



**City of Surprise**  
**Water Master Plan**  
**Preparation Guide**

Revised  
February 2010

## Introduction

This document provides a template of the necessary information that must be included in a Water Master Plan that is submitted to the City of Surprise. This template outlines the organization, design factors, and information that should be included in a Water Master Plan report. Following this template will help to expedite the City's review and approval process. A checklist has also been included with this document to help facilitate the preparation of the master plan. The master plan template and checklist are included on the following pages.

The information included in the master plan template may not apply to all situations. If a modification needs to be made to the master plan this should be clearly described in the submitted master plan. Any variances from the City's design standards must be approved in writing by the City's Public Works Department. A master plan requesting a variance to the design criteria will not be approved unless a written approval signed by the City's Public Works Department Director or his designee is included in the report.

## Submittal Process

The following is a summary of the City's submittal process.

1. The Applicant requests a concept review meeting with the City's Development Review Team. The concept review meeting can be scheduled by contacting the Community Development Department at 623-222-3000.
2. The Public Works Department will provide the applicant with the Master Plan preparation guide which will be attached to the concept review meeting summary.
3. Applicant prepares the Water, Wastewater, and Reclaimed master plan reports. Each report must be submitted as a stand alone document.
4. Applicant submits two (2) copies each of the Water Master Plan, Wastewater Master Plan, and Reclaimed Master Plan to the City's Community Development Center.
5. The Development Center will route the master plans to the Public Works Department for review.
6. A representative from the Public Works Department will review the master plans within 15 business days.
7. Based on the review of the master plan, Public Works will prepare an approval or deficiency letter for the master plan reports.
8. The letter will be sent to the applicant. If a deficiency letter is issued, then the applicant must repeat the process from step 4, ensuring that all comments have been addressed. If an approval letter is issued that applicant will need to include the approval letter with any future submittals.
9. The Water, Wastewater and Reclaimed master plans must be approved by the Public Works Department prior to proceeding with the Development Review Process.
10. For questions please contact (623)222-7000

## Responding to Comments

When resubmitting a master plan in response to comments provided by the City, please include a letter that references the review number and that lists the City's comments and a response to each comment. Please also reference where the revised information can be found in the new master plan report. Please also include the review number in the letter. Failure to respond to all comments will delay the review and approval process.

# **Project Name**

# **Water Master Plan**

Submittal #

**Date**

***Prepared For:***

Client's Name

Address

Phone

Contact Name

(Stamp of Registered PE Here)

***Prepared By:***

Engineer's Name

**Company Name and Address**

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## **Abbreviations**

Include a list of the abbreviations used in the report.

## **1.0 Introduction**

### **1.1 Introduction**

The introduction should include the following:

- project's name
- area
- general location (including the Special Planning Area (SPA))
- general land uses proposed for the project
- proposed water service provider
- Number of dwelling units

### **1.2 Project Location**

The location of the proposed site should be described in this section. This should include the section, township, and range of the proposed site, and the major cross streets.

A vicinity map showing the general site location should also be included in this section.

### **1.3 Topographic Conditions**

Include a description of the current site land use, and the topography used in preparing the water master plan. Include a description of the accuracy of the topography.

## **2.0 Projected System Demands**

### **2.1 Demand Calculations**

This section should outline the demand factors used in the development of the site's Water Master Plan. These demand factors should come from the City of Surprise Integrated Water Master Plan Water Resources (Revised November, 2008) and the City of Surprise Integrated Water Master Plan Water Infrastructure (Revised July 2009) and are summarized in Table 1 and Table 2.

