City of Mesa

2018 Wastewater Master Plan Update

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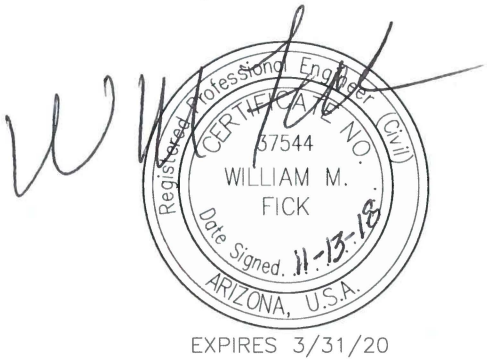

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Chapter 1 -Introduction

1.1 Purpose and Background

The purpose of this report, the 2018 Wastewater Master Plan Update (2018 Update), is to provide an update to the City of Mesa's (City) Wastewater Master Plan. The decision to update the current Master Plan started with the objective to evaluate the flows and the sewer capacities in Southeast Mesa, where most of the growth will occur in the future. Although, the primary focus of the 2018 Update is Southeast Mesa, the 2018 Update also re-evaluates and updates the flows and recommendations in the current Master Plan for the overall Wastewater Service Area of the City.

The City of Mesa currently provides wastewater services to an approximate population of 500,000 within a wastewater service area of approximately 152 square miles. The City's Wastewater Service Area is divided into six major sewer drainage basins and served by four major water reclamation plants (two of them jointly owned with other Cities). The City's wastewater infrastructure also consists of approximately 1,750 miles of collection system, 14 lift stations, 21 odor control stations and 37 diversion structures. Exhibit A presents a map of City's sewer drainage basins and major wastewater infrastructure.

In 2009, the City of Mesa hired an engineering consultant, Carollo Engineers, to prepare a comprehensive update to the City's Wastewater Master Plan. Subsequently, in 2012, the Engineering Group of City of Mesa Water Resources Department updated the 2009 Master Plan. As mentioned above, the purpose of this report is to perform another update to the 2009 Sewer Master Plan in order to update flow projections and identify any changes needed to the Capital Improvement Recommendations.

A major change in the overall approach that has been adopted in the 2018 Master Plan Update is that the Master Plan will only address growth related capital improvements. Rehabilitation and replacement of existing infrastructure that benefit existing customers will be addressed outside the Master Plan as part of annual CIP planning. This Master Plan will include an Infrastructure Improvement Plan (IIP) as a roadmap for future growth-related infrastructure improvements.

1.2 2009 Wastewater Master Plan and 2012 Update

The 2009 Wastewater Master Plan established a plan for the improvements that would be needed to the wastewater system through Buildout. The 2012 Update further refined and updated the recommendations. The major recommendations were as follows:

- The City of Mesa would keep the current ownership capacity in SROG and the current treatment capacities of Northwest Reclamation Plant (NWWRP) and Southeast Water

Reclamation Plant (SEWRP) and expand only the treatment capacity of Greenfield Water Reclamation Plant (GWRP).

  - The above recommendation is still valid for this update (i.e., the 2018 Master Plan Update).

- The City of Mesa would continue to maximize the beneficial use of reclaimed water through recharge into the aquifer at the Granite Reef Underground Storage Project (GRUSP) facility and through water right settlements with the Gila River Indian Community (GRIC).

  - The above recommendation is still valid for this update.

- In the 2009 Master Plan and 2012 update, several alternatives were evaluated as part of the reclaimed water strategy. To convey reclaimed water to the GWRP for delivery to the GRIC, two of the promising alternatives included:

  - A pipeline from the GRUSP site to the SEWRP conveying NWWRP effluent.

  - A 6-mgd pump-back station at Baseline Road and Greenfield Road and a force main pumping wastewater from the Baseline Interceptor to existing force mains located at SEWRP for delivery to GWRP.

  Based on current projections, at build-out, the City of Mesa will generate enough flow in the GWRP and SEWRP tributary areas to fulfill Mesa's GRIC obligation of 29,000 acre-ft, which is consistent with 2012 Update. However, due to the limited growth of reclaimed water flow in the GWRP tributary areas in the recent years, a more comprehensive evaluation of the water resources strategy is deemed necessary. This will be addressed as part of a comprehensive Integrated Master Plan, currently planned to be initiated in 2020, which will integrate the following components into one Master Plan: water, wastewater, reclaimed water, and water resources. An in-house high-level evaluation of this reclaimed water strategy will be performed in 2018 for CIP planning purposes. Both above-mentioned alternatives will be included in the upcoming studies.

1.2.1 Population and Land Use Development

The 2009 Wastewater Master Plan identified the following five new development areas. These development areas are still the major focus of this Master Plan Update. (Is a map needed?)

- Mesa Gateway Area

This 32-square-mile area is located in the southeast corner of the City of Mesa. It contains important regional facilities including the Phoenix-Mesa Gateway Airport and the east campus

of Arizona State University (ASU East). Near-term development projects in this area include Apple, DMB Eastmark, Niagara, several data centers, redevelopment of ASU East, and expansion of businesses (Fuji, CMC Steel etc.) in the Heavy Industrial Corridor at Meredian and Germann Road.

- West Main Street Area

This area is located in west-central Mesa and generally includes the area bounded by University Drive on the north, Broadway Road on the South, Country Club Drive on the east, and the Mesa/Tempe border on the west. Significant redevelopment was expected in this area with the operation of the Valley Metro Light Rail System.

- North Higley Area

This area is located in the vicinity of Loop 202 (Red Mountain Freeway) between Higley Road and Recker Road. This area is currently undeveloped and is zoned for both residential and commercial development.

- Lehi Crossing Area

This area is bounded by Gilbert Road on the west, Val Vista Drive on the east, the Southern Canal on the south, and Thomas Road on the North. Over the past several years, developers have expressed interest in this area for both residential and commercial development.

- TRW Safety Systems

The area labeled as TRW Safety Systems in the 2009 Masterplan is the industrial zone located in North Mesa, close to 56th St., approximately ½-mile north of Thomas Road. This area is currently underdeveloped and is zoned for future industrial development. It should be noted that the TRW Safety Systems Company has moved to Southeast Mesa.

1.3 Scope

Previous wastewater master plans were completed every five to ten years by consultants and provided comprehensive plans for wastewater collection and treatment infrastructure that would be required through Buildout. Master plan updates performed internally by Water Resources staff are limited in scope in that they focus primarily on high level decisions and updating flows and infrastructure capacities. As previously mentioned, the 2018 Master Plan update will only focus on the growth-related aspect of future infrastructure needs.

