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**Subject:** **MSWD Northeast Area Water Master Plan Update**

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**A. Introduction and Background**

In 2005, MSWD through the support of URS completed the District's Comprehensive Water Master Plan Study (CWMP). In 2007, MSWD conducted a comprehensive water master plan update to the Northwest area which reviewed, evaluated, and made recommendations to the primary pressure zones and infrastructure in the Northwest area of the District. The evaluation included some specific developments planned for the area. The focus of this memorandum is to provide a water master plan update to the Northeast Area which is east of West Street and North of Hacienda and includes the Tuscan Hills Development as show in Figure 1. MSWD has requested URS conduct a detailed analysis and evaluation of water supply, storage, and transmission infrastructure to better serve the existing Northeast area of the District and incorporate future developments such as the Tuscan Hills development.

**B. Existing Northeast System**

As part of the Northwest Area Master Plan Update, URS recommended a reconfiguration of the primary pressure zones established in the CWMP to better accommodate future developments. Due to the nature of the developed and undeveloped land in the Northeast area, the revised pressure zones also provide significant advantages in consolidating distribution facilities and thereby providing better redundancy and flexibility. Pressure Zones 1240, 1400, and 1530 remain unchanged with the upper Northeast Area pressure zone boundaries revised to 1700 and 1875 as shown in Figure 1 and Table 1.

**Table 1  
Northeast Area Primary Pressure Zone Boundaries**

<b>Pressure Zone</b>	<b>Static Head (psi)</b>	<b>Proposed Elevation (ft)</b>	<b>Existing Pressure Zone</b>	<b>Current Pressure Range</b>	<b>Current EL Range</b>
Pressure Zone 1530	100	1300	No Change	100	1300
	43	1430		43	1430
Pressure Zone 1700	117	1430	Current Zone 1630	87	1430
	43	1600		43	1530
Pressure Zone 1875	119	1600	Current Zone 1800	117	1530
	41	1780		43	1700

The existing infrastructure affected by the pressure zone change includes the 0.06 MG Highland tank, 266 GPM Red Bud pump station, 0.3 MG Vista tank, 0.3 MG Vista hydro tank, and the Vista pump station. The overflow elevations in both storage tanks are around 1,640 feet which would reduce the pressures in the upper portions of the revised pressure zones below 20 psi. However, due to the age and small capacities of this infrastructure, URS recommends that the reconfiguration of the pressure zones will provide greater advantages than keeping this infrastructure. In the ultimate condition plan, the Vista 0.3 MG storage tank is planned for use in the interim as described in more detail in the following sections.

**C. Water Demand**

The MSWD water supply and distribution system model created for the CWMP was based on meeting the water needs for a 25-year build out period. However, the Northeast area update is based on an ultimate maximum day demand scenario to incorporate long term value in the proposed primary distribution infrastructure. The ultimate demands for the Northeast area are calculated using the 2000 Land Use Plan and the Tuscan Hills development plan as provided by the District (Figure 1). The average day demands (ADD) are determined for each land use utilizing the criteria set forth in the CWMP and then summarized by pressure zone.

The ADD for the Tuscan Hills development is calculated with information provided in an email from the District dated 5/15/09 and the demand criteria outlined in the CWMP. The development will include 175 SFR, 100 MFR, and 360 hotel rooms in Zone 1400; 408 SFR and 100 MFR in Zone 1530; and 283 SFR in Zone 1700.

The maximum day demand (MDD) is approximately 2 times the ADD. The resulting demands for each pressure zone and the contributing percentage from the Tuscan Hills Development are shown in Table 2.