**Table 1 City of Surprise Drinking Water Average Day Demands**

Land Use Category	Units	Non-Irrigation Water			Wastewater Flow	Reclaimed Water Production
		Indoor	Outdoor	Total		
<b>Residential</b>						
Rural Residential (0-1 du/acre)	gpd/du	210	110	320	210	190
Suburban Residential (1-3 du/acre)	gpd/du	210	110	320	210	190
Low Density Residential (3-5 du/acre)	gpd/du	210	110	320	210	190
Medium Density Residential (5-8 du/acre)	gpd/du	190	100	290	190	170
Medium/High Density Residential (8-15 du/acre)	gpd/du	190	100	290	190	170
High Density Residential (15-21 du/acre)	gpd/du	190	100	290	190	170
<b>Commercial/Other</b>						
Airport Preservation (0-2 du/acre)	gpd/acre	390	210	600	390	350
Surprise Center	gpd/acre	1,300	700	2,000	1,300	1,200
Original Townsite	gpd/acre	800	400	1,200	800	720
Commercial	gpd/acre	1,300	700	2,000	1,300	1,200
Employment	gpd/acre	650	350	1,000	650	590
Mixed Use Gateway	gpd/acre	1,200	1,000	2,200	1,200	1,080
Agriculture	gpd/acre	2,600	1,400	4,000	2,600	2,340
Landfill	gpd/acre	325	175	500	325	290
Military	gpd/acre	650	350	1,000	650	590
Open Space	gpd/acre	0	0	0	0	0
Public Facilities	gpd/acre	650	350	1,000	650	590
Proving Grounds	gpd/acre	325	175	500	325	290
<b>Landscape</b>						
Turf	gpd/acre	0	4,000	4,000	0	0
Xeriscape	gpd/acre	0	1,300	1,300	0	0
Desert	gpd/acre	0	0	0	0	0

**Table 2 City of Surprise Drinking Water Peaking Factors**

Demand	Factor
Maximum Day Demand (MDD)	2 x Average Day Demand (ADD)
Peak Hour Demand (PHD)	3 x ADD

The water demand calculations should be summarized in this section. Detailed demand calculations for a project consisting of multiple parcels should be included in the Appendix. If off-site water demands are involved, the off-site demand calculations should be summarized in this section. If the project will be phased, the phasing calculations should be summarized in this section.

## 2.2 Fire Flow Requirements

This section should summarize the fire flow requirements used in the preparation of the Water Master Plan for the proposed development. The City of Surprise requirements are summarized in Table 3. These fire flow requirements are for planning purposes only. The actual fire flow requirements for a specific project must be coordinated with the City's Fire Department.

**Table 3 City of Surprise Fire Flow Requirements**

Land Use	Fire Flow Requirement
Single family residential	2,000 gpm for 2 hours (minimum pressure of 20 psi)
Multi-family residential	2,000 gpm for 2 hours (minimum pressure of 20 psi)
Commercial	3,000 gpm for 3 hours (minimum pressure of 20 psi)
Industrial	3,000 gpm for 3 hours (minimum pressure of 20 psi)

## 3.0 Distribution System

This section should provide an overview of the proposed distribution system infrastructure. Explain if the project will be connecting to the City's existing infrastructure. If a will serve letter has been obtained, include a copy on the Appendix.

### 3.1 Pressure Zone

This section should include pressure zone information for the proposed site. This pressure zone should match that given in the City of Surprise Integrated Water Master Plan unless the City had previously approved a change in the pressure zone boundary, in which case, documentation for the approval of the change should be included in the appendix and should be referenced from this section.

Include an exhibit that shows the boundary of the proposed project and the City's pressure zones.

### 3.2 System Pressure

Parameter	Design Requirement
Maximum Pressure	100 PSI



Max Day / Peak Hour Conditions	40 to 100 PSI
Fire Flow Conditions	20 PSI Minimum

### 3.3 Pipe Sizing

Parameter	Design Requirement
Velocity	< 5 ft/s
Headloss	< 10 ft/1000 ft
Design Criteria	Larger of Peak Hour or Max Day + Fire Flow
Fire Flow Velocity	< 10 ft/s (during max day + fire flow)

### 3.4 Water Storage

This section should outline the water storage required for the proposed development. The recommended storage to be provided is the sum of the volumes identified within table 4 below.

