with as-built review). Where retention basins are constructed without dry wells, designed to hold water deeper than one (1) foot, or designed to have a capacity greater than one thousand (1,000) square feet of storm water, these basins shall be tested post-construction for the one hundred- (100) year two- (2) hour storm design depth for compliance with the thirty-six- (36) hour drain time requirement.
  - All side slopes in retention areas, common areas, and right-of-ways are per the approved plans.
  - Riprap or other plan-approved erosion control is in place at the headwalls.
  - Project erosion control is in place, i.e., best management practices (BMP) have been implemented.
- **Sewer**
  - All sewer manhole covers are marked “City of Surprise – Sanitary Sewer”, and all manholes have been inspected for proper materials and construction using the requirements of MAG Specifications, Sections 505, 615 and 625.

- All manholes have been raised to grade per MAG Specification Section 345 and Standard Detail 422, cleaned throughout, and set according to the requirements of MAG Standard Details 420-1 and 420-2.
- All manholes, sewer lines, and sewer services, in addition to all appurtenances necessary for the sewer system to operate as designed have been constructed and located per the approved plans.
- All manholes are constructed without steps.
- All watertight manhole covers called for are in place.
- All sewer services are located at the back of the P.U.E. with either a metallic (preferred) or a wooden marker in place.
- All manholes have had their plugs removed, and all tie-in manholes have been opened to receive flow into the existing sewer system.
- All manholes have been sprayed with an insecticide, and a copy of the verification letter is on file at the City of Surprise Engineering Division office.
- All manholes and mains are clean and free of debris.
- Trench settlements shall be excavated to a stable depth and width, where the stable material encountered is free from excess moisture. Mechanical compaction shall only be allowed to within four (4) feet of the finished grade using ABC or native backfill (with compaction tests required). The top four (4) feet of material shall be replaced with 1/2 a sack of concrete ABC slurry over the entire width and length of the settled area. This method shall apply to all sewer, storm drain, or deep-water trench settlements. Asphalt concrete pavement and concrete shall be replaced in kind.

- **Water (City of Surprise service area)**
  - The city shall oversee & inspect all of the operational water distribution system tests conducted by the Contractor.
  - All water mains, services, hydrants, valves, and appurtenances necessary in order for the water distribution system to operate as designed have been constructed.
  - Fire hydrants have been set to grade per City of Surprise detail 6-09.
  - Fire hydrant covers are all in place, and any hydrant from which water is being drawn has a construction water meter and reduced pressure backflow prevention device attached.
  - All water services and blow off valves are set to grade within a meter box.
  - All pressure relief valves are installed at plan locations.
  - All water valve covers are round and marked “Water” using a deep-skirted lid (four inches or more) and are raised to grade per MAG Specification Section 345 and Standard Detail 391-1, Type C only.
  - All backflow prevention devices are installed at plan locations and have been inspected by a certified Backflow Prevention Assembly Tester.

- All sample taps are installed at plan locations.
- All landscape water services are constructed per the approved plans.
- The city is responsible for all pressure, bacteriological, and operational water distribution system tests and documentation within the City of Surprise service area. All operational tests shall only be performed under the direction of a City of Surprise Utilities Division certified operator pursuant to A.A.C. R18-5-104 (A)(2).
- All fire hydrant reflectors are installed and fire hydrant paint has been refreshed if deterioration has occurred.
- Copies of all water (mains and service lines) trench compaction tests are on file at the City of Surprise Engineering Division office.

- **Reclaimed Water**
  - The city shall oversee & inspect all of the operational reclaimed water distribution system tests conducted by the Contractor.
  - All reclaimed water lines, services, hydrants, valves, and appurtenances necessary in order for the reclaimed water distribution system to operate as designed have been constructed.
  - All reclaimed water services and blow off valves are set to grade within a meter box.
  - All pressure relief valves are installed at plan locations.
  - All reclaimed water valve covers are square and marked “Reclaimed Water” using a deep-skirted lid (four inches or more) and are raised to grade per MAG Specification.
  - All reclaimed water sample stations are installed at plan locations and labeled as “Reclaimed Water”.
  - All landscape water services are constructed per the approved plans.
  - All reclaimed air relief valves are installed at plan locations and properly set.
  - All reclaimed backflow prevention devices are installed at plan locations and have been inspected by a certified Backflow Prevention Assembly Tester.
  - The city is responsible for all pressure, bacteriological and operational water distribution system tests and documentation. All operational tests shall only be performed under the direction of a City of Surprise Utilities Division certified operator pursuant to A.A.C. R18-5-104 (A)(2).