**Table 2**  
**Northeast Area AAD and MDD**  
**Water Demand Summary per Pressure Zone**

<b>Pressure Zone</b>	<b>Zone ADD gpm</b>	<b>Zone MDD gpm</b>	<b>Tuscan Hills Percentage</b>
1240	6,709	13,418	-
1400	3,625	7,250	5%
1530	1,735	3,470	14%
1700/1875	1,135	2,270	14%

**D. Water Storage**

Storage requirements for each pressure zone are determined by calculating the maximum day demand (MDD) plus the required fire flow. The following is a list of assumptions used to calculate the storage volume for each zone:

- Fire flow Residential Demand = 1,000 gpm
- Fire flow Commercial Demand = 1,500 gpm
- Fire flow Duration = 2 hr

Table 3 lists the total storage requirements for each Northeast area primary pressure zone and the Tuscan Hills development.

**Table 3**  
**Primary Pressure Zone**  
**Ultimate and Tuscan Hills Water Storage Requirements**

<b>Pressure Zone</b>	<b>Zone MDD MGD</b>	<b>Zone Storage MG</b>	<b>Tuscan Hills Storage MG*</b>
1240	19.3	20	-
1400	10.4	11	0.5
1530	5.1	6	0.7
1700/1875	3.3	4	0.5

\*Storage requirements for the Tuscan Hills development are included in the Total Zone Storage

The proposed Tuscan Hills portion based on storage requirements show that Tuscan Hills requires approximately 2.0 MG of storage. It is suggested that if available, the Tuscan Hills development plan a 2.0 MG tank location within the designated development area to contribute to the Zone 1400 or 1530 total storage.

Figure 2 illustrates all proposed infrastructure for the Northeast area update, which includes the following storage per zone:

**Table 4**  
**Existing and Proposed Water Storage Requirements per Zone**

<b>Pressure Zone</b>	<b>Existing Storage MG</b>	<b>Proposed Storage MG</b>	<b>Total Storage MG</b>
1240	7.13	13	20
1400	3.53	7	11
1530	1.04*	5	6
1700/1875	0*	4	4

\*Assumes small existing storage structures (Low Northridge, Redbud, Highland, and Vista tanks) will eventually be completely replaced by new storage.

Storage for Zone 1875 will be provided by the proposed Zone 1700 tanks and pumped directly to the Zone 1875 system.

**E. Water Supply**

The water supply to meet each of the pressure zone’s ultimate maximum day demands is based on the largest well out of service. URS evaluated and categorized well fields and transmission systems into three water delivery systems discussed later in this report. Future wells within each of the water delivery systems are assumed to yield 2,000 gpm. Overall 14 additional wells are needed to serve zones 1240, 1400, 1530, 1700, and 1875 in the Northeast Area. The breakdown of supply per pressure zone is shown in Table 5 and further discussed in Section F. The details of the proposed well pumps are discussed in Table 6.

**Table 5**  
**Existing and Proposed Water Supply per**  
**Northeast Area Pressure Zone**

	Delivery System	Pressure Zone			
		1240	1400	1530	1700/1875
<b>Existing Water Supply (gpm)</b>					
Well 29	Terrace	1700			
Well 37	Terrace	2000			
Well 38	Terrace	2000			
Well 22	Little Morongo		2400		
Well 24	Little Morongo		2400		
Well 28*	-	-	1950	-	-
Well 30*	-	-	-	850	-
<b>Subtotal Existing Supply</b>		<b>5700</b>	<b>4800</b>	<b>0</b>	<b>0</b>
<b>Proposed Water Supply (gpm)</b>					
F-Wells 1240 A-E	-	10000			
F-Well 1400A	Mountain View		2000		
F-Well 1400B	Little Morongo		2000		
F-Well 1400C	Little Morongo		2000		
F-Well 1530 A	Mountain View			2000	
F-Well 1530 B	Mountain View			2000	
F-Well 1530 C	Mission Lakes			2000	
F-Well 1700 A by 1530 F-Redbud PS	Mountain View				2000
F-Well 1700 B by 1530 F-Redbud PS	Mountain View				2000
F-Well 1700 C by 1530 F-High Northridge PS	Mission Lakes				2000
<b>Subtotal Proposed Supply</b>		<b>10,000</b>	<b>6,000</b>	<b>6,000</b>	<b>6,000</b>
<b>Total Supply</b>		<b>15,700</b>	<b>10,800</b>	<b>6,000</b>	<b>6,000</b>
Northeast Area Ultimate Demand (gpm(mgd))		13,418 (19.3)	7,250 (10.4)	3,470 (5)	2,270 (3.3)
Firm Supply Required (gpm)		15,418	9,650	5,470	4,270

\*Well shut down due to water quality. Flow not included in totals.