The storage requirements from the City of Surprise guidelines are listed in Table 4. If existing storage capacity at the development does not exceed these requirements, an existing tank site should be upgraded or a new tank site should be added so that these requirements will be met. If a tank site is to be upgraded or a new tank site is to be constructed, a site plan should be provided for the site and the capacity of the new tank shall be provided.

**Table 4 City of Surprise Storage Requirements**

Parameter	Design Requirement
Equalizing Storage	20% of Max Day Demand
Fire Storage	Fire Flow x Duration (Table 3 Above)
Emergency Storage	10% of Max Day Demand
Maximum sidewall reservoir height	16ft
Minimum Reservoir Size	1.2 million gallons (MG)

### 3.5 Booster Pump Capacity

This section should outline the booster pump capacity required for the proposed development.

The booster pump capacity should be the larger of the maximum day plus fire flow or peak hour demands with the largest pump offline.

### 3.6 Water Supply

A description of the anticipated water supply for the proposed site should be provided in this section. The description should identify the source of the water supply, the water supply required for the proposed development, the capacity of any existing water supply

facilities, and any proposed improvements for increasing water supply to the site. Wells shall also meet the City of Surprise guidelines outlined in Table 5.

**Table 5 City of Surprise Well Requirements**

Parameter	Design Requirement
Well Production Capacity	Maximum Day Demand (MDD)
Well Firm Capacity	Maximum day demand with the largest well out of service
Well site size (minimum)	150 feet x 150 feet
Well discharge (maximum)	1,500 gpm per well
Well discharge (maximum)	Well efficiency of 85%
Specific capacity (minimum)	>= 10 gpm per foot

Include a description of any wells that have been currently drilled and their anticipated production capacity.

If water quality information is available, include that information in this section.

### **3.7 Water Treatment**

Include a description of the type of treatment that will be required for the project if known.

### **4.0 Transmission System**

This section should provide an overview of the proposed transmission system infrastructure. This section will describe the pipelines from the wells to the water supply facility. Explain if the project will be connecting to the City's existing infrastructure. The minimum size pipeline for a well transmission line is 12-inch.

Parameter	Design Requirement
Velocity	< 5.0 ft/s
Headloss	< 2.0 ft/1000 ft
Design Criteria	Max Day

### **5.0 Water Model**

This section should discuss the water model for the proposed development. A separate water model shall be provided for the distribution system and transmission system. The water model should include the Average Day, Maximum Day, and Peak Hour scenarios and results for each of these scenarios should be included in the Appendix.

Include a description of the assumptions used in developing the water model. If the water model evaluates connecting to the City's existing water system, the fire flow test used for setting up the model should be included in the Appendix.

### **5.1 Average Day Demand Analysis**

Results from the water model for the Average Day scenario should be discussed in this section. Pressures for all junctions should fall between 40 and 100 psi per City of Surprise guidelines. Velocities for all pipes should be below 5 feet per second, and the headloss through each pipe should be less than 10 ft per 1,000 ft of pipe for distribution piping and should be less than 2 ft per 1,000 ft of pipe for transmission system piping.

### **5.2 Maximum Day Demand Analysis**

Results from the water model for the Maximum Day scenario should be discussed in this section. Pressures for all junctions should fall between 40 and 100 psi per City of Surprise guidelines. Velocities for all pipes should be below 5 feet per second, and the headloss through each pipe should be less than 10 ft per 1,000 ft of pipe for distribution piping and should be less than 2 ft per 1,000 ft of pipe for transmission system piping.

### **5.3 Peak Hour Demand Analysis**

Results from the water model for the Peak Hour scenario should be discussed in this section. Pressures for all junctions should fall between 40 and 100 psi per City of Surprise guidelines. Velocities for all pipes should be below 5 feet per second, and the headloss through each pipe should be less than 10 ft per 1,000 ft of pipe for distribution piping.

### **5.4 Fire Flow Demand Analysis**

This section should discuss the results from the fire flow analysis.