- **Concrete**
  - All concrete curbs, gutters, scuppers, sidewalks, sidewalk ramps, driveways, and alley entrances are installed per the approved plans, and have been inspected for line, grade, width, workmanship, spalling, cracking, and displacement. Any concrete that is out of specification shall be removed and replaced.

- Concrete has been stamped with the Contractor's name and the date of construction.
- Roadway grading adjacent to all curbs, gutters, sidewalks, sidewalk ramps, driveways, and alley entrances is complete and adjusted to grade, about two (2) inches below the top of curb and sidewalk.
- Inspections shall incorporate the requirements of MAG Specifications Section 340, all applicable MAG 200 series Standard Details, and the approved plan details. All concrete sidewalks that are displaced by more than one eighth (1/8) inch per five (5) feet shall be removed and replaced.
- Using a ten (10) foot straightedge placed longitudinally across the face and flow line of the curb, any deviation in excess of one quarter (1/4) inch shall be corrected.
- Water testing shall be performed on all curbs and gutters, valley gutters, and aprons per MAG Specifications Section 340.3.9. All concrete ponding that is in excess of ten square feet in surface area, that holds more than one half (1/2) inch of water, or that migrates to the adjacent pavement after being flooded one hour before shall be removed and replaced.
- The patching of concrete curbs is discouraged and will only be allowed on a case-by-case basis.

- **Asphalt Concrete**
  - All asphalt concrete pavement has been installed per the approved plans.
  - Where asphalt concrete pavement has areas with humps, rutting, segregation, loss of aggregate/fines, bleeding, cracking, gouges, roller marks or raveling, etc.; repairs, treatments, or removals shall be specified on a case-by-case basis. Although sawcutting may be used initially before a/c replacement occurs, a minimum one- (1) foot-wide milled edge shall be required along the entire edge. Cupping and settlement next to gutters, etc. shall also be milled and replaced, with length and width as determined by the city.
  - Asphalt concrete pavement joints shall be visually examined for grade matching and separation. Milling and/or crack sealing are options where either grade differential or separation occurs, depending on the severity. A hot-placed polyflex type III crack seal or equivalent shall be required for all crack sealing.
  - All survey monuments have been installed and punched. Section corner survey monuments are in place, punched, and installed in a survey monument handhold with frame and cover.
  - All water valves and sewer manholes are one quarter (1/4) inch for arterial and collector streets and one eighth (1/8) inch for residential streets below the asphalt concrete pavement finished grade.
  - The pavement width is per the approved plans.

- Street crown cross slopes are sufficient for drainage purposes. All streets shall be water-tested for drainage per Section 321 of the MAG Specifications. Areas of ponding that are shallower than one quarter (1/4) inch may require treatment, depending upon the area's size and location.
- Asphalt concrete pavement SS1H fog seal shall be certified. Pavement older than 2 ½ years shall require a fog seal the full width of the pavement.

- **Dry Utilities**
  - All streetlights have been installed per specified type and at approved plan locations. Utility enclosures are set along property lines or within five (5) feet of one another when clustered, are set to the finished grade, have their sides aligned at ninety (90) degree angles to the street curb and gutter or centerline, and have their fronts in direct alignment with the street curb and gutter or centerline.
  - Compaction failures around streetlights, utility enclosures, pull boxes, and trench lines should be checked for.
- **Signage and Striping**
  - All striping is installed per the approved plans and thermoplastic and paint is installed at the required locations. Refer to City of Surprise Standard Detail 4-20I.
  - All signage is installed per the approved plans and all temporary signage has been replaced with permanent signage.
  - Signposts may be hand-tested to check the stability of all concrete bases and the security of all hardware and attached signage. CAUTION: UNSECURE SIGNS MAY FALL OFF. HARDHATS OR OTHER SAFETY MEANS SHOULD BE EMPLOYED!
  - All temporary safety barricades, such as those specified in MAG Standard Detail 130, are in place. The Contractor shall notify the City of Surprise Transportation Department so that they will perform inspections for signs, pavement markings, and any unforeseen traffic hazards.
- **Miscellaneous Items**
  - Other items approved on plans and/or requested by the city shall be implemented.