**Table 6  
Northeast Area Well Pumps**

Well Name	Water Tank	Pressure Zone	Static Head (ft)	Total Dynamic Head (ft)	Motor (HP)
F-WELL-1400A	2 MG Zone 1400 Tank	1400	700	768	485
F-WELL-1400B	5 MG Zone 1400 Tank	1400	700	796	502
F-WELL-1400C	5 MG Zone 1400 Tank	1400	700	770	486
F-WELL-1530A	2 MG Redbud Tank	1400	700	787	497
F-WELL-1530B	2 MG Redbud Tank	1400	700	780	493
F-WELL-1530C	2 MG High Northridge Tank	1530	830	901	569
F-WELL-1700A	1 MG Highland Tank (by Redbud PS)	1400	700	787	497
F-WELL-1700B	1 MG Highland Tank (by Redbud PS)	1400	700	784	495
F-WELL-1700C	1 MG Vista Tank (by High Northridge PS)	1530	830	901	569

\*The well pumps assume a capacity of 2,500 gpm and a WSE of 700 feet.

**F. Water Supply, Transmission, and Storage Plans**

The goals for the proposed improvements in the Northeast area include sufficient storage, transmission capacity, adequate water supply, and distribution flexibility and redundancy. An initial focus for each of these goals is placed on the Tuscan Hills development and subsequent Northeast area as discussed in the following sections.

The northeast water supply comes from three general locations with storage tank locations chosen to supply a certain geographic range within each pressure zone. The proposed water supply improvements have been divided into three main delivery systems; Mission Lakes, Mountain View, and Little Morongo delivery systems. Each delivery system is outlined below and are highlighted on the Hydraulic Profile (Figure 3).

**1. Water Supply and Transmission**

**Mission Lakes Delivery System (Zones 1530, 1700, and 1875)**

The Mission Lakes Delivery System supplies the western portion of the Northeast area and serves Zones 1530, 1700 and 1875. The delivery system summarized in Table 7 below includes two wells, a 24” transmission main, one pump station, and a 2 MG tank and a 1 MG tank.

**Table 7  
Mission Lakes Delivery System**

Well Head Equipment	
Water Tank	High Northridge Tank
Pressure Zone	1530
Well Water Surface Elevation	700
Static Head (ft)	830
Total Dynamic Head (ft)	901
Well Capacity (gpm)	2,000
Motor (HP)	569

<b>Delivery System</b>	
Transmission Pipe Diameter (in)	24
Approximate Distance to Tank (lf)	21,000
Total Number of Wells	2
Ultimate Flowrate (gpm)	4,000

Two existing wells on Mission Lakes Blvd (28 & 30) are planned for decommissioning due to water quality issues; therefore, two new wells (Well 1530C & Well 1700C) are proposed near the intersection of Mission Lakes Boulevard and Little Morongo to feed this delivery system. Due to the proximity of the proposed wells to the decommissioned wells 28 and 30, a water quality test will be necessary to assure the functionality of this delivery system. These wells will pump to the proposed 2 MG High Northridge tank (Z1530) via a 24" proposed transmission line along Mission Lakes Boulevard. The supply of one of these wells will be pumped into the proposed future Vista 1 MG tank (Z1700) through a proposed 2,000 gpm pump station.

Redundancy is introduced into the system by connecting the proposed 24" transmission line to the existing Mission Lakes tank and constructing a proposed line from the future 1 MG Vista tank (Z1700) to the future 2 MG High Northridge tank (Z1530) connected by a normally closed PRV. This PRV will be normally closed but will be available if needed.