## **6 Conclusion**

This section should summarize the key findings and proposed improvements discussed in the water master plan.

## **References**

List all references used.

## **Appendices**

At a minimum, the following Appendices should be included in the report.

### **Demand Calculations**

Water demand calculations by parcel.

### **Water Model Exhibits (including Distribution & Transmission System)**

- Overall development layout identifying parcels and street layouts and names
- Well Site locations
- Water Supply facility locations
- Clearly label all junction and pipe IDs.
- Color code all pipe diameters.
- Show development phasing plan
- Identify any water lines anticipated to be located outside of dedicated ROW i.e. within an easement (if known).

### **Model Results**

Include the water model results ordered by element ID.

- Average Day Results: Junction, Pipe, Pump, Reservoir, and Valve Reports
- Maximum Day Results: Junction, Pipe, Pump, Reservoir, and Valve Reports
- Maximum Day plus Fire Flow Results
- Peak Hour Results: Junction, Pipe, Pump, Reservoir, and Valve Reports

### **Land Use Map**

#### **Phasing Exhibits**

- For Parcels
- Distribution Lines
- Transmission Lines

#### **Preliminary Site Plan Layouts**

- Well Sites
- Water Campuses

#### **Additional Information Supporting the Master Plan**

Include additional supporting information in the appendix as necessary.



# City of Surprise Water Master Plan Check List

## Cover Sheet

- Project title
- Prepared for
- Prepared by
- Stamped by registered PE

## Table of Contents

## Abbreviations

## Introduction

- Project Name
- Project Location (Include Special Planning Area (SPA))
- Project Size
- General Land Use
- Number of Units
- Vicinity Map Showing Project Location (include bench marks used, scale, and north arrow)

## Demand Calculation

- Demand Criteria Per Table A-4 of the 2009 Integrated Water Master Plan

## Fire Flow Requirement

- Single Family Residential Fire Flow = 2,000 gpm for 2 hours with minimum of 20 psi
- Multi Family Residential Fire Flow = 2,000 gpm for 2 hours with minimum of 20 psi
- Commercial = 3,000 gallon per minute for 3 hours with minimum of 20 psi
- Industrial = 3,000 gallons per minute for 3 hours with a minimum of 20psi

## Pressure Zone

- Pressure zone in the report matches with pressure zone in IWMP
- If pressure zone doesn't match with IWMP (check elevation), has approval been received for changing pressure zone boundary

## Water Supply Facility

- Identify where water is supplying from
- Identify the proposed improvements required at the water supply facility

- Water storage = The total sum of 20% of Max day demand, fire flow X duration, and 10% of Max Day demand.
- Booster Pump Capacity is the larger of the Maximum Day plus Fire Flow or Peak Hour demand with the largest pump offline
- Well Supply = Must meet max day demand with the largest pump out of service.

#### **Water Model**

- Show results for Average Day, Maximum Day, and Peak Hour scenarios
- Model results for the Distribution & Transmission system.
- Pressure for all junctions for Average Day, Maximum Day, and Peak Hour scenarios between 40 and 10 psi
- Velocity for all pipes are below 5 feet per second
- Unit Head loss is below 10-ft/1,000-ft

#### **Fire Flow Model**

- Clearly list fire flow requirement.
- Show fire flow result for all junctions
- Meet fire flow requirement at all junctions
- Pressure is equal or larger than 20 psi while supply fire flow

#### **Appendices**

##### **Model Results**

Include the following reports in the Appendix:

- Average Day: Junction, Pipe, Pump, Reservoir, and Valve Reports
- Maximum Day: Junction, Pipe, Pump, Reservoir, Valve, and Fire Flow Reports
- Peak Hour: Junction, Pipe, Pump, Reservoir, and Valve Reports
- All results sorted in numerical order by node or pipe ID.

##### **Exhibit**

- Show pipe and junction IDs which correspond to model results
- Include street names
- The pipe alignment shows the "Looped" pipe system for the development
- If connecting to off-site system, show connection point