The scope of the 2018 Wastewater Master Plan is summarized below:

1) Update wastewater flow projections based on revised land use and revised growth projections.
2) Assess the impact of the revised flows on the City's wastewater treatment facilities.
3) Perform collection system hydraulic analyses using the revised flows and refine the capacity of sewer lines and lift stations and/or add new sewer lines and lift stations as needed.
4) Provide a detailed Infrastructure Improvements Plan for wastewater collection and treatment infrastructure based on revised growth and land use plans.

1.4 Report Organization

The results of the master planning effort are summarized in the 2018 Wastewater Master Plan Update. The report is organized into five chapters as follows:

- Chapter 1 – Introduction
- Chapter 2 – Flow Projection
- Chapter 3 – Treatment Plant Capacity and Expansion Evaluation
- Chapter 4 – Collection System Evaluation
- Chapter 5 – Infrastructure Improvement Plan

Chapter 2 -Flow Projection

Wastewater flow projection is one of the key questions that every wastewater master plan tries to answer as accurately as possible. The answer to this question is crucial for evaluating conveyance capacity of the collection system and treatment capacity of the wastewater treatment plants, and for developing system expansion and capital improvement programs. This Chapter evaluates the current wastewater flows in the City of Mesa wastewater system, as well as projected wastewater flows at buildout (2040). An interim scenario was also evaluated for the year 2028, when the final expansion of the Greenfield Water Reclamation Plant (GWRP) is planned to be completed. However, the interim scenario was not documented in detail in this report because most of the infrastructure for the buildout scenario will be built by 2028 to supplement the final phase of GWRP expansion.

2.1 Current Wastewater Flow

The City of Mesa wastewater collection system receives wastewater flows from four drainage basins and conveys the wastewater to four wastewater treatment plants (also known as water reclamation plants): (1) the Northwest Water Reclamation Plant (NWWRP), serving the Northwest area of the City; (2) the Southeast Water Reclamation Plant (SEWRP) serving the Northeast area of the City; (3) the Greenfield Water Reclamation Plant (GWRP), jointly owned with Town of Gilbert and Town of Queen Creek, serving the Northeast and Southeast areas of the City; and, (4) the 91st Avenue Wastewater Treatment Plant, serving the North-Central area and part of the Western area of the City. This plant is owned by the Sub Regional Operating Group (SROG), an association of five Cities including Phoenix, Glendale, Scottsdale, Tempe and Mesa. There are 36 diversion structures in the collection system providing some flexibility in directing wastewater flows to different plants. The annual average wastewater flow at each of the above wastewater treatment facility from January 2017 to December 2017, is presented in Table 2-1.

2.2 Flow Projections

The Buildout wastewater flows were calculated by adding the wastewater flows generated from new sewer areas to the current wastewater flows.

2.2.1 New Sewer Areas

New sewer areas include new development areas and septic areas. The areas that are available for new development are classified as vacant parcels in underdeveloped areas and vacant areas. In addition, the City of Mesa has plans to extend sewer collection lines to areas within the City's Service Area that are currently served by septic systems. Figure 2-1 shows the vacant areas and septic areas. It should be noted that the City of Mesa provides wastewater services to the Arizona

Water Company Service Area within the City of Mesa boundary (See Figure 2-1), while the Arizona Water Company provides water services to that area.

Table 2-1. City of Mesa January -December 2017 Wastewater Flow

Month-Year	GWRP Flow (mgd)	SEWRP Flow (mgd)	NWWRP Flow (mgd)	SROG Flow (mgd)	Total Flow (mgd)
Jan 2017	4.85	4.67	8.67	16.55	34.74
Feb 2017	4.84	5.25	8.76	16.03	34.88
Mar 2017	4.89	5.09	8.94	16.66	35.59
Apr 2017	4.85	4.72	7.43	17.04	34.04
May 2017	4.56	4.37	8.43	16.17	33.52
Jun 2017	4.32	4.20	8.53	15.88	32.93
Jul 2017	4.49	4.31	8.76	15.99	33.55
Aug 2017	4.76	4.39	9.02	15.90	34.07
Sep 2017	4.53	4.63	9.09	15.41	33.65
Oct 2017	4.76	4.32	8.87	15.49	33.43
Nov 2017	5.01	4.36	8.86	16.13	34.36
Dec 2017	4.98	4.61	8.60	15.67	33.86
Annual Average	4.74	4.58	8.66	16.08	34.05
Maximum Month	5.01	5.25	9.09	17.04	34.88
Max to Avg. Ratio	1.06	1.15	1.05	1.06	1.02

2.2.2 Buildout Wastewater Flow

The buildout wastewater flow was calculated assuming all the available land will be fully developed and all the septic areas will be connected to the wastewater collection system. The Buildout Flow was calculated by adding the projected flows from the new sewer areas to the existing wastewater flow. The latter was calculated based on the water demand projection which used land use data. For each land use, the water demand was calculated by multiplying the area of that land use category by the unit water demand. In the past, the wastewater flow was calculated independent of the water demand projection using land use category, a similar approach to water. In this Master Plan Update, a new approach was used by integrating the water demand and wastewater flow projections. After the water demand projection was calculated using the land use data, the wastewater flow was calculated by multiplying the water demand by

a water demand to wastewater flow ratio. This ratio was calculated from the historical water customer data and wastewater flow monitoring data and it ranges from 0.36 to 0.68 for various drainage basins. Most septic areas are located in the SROG drainage basin, the SEWRP drainage basin and the GWRP drainage basin. Considering that the wastewater flow to water demand ratio at the buildout for septic areas may be more uniform than the variation among the basins at present, an average ratio of 0.5 for the three drainage basins was applied to the septic areas for buildout flow projection. The water demand projection uses a contingency factor of 1.19 consisting of inactive accounts (9%) and contingency (10%) to the buildout scenario. To be consistent with water demand projections, these two factors were also applied to the buildout wastewater flow projections.

Southeast Mesa is a new development area with high-density industrial/commercial users. The wastewater flow projection for this area was completed separately and was mostly based on wastewater master plans submitted by the developers. The contingency factor of 1.19 was not applied to the flow projection by the developers, which was already very conservative.

At Buildout, the Salt River Pima-Maricopa Indian Community (SRPMIC) is projected to send 4.0 mgd wastewater flow to the City of Mesa wastewater system for treatment. The Town of Gilbert's Neely Wastewater Treatment Plant could send 1.0 mgd of sludge to the Baseline Interceptor. At this point, the Neely sludge is uncertain because Gilbert may discontinue discharging Neely sludge to the Baseline Interceptor. However, 1.0 mgd sludge from the Neely Wastewater Treatment Plant was included to obtain a conservative flow projection in this study.