#### **Little Morongo Delivery System (Zone 1400)**

The Little Morongo Delivery System supplies the western portion of the Northeast area and serves Zone 1400. The delivery system summarized in Table 8 below includes four wells, a 24" transmission main, and a 5 MG tank.

**Table 8  
Little Morongo Delivery System**

<b>Well Head Equipment</b>	
Water Tank	Proposed Zone 1400 Tank
Pressure Zone	1400
Well Water Surface Elevation	700
Static Head (ft)	700
Total Dynamic Head (ft)	See Table 6
Well Capacity (gpm)	2,000
Motor (HP)	See Table 6
<b>Delivery System</b>	
Transmission Pipe Diameter (in)	24
Approximate Distance to Tank From Future Wells (lf)	Varies by well location; Largest Dist. = 16,500 lf
Total Number of Wells	4
Ultimate Flowrate (gpm)	8,000

As part of a previous study, *MSWD Zone 1400 and 1240 Improvements Evaluation*, a

recommendation was made to retrofit existing Wells 22 and 24 (currently zone 1240) to supply Zone 1400. The Little Morongo Delivery System will be fed by the retrofitted Wells 22 and 24 and two additional wells (Well 1400B and Well 1400C) proposed near the intersection of Little Morongo and 8<sup>th</sup> street and 11<sup>th</sup> Street and Indian Avenue. The wells will feed a proposed Zone 1400 5 MG tank at the northern end of West Drive via a 24” transmission line. Eventually the Zone 1400 distribution line along Mission Lakes Blvd will need to be increased to a 24” diameter.

Redundancy will be provided in this delivery system by a connection between the 1530 transmission and Annandale transmission.

**Mountain View Delivery System (Zones 1400, 1530, 1700, and 1875)**

The Mountain View Delivery System supplies the eastern portion of the Northeast area and serves Zones 1400, 1530, 1700 and 1875. The delivery system summarized in Table 9 below includes five wells, a 24” transmission main, three tanks, and two upgraded pump stations.

**Table 9  
Mountain View Delivery System**

<b>Well Head Equipment</b>	
Water Tank	High Desert View Tank
Pressure Zone	1400
Well Water Surface Elevation	700
Static Head (ft)	700
Total Dynamic Head (ft)	See Table 6
Well Capacity (gpm)	2,000
Motor (HP)	See Table 6
<b>Delivery System</b>	
Transmission Pipe Diameter (in)	24
Approximate Distance to Tank (lf)	Varies by well location; Largest Dist. = 13,500 lf
Total Number of Wells	5
Ultimate Flowrate (gpm)	10,000

A well field for this delivery system is proposed along Mountain View just north of Dillon Road. The well field will include five new wells (Well 1400A, Well 1530A, Well 1530B, Well 1700A & Well 1700B). This supply will be conveyed through a 24” transmission line along Mountain View Blvd to the existing High Desert View (Zone 1400) tanks. The supply from four wells will then be pumped via an upgraded High Desert View pump station to a proposed 3 MG Redbud (Zone 1530) tank. The supply from two wells will then be pumped through an upgraded Red Bud pump station to a proposed 1 MG Highland (Zone 1700) tank.

## 2. Water Storage

### Terrace Tanks and Zone 1240

In order to appropriately evaluate the supply for the upper pressure zones, URS performed an analysis of the supply and demand in Zone 1240 and reviewed the storage requirements and piping surrounding the Terrace tanks. The supply analysis resulted in an additional 5 wells required to meet the ultimate demand scenario and an additional 12.5 MG of storage. Approximate tank locations are shown on Figure 2, however well locations and transmission plans were not determined as a part of this update.

There is currently a capacity restriction in the inlet/outlet piping at the Terrace Tanks. Based on the new location of supply to this zone (Wells 29, 37, and 38), a 24” transmission line is proposed from the western end of Hacienda to the Terrace Tanks via Mesquite Avenue, 4<sup>th</sup> Street and Terrace Drive. URS has provided a scope of work for recalibration of the hydraulic modal in order to better assess current conditions.