As shown in Table 2-2, the total projected wastewater flow will be 68.0 mgd at Buildout. This number is slightly lower than the Buildout flow projection in 2009 Wastewater Master Plan, which was 69.2 mgd.

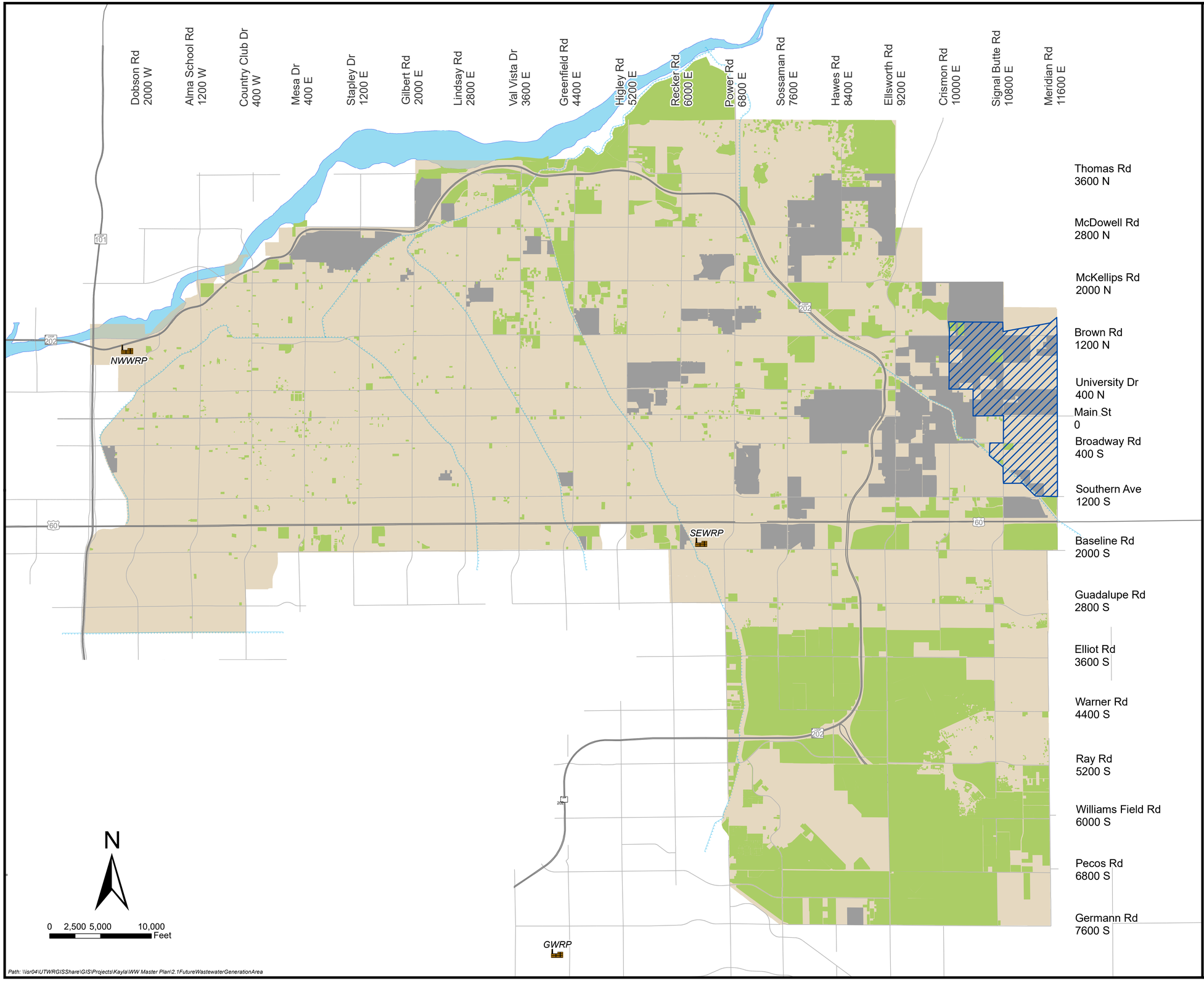
Table 2-2. City of Mesa Buildout Wastewater Flow Projection

Service Areas	Projected Flow (mgd)
Existing Sewer Service Area	40.0
Development at Vacant Parcels	9.6
Southeast Mesa Development Area	9.2
Septic Areas	2.2
Arizona Water Company Service Area	2.0
SRPMIC	4.0
Gilbert Neely Sludge	1.0
Total	68.0

A summary of wastewater flows in each Wastewater Treatment Plant Service Area at Buildout is presented in **Table 2-3**.

Table 2-3. City of Mesa Wastewater Plant Flows

	Current Flow (mgd)	Buildout Flow (mgd)
NWWRP	8.66	14.0
SEWRP	4.58	8.0
GWRP	4.74	23.5
SROG	16.08	22.5
Total	34.05	68.0



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Legend

- Reclamation Plant
- Septic Area
- Vacant Parcel
- Existing Developed Area
- Arizona Water Co. Area
- Highway
- Street
- Canal
- Salt River

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City of Mesa
Wastewater Master Plan

Figure 2-1
City of Mesa
Future Wastewater
Generation Areas

March 2018

2.3 Infiltration and Inflow Strategies

Infiltration and Inflow (I/I) into the sanitary sewer system from wet weather events needs to be considered when evaluating the capacity of the collection system. The 2009 Wastewater Master Plan Update estimated the Rainfall Derived Infiltration and Inflow (RDII) that would enter the collection system from a 10-year, 24-hour storm. The estimates were based on difference between wastewater flow volumes in wet and dry periods at various locations within the collection system. The ratio of the RDII that enters the system to the total rainfall that falls over a given area is termed the R-Value. The R-Values were applied to the design storm to estimate the RDII in a given segment to evaluate the adequacy of the collection system for both existing and future flows. This approach assumes that the design storm occurs uniformly over the entire City and that the simulated design storm is representative of actual storms that occur. The approach used in the 2009 Update was the same as that used by the Sub-Regional Operating Group (SROG) for their Regional Capacity Management Facilities (RCMF) study, prepared in 2007. The purpose of that study was to quantify the amount of RDII in the SROG interceptor system and develop strategies to prevent surcharging of the system. SROG has since initiated an Interceptor Capacity study to re-evaluate the results of the 2007 study using more sophisticated methods for distributing rainfall based on historical weather radar data. This revised approach should result in more accurate estimates of. The study has been completed but the results have not been published yet.

The City is committed to maintaining peak flows into the SROG system within agreed upon limits and to avoid sanitary sewer overflows (SSOs) within the City system following storm events. SSOs due to RDII have historically not been a problem within the City system. After the SROG Interceptor Capacity study results become available and the City initiates the Integrated Master Plan in the next bond cycle, the RDII obtained from that study will be incorporated to the hydraulic model to perform a more in-depth analysis to assess the impact of RDII on wastewater flows. Until more accurate estimates of RDII are performed in the next master plan update, the approach taken in this Master Plan update is to design the sewer capacity to keep the depth of peak dry-weather flow in all sewer lines at or below 80% of the diameter (i.e., $d/D < 0.8$ at average day flow) at the buildout. This leaves room for I/I during wet weather events.

Chapter 3 - Water Reclamation Plant Capacity and Expansion

3.1 Introduction

The purpose of this chapter is to review the capacities of the treatment plants owned by the City of Mesa and evaluate the future expansion needs. This chapter also evaluates reclaimed water and biosolids treatment strategies at the various plants owned by the City.

3.2 Wastewater Treatment Plant Capacity

3.2.1 Existing Facilities

As mentioned in Chapter 2, the City owns and operates three Water Reclamation Plants: The Northwest Water Reclamation Plant (NWWRP), The Southeast Water Reclamation Plant (SEWRP), and the Greenfield Water Reclamation Plant (GWRP). The GWRP is a shared facility with the towns of Gilbert and Queen Creek. Mesa is also a member of Sub-Regional Operating Group (SROG) along with the Cities of Glendale, Phoenix, Scottsdale, and Tempe, and sends a portion of the wastewater generated within the City to the regional 91st Avenue Wastewater Treatment Plant that is operated by the City of Phoenix. A summary of the current design capacities of these facilities is presented in Table 3–1.

Table 3-1. Mesa Wastewater Treatment Facilities Current Design Capacities

Wastewater Facility	Design Capacity (mgd)
NWWRP	18.0 (12.0)[1]
SEWRP	8.0
GWRP [2, 3]	4.0/16.0(14.0/30.0)
SROG 91st Ave WWTP [4]	26.5/204.5
Total	56.5

Notes:

(1) NWWRP has 18.0 mgd officially rated capacity, however, only 12.0 mgd capacity is in service
(2) Mesa Capacity/Total Capacity.
(3) GWRP is undergoing construction for Phase III expansion, which will expand Mesa capacity to 14 mgd and the overall plant capacity to 30 mgd. The Phase III expansion will be online by mid-2020. The Phase III capacities are shown in parenthesis.
(4) Total Mesa Capacity at SROG 91st Ave. including a 10% reserve is 29.2 mgd.

The existing collection system consists of four major interceptor sewers and diversion structures as shown in Exhibit A. The Southern Avenue Interceptor (SAI), the Baseline Interceptor (BRI), and/or the Salt River Outfall (SRO) convey flow to the SROG system through Metering Stations ME01 and ME02, respectively. The Central Mesa Interceptor (CMI) conveys flow to the

NWWRP. This flow can also be diverted to the SROG system by diverting flow to Southern Avenue Interceptor (SAI), the Baseline Road Interceptor (BRI), and/or the Salt River Outfall (SRO). The East Mesa Interceptor (EMI) conveys flow to the GWRP. A number of diversion structures, throughout the collection system, provide operational flexibility by directing flows to different water reclamation plants.

3.2.2 Projected Flows and Loads

The average annual wastewater flow projections from 2018 through build-out (2040) for each plant are presented in Table 3-2. These projections are based on linear growth from the present to buildout.

3.2.3 Treatment Plant Flow and Capacity Optimization

The following strategies were taken into consideration to optimize the buildout design wastewater flows and treatment capacity at the various plants:

- Maximize the utilization of available plant capacities.
- Utilize the existing collection system infrastructure as much as possible to deliver flows to the plants.
- Evaluate reclaimed water disposal alternatives at each plant to maximize the water resource credit in lieu of providing reclaimed water to prospective users.
- Minimize the overall capital and annual operating costs.

The above strategies also help meet the City's goals of expanding the system to serve projected growth while maximizing the beneficial use of reclaimed water and meeting existing reclaimed water commitments.

Table 3-2. City of Mesa Annual Average Wastewater Flow Projection

Year	SROG Flow (mgd)	NWWRP Flow (mgd)	SEWRP Flow (mgd)	GWRP				Total System Flow[1] (mgd)
				Mesa Flow (mgd)	Gilbert Flow (mgd)	QC Flow (mgd)	Total Flow (mgd)	
2017[2]	16.08	8.66	4.58	4.74	5.55	2.07	12.36	34.06
2018	16.36	8.89	4.72	5.55	6.28	2.35	14.19	35.53
2019	16.64	9.13	4.87	6.37	6.77	2.64	15.78	37.00
2020	16.91	9.36	5.02	7.18	7.26	2.92	17.37	38.48
2021	17.19	9.59	5.17	8.00	7.75	3.20	18.96	39.96
2022	17.47	9.82	5.32	8.82	8.24	3.49	20.54	41.43
2023	17.75	10.06	5.47	9.63	8.73	3.77	22.13	42.91
2024	18.03	10.29	5.62	10.45	9.22	4.06	23.72	44.38
2025	18.31	10.52	5.77	11.26	9.71	4.34	25.31	45.86
2026	18.59	10.75	5.92	12.08	10.20	4.62	26.90	47.34
2027	18.87	10.98	6.06	12.89	10.69	4.91	28.49	48.81
2028	19.15	11.22	6.21	13.71	11.18	5.19	30.08	50.29
2029	19.43	11.45	6.36	14.53	11.67	5.48	31.67	51.76
2030	19.71	11.68	6.51	15.34	12.16	5.76	33.26	53.24
2031	19.99	11.91	6.66	16.16	12.65	6.04	34.85	54.72
2032	20.27	12.14[(3)]	6.81	16.97	13.14	6.33	36.44	56.19
2033	20.55	12.38[(3)]	6.96	17.79	13.62	6.61	38.03	57.67
2034	20.82	12.61[(3)]	7.11	18.61	14.11	6.90	39.61	59.14
2035	21.10	12.84[(3)]	7.26	19.42	14.60	7.18	41.20	60.62
2036	21.38	13.07[(3)]	7.40	20.24	15.09	7.46	42.79	62.10
2037	21.66	13.30[(3)]	7.55	21.05	15.58	7.75	44.38	63.57
2038	21.94	13.54[(3)]	7.70	21.87	16.07	8.03	45.97	65.05
2039	22.22	13.77[(3)]	7.85	22.68	16.56	8.32	47.56	66.52
2040	22.50	14.00[(3)]	8.00	23.50	17.05	8.60	49.15	68.00

Notes: (1) City of Mesa total flow
(2) 2017 flow data are actual flows
(3) NWWRP only has 12 mgd usable capacity. Any flow over 12 mgd will be diverted to SROG. The bypass capacity is 5.8 mgd based on SROG ownership capacity in Segment 1 of SROG SRO interceptor.