### F. Capital Improvement Plan

Table 10 shows a summary of the infrastructure described in the previous sections. Figure 3 shows a revised hydraulic profile. The infrastructure recommendations below meet the chlorine contact time requirement.

**Table 10**  
**Northeast Area Infrastructure Recommendations**

Pressure Zone	Tank(s)	Booster Stations	Transmission Lines
1240	(1) 1.5 MG (1) – 5 MG (1) – 6 MG	N/A	24”
1400	(1) – 2 MG (1) – 5 MG	6000 GPM (210 HP) 2000 GPM (183 HP)	16/24”
1530	(1) – 2 MG (1) – 3 MG	2000 GPM (178 HP) 2000 GPM (98 HP)	24”
1700/1875	(2) – 1 MG (1) – 2 MG	450 GPM (20 HP)	16”

### G. Tuscan Hills Development Plan

The Tuscan Hills development will ultimately be supplied by the Mountain View delivery system. There are two options available to construct this infrastructure and provide the necessary water supply, transmission and storage facilities.

**Option 1: Delivery from South:** The first option includes construction of one well from the Mountain View delivery system, the 24” transmission line (approx. 11,000 lf) to the High Desert View tanks, the 2 MG Zone 1400 tank within the Tuscan Hills development and the pump station (pumping from Zone 1400 to Zone 1700). These proposed improvements are shown on Figure 5 and listed below with rough estimated costs of each item.

- Well 1400 A (\$200,000)

- 11,000 lf of 24” transmission main (\$2,640,000)
- Proposed 2 MG Zone 1400 tank within Tuscan Hills development (\$4,000,000)
- 2,000 lf of 16” transmission line from proposed 2 MG Zone 1400 tank to transmission main in Pierson Boulevard (\$320,000)
- Pump station from proposed 2 MG Zone 1400 tank to Zone 1700 distribution system (eventually to future 2 MG Zone 1700 tank) (\$350,000)
- Total Estimated Cost: \$7,510,000

**Option 2: Delivery from West:** The second option includes construction of one well from the Mission Lakes delivery system, the 24” transmission line (approx. 12,500 lf) to the High Northridge tanks, the 2 MG Zone 1530 tank, and the pump station (pumping from Zone 1530 to Zone 1700). In this scenario, the Zone 1400 area within the Tuscan Hills development would be supplied by the existing Zone 1400 infrastructure. These proposed improvements are shown on Figure 6 and listed below with rough estimated costs of each item.

- Well 1530 A (\$200,000)
- 12,500 lf of 24” Transmission Main(\$3,000,000)
- Proposed 2 MG Zone 1530 Tank within Tuscan Hills development (\$4,000,000)
- Pump station from Proposed 2 MG 1530 tank to Zone 1700 distribution system (eventually to future 2 MG Zone 1700 tank) (\$350,000)
- Total Estimated Cost: \$7,55,000

**Table 11  
Advantages and Disadvantages of Each Option**

	<b>Option 1 Delivery from South</b>	<b>Option 2 Delivery from West</b>
<b>Advantages</b>	<ul style="list-style-type: none"> <li>-Will have infrastructure in place for large proposed well field</li> <li>-New wells will not be in close proximity to decommissioned wells</li> <li>-Slightly lower cost</li> </ul>	<ul style="list-style-type: none"> <li>- Better use of existing infrastructure for initial conditions</li> <li>-Proposed infrastructure is closer to initial phases of Tuscan Hills development</li> <li>-Will have infrastructure in place to move water across system west to east</li> </ul>
<b>Disadvantages</b>	<ul style="list-style-type: none"> <li>-Will have to build major infrastructure for all three pressure zones</li> <li>-Slightly more piping length</li> </ul>	<ul style="list-style-type: none"> <li>-Proposed well location is in close proximity to decommissioned wells</li> <li>-Slightly higher cost</li> </ul>