3.2.4 Northwest Water Reclamation Plant

The NWWRP was originally designed for a capacity of 18 mgd, consisting of two trains, a 6-mgd and a 12-mgd train. However, the 6-mgd train would currently require significant upgrades to be operational, and the current total usable capacity is 12 mgd. The City has to reserve a capacity of 4 mgd at the NWWRP for the Salt River Pima-Maricopa Indian Community (SRPMIC), which has an Inter-Governmental Agreement (IGA) with the City. The IGA became effective in August 2013 and has a term of 20 years. The 2017 average flow to the NWWRP was approximately 8.7 mgd. As shown in Table 3-2, the projected flow for the NWWRP Service Area at buildout (2040) is approximately 14 mgd, which includes 4 mgd from the SRPMIC.

The SRPMIC completed a Water and Wastewater Master Plan in 2008. In the SRPMIC Master Plan, the wastewater flow was projected to be 3.5 mgd in 2018. However, the 2017 data shows that the SRPMIC sent less than 1 mgd to the NWWRP for treatment. The SRPMIC is currently in the process of updating their Water and Wastewater Master Plan.

In 2017, the City initiated a study to evaluate the NWWRP true capacity and establish a roadmap for the development of the facility into the future. With a 6-mgd treatment train currently not operational, only the 12-mgd plant is in service. The study will determine the true current capacity of the NWWRP, which will be used as the amount of wastewater that can be treated, without the need for an expansion. The cost to restore the 6-mgd plant will have impacts on the City's overall wastewater treatment strategy. The conveyance of the reclaimed water for water credit exchange, which will be discussed in section 3.4, needs to be carefully evaluated in the near future. The NWWRP facility evaluation study is expected to be completed in late 2018. Once the study is concluded, the recommendations will be incorporated in future Master Plans and Capital Improvement Plans.

Three alternatives are being considered for the NWWRP at buildout:

- Alternative 1 - Send 2 mgd of flow from the NWWRP to SROG using the plant bypass at the NWWRP. The existing Salt River Outfall (SRO) Interceptor owned by SROG has sufficient capacity and ownership to convey the additional 2 mgd flow to the 91st Ave. WWTP.
- Alternative 2 - Build a new 2-mgd expansion to the NWWRP.
- Alternative 3 - Restore the original 6-mgd train.

Although accurate cost estimates for the above alternatives cannot be made until the NWWRP Facility Evaluation Study is complete, a concept level "Order of Magnitude" capital cost for Alternative 2 and 3 is $20 and $30 million, respectively. On the other hand, no capital investment is needed for Alternative 1. Also, the cost of treatment at 91st Ave. WWTP is less

than at the NWWRP because of the economy of scale. Therefore, Alternative 1 would be least expensive alternative based on capital and O&M costs. One shortcoming of Alternative 1, however, is the loss of 2 mgd or 2,234 acre-ft per year of groundwater recharge credits. At this point, it is difficult to estimate the cost of losing water rights associated with this alternative, but the cost could be significant. This issue will need to be revisited as part of the comprehensive Integrated Master Plan, that will integrate water, wastewater, reclaimed water, and water resources, and is currently planned to be initiated in 2020.

It is not anticipated that the flows at the NWWRP will exceed 12-mgd, the current rated capacity in the new train, anytime soon. It is very likely that any expansion, if needed, will not be required until the 2024 bond period. This will allow us to complete the Integrated Master Plan mentioned above and incorporate any recommendations for the NWWRP in the 2024 bond capital plan. The NWWRP also has the option of bypassing all flows. For now, the recommendation is stay at the current capacity of 12-mgd and send any flows that exceed 12mgd to SROG. This recommendation, however, could change after the completion of the Integrated Master Plan.

3.2.5 Southeast Water Reclamation Plant

The current capacity of the SEWRP is 8 mgd. The 2017 average flow to SEWRP was 4.6 mgd. Based on the recommendations presented in the 2009 Wastewater Master Plan Update, the capacity of this plant will not be expanded. The recommendations in this update stay the same. It should be noted that, due to the configuration of the collection system, flows can be diverted between the SEWRP and the GWRP, allowing the plants to be operated as a system. Some flow that would normally be treated at the GWRP can be diverted to the SEWRP for treatment and vice versa. This provides the operational flexibility to optimize the utilization of the existing capacities at both plants, to respond to operational problems, and to provide treatment coverage for any construction delays related to the GWRP Phase III expansion. Diversion of flow from the GWRP to the SEWRP may be necessary in the next few years until the completion of the current GWRP expansion to reduce the overall operating cost for the City of Mesa and the partners.

3.2.6 Greenfield Water Reclamation Plant

The existing GWRP has a total liquids capacity of 16 mgd, of which the City of Mesa owns 4 mgd. The 2017 average flow to the GWRP from City of Mesa was approximately 4.7 mgd. The Phase III Expansion is currently underway and is scheduled to be completed in 2020. The Phase III Expansion will increase the liquid treatment capacity to 30 mgd and Mesa's capacity to 14 mgd. The solid treatment will be expanded to 38 mgd, with Mesa's capacity of 22 mgd. The final (Phase IV) expansion of the GWRP, must be adequate to treat the projected flows form Mesa, Gilbert, and Queen Creek at buildout. However, Mesa's capacity must also be capable of producing enough reclaimed water, which when combined with reclaimed water from the

SEWRP, will allow the City to meet its obligations to the Gila River Indian Community (GRIC) (see Section 3.4).

The flow projection and expansion phasing for GWRP are shown in Figure 3-1. The Phasing and Capacities associated with the GWRP expansions are presented in Table 3-3.

Table 3-3. GWRP Expansion Phasing and Capacities

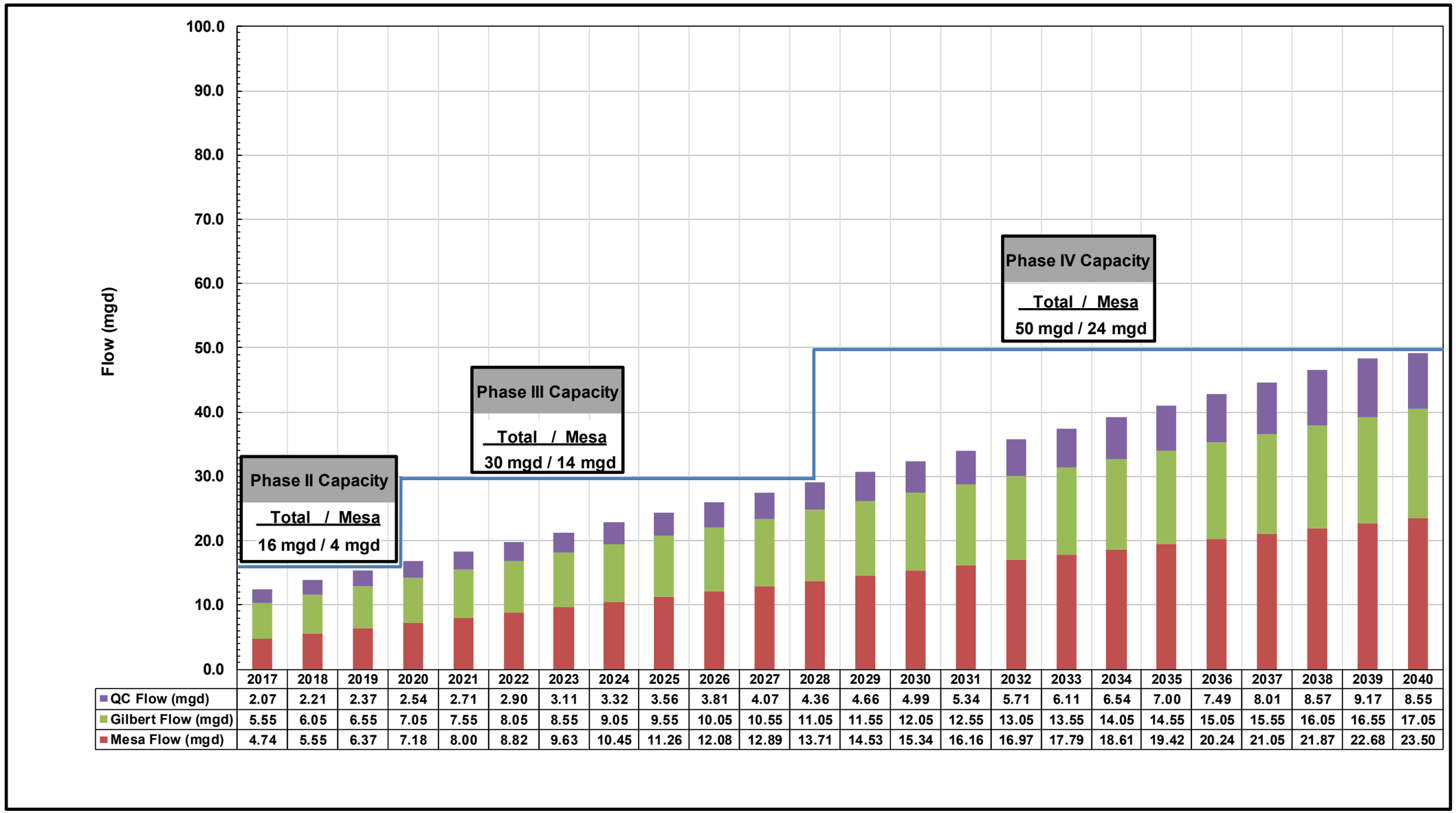
Phase	Treatment Capacity (mgd)			
	Liquids		Solids[1]	
	Total	City of Mesa	Total[1]	City of Mesa
Phase II	16	4	24	12
Phase III	30	14	38	22
Phase IV	50	24	58	32

Note 1: The Solids Capacity at GWRP includes 8 mgd equivalent additional solids flow from SEWRP, which does not have solids treatment facility and pumps the primary and secondary sludge to the GWRP.

Based on current flow and loading projections, it is anticipated that the Phase IV Expansion will need to be operational by 2028. The City's capacity at the GWRP will be increased to 24 MGD (total 50 MGD) with the Phase IV expansion. The planned Phase IV expansion schedule is shown in Table 3-4.

Table 3-4. Estimated GWRP Phase IV Expansion Schedule

Activity	Projected Date
Start Design	Mid 2023
Start Construction	Mid 2025
Plant Start Up / Commission	End of 2028



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040
QC Flow (mgd)	2.07	2.21	2.37	2.54	2.71	2.90	3.11	3.32	3.56	3.81	4.07	4.36	4.66	4.99	5.34	5.71	6.11	6.54	7.00	7.49	8.01	8.57	9.17	8.55
Gilbert Flow (mgd)	5.55	6.05	6.55	7.05	7.55	8.05	8.55	9.05	9.55	10.05	10.55	11.05	11.55	12.05	12.55	13.05	13.55	14.05	14.55	15.05	15.55	16.05	16.55	17.05
Mesa Flow (mgd)	4.74	5.55	6.37	7.18	8.00	8.82	9.63	10.45	11.26	12.08	12.89	13.71	14.53	15.34	16.16	16.97	17.79	18.61	19.42	20.24	21.05	21.87	22.68	23.50

Figure 3-1. GWRP Flow Projection and Plant Expansion Phasing

3.2.7 Treatment Capacity Summary

Based on the discussions above, the build-out capacities of the City's treatment facilities and flow to SROG are presented in Table 3-5:

Table 3-5. City of Mesa Projected Wastewater Flow at Buildout

Water Reclamation Plant	Buildout Capacity (mgd)	Buildout Flow (mgd)
NWWRP	12.0	14.0
SEWRP	8.0	8.0
GWRP	24.0	23.5
SROG	26.5	22.5
Total	70.5	68.0

3.3 Biosolids Management Strategies

3.3.1 Biosolids Treatment Facilities

Northwest Water Reclamation Plant (NWWRP)

The NWWRP solids handling facility has a current design capacity of 18.0 mgd. On-site solids treatment is provided utilizing anaerobic digesters and centrifuges for both thickening and dewatering. The NWWRP solids handling facilities treat primary and waste activated sludge to Class B standards. The dewatered biosolids are hauled off site for disposal via land application at Coolidge and Arlington. Future expansion of this plant is not anticipated. The NWWRP is equipped with co-generation facilities that are capable of generating electricity from waste digester gas that can be used to operate the equipment in the solids handling facilities. This co-generation facility is currently used for peak shaving during high electricity demand periods but does not have the ability to run on a continuous basis. Preliminary evaluations have been made to determine what would be required to upgrade the existing facilities to allow continuous operation. However, it was determined that upgrading this facility would not be cost-effective at this time due to the limited volume of digester gas that can be stored and made available for the co-gen generator and relatively inexpensive electricity rates. Therefore, this facility should continue to be used for peak shaving only until gas production increases.

In January 2012, scaling was found in the piping in and around the digester heat exchangers. This scaling was so severe that the heat exchangers were unable to maintain the biosolids at the

temperature required for digestion. In order to address this problem, the heat exchangers were shut down and the scaling was physically removed. Tests performed on the scale indicated that it was vivianite, or iron phosphate. In August 2012, the City hired a consulting firm to perform a study to determine the magnitude and extent of the scaling and the cause of the scaling, and to develop a plan for removing the scaling and eliminating or controlling future scaling. The study recommended replacement and rerouting of some pipelines in the digester gallery. The recommended improvements will be implemented as part of a Miscellaneous Improvements Project that is currently underway.

Southeast Water Reclamation Plant (SEWRP)

The SEWRP has a current capacity of 8.0 mgd with no solids handling facilities. This plant was originally designed to pump solids to the Baseline Road Interceptor (BRI) for treatment at the SROG 91st Avenue WRP; however, primary and secondary solids from the SEWRP are now pumped to the GWRP for treatment. Solids from the SEWRP can be discharged to the BRI in emergencies or when problems are experienced at the GWRP. At the time of the 2012 Update, the existing plant did not include grit removal as part of the primary treatment train and problems were encountered with the primary sludge pumps due to the presence of grit in the primary sludge and plugging of the primary sludge piping. A project was completed in 2017 that installed two Smith & Loveless "Pista-Grit" grit removal units, which should eliminate these problems. The buildout capacity of the SEWRP is projected to remain at 8 mgd.

Greenfield Water Reclamation Plant (GWRP)

The GWRP currently has a total liquids treatment capacity of 16.0 mgd and a total solids treatment capacity of 24 mgd, of which the City owns 4.0 mgd and 12 mgd, respectively. The additional solids treatment capacity allows for the SEWRP biosolids to be pumped to the GWRP for treatment. The treatment process is similar to that at the NWWRP and consists of anaerobic digestion with centrifuges for thickening and dewatering. The facility currently produces Class B Biosolids and the dewatered sludge is hauled off-site for disposal via land application at Coolidge and Arlington. At Buildout, the total liquids and solids treatment capacity at GWRP is projected to be 50 and 58 mgd, respectively, of which Mesa's capacity will be 24 and 32 mgd, respectively.

The 2009 Master Plan Update assumed that all future expansions of the GWRP would include expansion of the solids handling facilities by the same amount as the liquid treatment. At the time of the 2012 Update, the City was contemplating not expanding the solids handling capacity at the GWRP with the Phase III expansion. That plan was subsequently revised, and the Phase III expansion, which is currently underway, includes a 10-mgd expansion of both liquid and solids treatment trains, which will increase the solids treatment capacity for Mesa at the GWRP to 22 mgd.

The GWRP does not currently include co-generation facilities. An economic analysis previously conducted concluded that co-generation would not be economically viable.

3.3.2 Biosolids Management Strategies

The application of biosolids to agricultural land is currently an acceptable means of disposal. However, if regulatory trends in Arizona follow the trends in other parts of the southwest, and/or if available agricultural land continues to decrease, land application could cease to be a viable option in the future. If both land application and landfill disposal become unavailable, or limited, upgrading the facilities at the NWWRP and/or the GWRP to produce Class A or Class A EQ (Exceptional Quality) biosolids may be required. Multi-Phase anaerobic digestion would be the preferred technology as it would be compatible with the existing digestion facilities and would only require a few additional facilities to be implemented. Conversion to EQ or Class A biosolids treatment at the NWWRP and/or the GWRP would enable the City to apply biosolids to City-owned land such as those managed by the City's Parks and Recreation and Transportation Departments. While production of EQ or Class A biosolids would increase the availability of land for disposal, it is unlikely that there would be enough City owned land to handle all of the biosolids produced at the NWWRP and GWRP. Therefore, additional disposal sites would still be required.

3.4 Reclaimed Water Management

3.4.1 Water Resources Plan

In 2011, the City updated their Water Resources Plan that includes demand and supply projections, supply development, reclaimed water management, water conservation programs, and supply shortage strategies. The Plan recommends actions to provide adequate, reliable, and economical water supplies for the future. The City has developed several policies that guided the development of the Water Resources Plan, with the following applying specifically to reclaimed water management:

- Continue to develop and use reclaimed water as an integral part of Mesa's water resource portfolio, including the development and maintenance of necessary infrastructure.
- Maximize efficient development and use of reclaimed water, giving due consideration to water quality, public acceptance, and cost.

The utilization of reclaimed water supplies has become an important component of the City's Water Resources Plan, and its designation of Assured Water Supply from the Arizona Department of Water Resources.

Management of the City's reclaimed water should be handled in such a way as to provide maximum beneficial use. Long-term storage credits are created through artificial recharge of

Central Arizona Project (CAP) surface water or wastewater effluent. For each acre-foot of reclaimed water the City recharges, the City receives one acre-foot of reclaimed water long-term storage credit. Reclaimed water from the NWWRP is recharged directly into the aquifer at the Granite Reef Underground Storage Project (GRUSP) and recovered for later use via groundwater pumping.

The City intends to make maximum utilization of its reclaimed water supplies to meet its long-term storage credit account needs to offset non-renewable groundwater pumping during drought conditions. To achieve this, the City has established a goal of providing 100% backup or redundant capacity for the potential out-of-service recharge/exchange conditions, as summarized below:

- The occurrence of hydrologic conditions along the Salt River that cause GRUSP to be out-of-service for extended periods of time.
- The occurrence of conditions on the Gila River Indian Community (GRIC) reservation that would cause them to stop receiving deliveries of reclaimed water for an extended period of time.

It should be noted that this section attempts to provide an overview of the issues related to the reclaimed water portfolio. However, a comprehensive evaluation of the reclaimed water strategy cannot be done independent of an Integrated Master Plan that ties the water resources, water supply/treatment, wastewater collection/treatment, and reclaimed water utilization/disposal aspects together. The reclaimed water alternatives recommended in the 2009 Master Plan and the 2011 Water Resources Master Plan will be revisited along with potential additional alternatives, to firm up the recommendations for reclaimed water in the upcoming Integrated Master Plan, which will be initiated in 2020.

3.4.2 Reclaimed Water Exchange Agreements

In 2005, the City signed a water rights settlement agreement with the GRIC through which the City exchanges reclaimed water for a portion of the GRIC's CAP water. The agreement calls for the City to initially deliver 7,000 AF/yr. of reclaimed water, increasing deliveries by 1,000 AF/yr – 1,500 AF/yr., to a maximum of 29,400 AF/yr. by 2032. In exchange, the City would receive 4 AF of CAP water for every 5 AF of reclaimed water delivered, up to 23,530 AF/yr. This exchange allows the City to convert a non-potable water supply into a potable supply. Reclaimed water from the GWRP, the SEWRP, and possibly the NWWRP, would be used to meet the commitments of the GRIC exchange at year 2034. Deliveries of reclaimed water to the GRIC began in November 2007. The reclaimed water is used for agricultural irrigation.

In 1998 the City entered into an Intergovernmental Agreement (IGA) with the Salt River Pima-Maricopa Indian Community (SRPMIC). This agreement was renegotiated in 2013, to:

- Reserve 4MGD of plant capacity for treatment of SRPMIC wastewater
- Provide payment by SRPMIC to the City for variable wastewater treatment cost and a fixed 4MGD capacity reservation cost.

3.4.3 Reclaimed Water Management – NWWRP

Current reclaimed water management strategies for the NWWRP include:

- Aquifer Recharge at GRUSP
- Recharge at the NWWRP Basins
- Salt River Discharge

Historically, the City recharged reclaimed water from the NWWRP in basins located along the north side of the 202 Freeway adjacent to the plant. However, hydrologic conditions along the Salt River changed dramatically over the past 20 years, adversely impacting the City's ability to recharge at the NWWRP basins. Because of these changes, the City decided not to renew the Underground Storage Facility (USF) permit for the basins when it came up for renewal in 2008. While these basins can still be used for recharge, the City will not receive long-term storage credits. Therefore, these basins are currently only used when discharge to GRUSP is not available.

The primary reclaimed water management strategy for the NWWRP is to discharge to the GRUSP recharge facility, located on SRPMIC land near Val Vista Dr. and the 202 Freeway. This facility was originally permitted to receive 200,000 AF/yr. However, the permitted capacity was reduced to 93,000 AF/yr when the USF permit was renewed in 2010, due to hydro-geologic limitations. The City has a 25% share (23,250 AF/yr) in this facility. While GRUSP is the preferred disposal option, it is not always available and has been closed occasionally due to high groundwater elevations resulting from discharges from the SRP reservoir system. Over the past two years, GRUSP has been available to receive reclaimed water from the NWWRP more than 75% of the time.

Reclaimed water from the NWWRP can also be discharged directly to the Salt River, under the facility's AZPDES Permit, when other disposal options are not available. The City, however, cannot obtain long-term storage credits for discharges to the river. Therefore, direct discharge is not desirable as a long-term strategy.

The 2011 Water Resources Plan Update identified several alternatives for utilizing reclaimed water generated within the City. Options for utilizing reclaimed water from the NWWRP, as presented in the plan, are as follows:

- Continue to pump reclaimed water to GRUSP for recharge, assuming GRUSP is available.

- Construct a reclaimed water pipeline from the existing GRUSP pipeline at Val Vista Dr. and E. Quenton Dr. to the SEWRP.
- Partner with the Salt River Project (SRP) and the Roosevelt Water Conservation District (RWCD) to bank water through a Groundwater Saving Facility (GSF). This would require the extension of the existing GRUSP pipeline at Val Vista Dr. and E. Quenton Dr. approximately 1.5 miles to the RWDC Canal. A flow equalization basin and pump station would also be required to allow the reclaimed water to be discharged to the RWCD Canal at a constant rate. The reclaimed water would be delivered to the GRIC through the RWCD canal.
- Construct recreational lakes, wetlands, and/or riparian area to utilize reclaimed water. Preliminary calculations indicate that between 220 to 430 acres of property would be required to handle the total reclaimed water flow from the NWWRP at Buildout. It should be noted that the reclaimed water flow from the NWWRP at Buildout has been revised downward from 18 mgd to 14 mgd, and consequently the above numbers will need to be revised accordingly.

Based on current projections, at build-out, the City of Mesa will generate enough flow in the GWRP and SEWRP tributary areas to fulfill Mesa's GRIC obligation of 29,000 acre-ft, which is consistent with 2012 Update. However, due to the limited growth of reclaimed water flow in the GWRP tributary areas in the recent years, a more comprehensive evaluation of the water resources strategy is deemed necessary. This will be addressed as part of a comprehensive Integrated Master Plan, currently planned to be initiated in 2020. An in-house high-level evaluation of this reclaimed water strategy will be performed in 2018 for CIP planning purposes.

3.4.4 Reclaimed Water Management – SEWRP

Reclaimed water from the SEWRP is primarily used, along with reclaimed water from the GWRP, to meet delivery obligations to the GRIC. In emergencies, the reclaimed water can be discharged to the East Maricopa Floodway (EMF) and/or diverted to the Baseline Interceptor for delivery to the SROG 91st Avenue WWTP. It is anticipated that all reclaimed water from the SEWRP will continue to be used to meet the City's GRIC obligation through build-out.

3.4.5 Reclaimed Water Management – GWRP

The City's portion of reclaimed water generated at the GWRP is delivered to the GRIC to satisfy the Exchange Agreement between the City and the Community. The reclaimed water can also be discharged to the EMF in emergencies or when no other disposal options are available. This discharge, however, is limited by the GWRP APP to 60 calendar days per year. If the City discharges more than 60 days, monitoring wells will be required to be installed. and will become part of the plants monitoring plan for the life of the permit. If the GRIC is unable to take delivery due to weather conditions or system problems, or if there are process upsets at the plant,

GRIC deliveries may not be feasible for extended periods. Therefore, the City must develop other management strategies that can provide for the disposal of reclaimed water for periods of up to 1 year.

The 2009 Master Plan Update identified two long-term redundant disposal options: (1) Develop a recharge facility on GRIC lands, and (2) Develop a recharge facility at the Schnepf Farms gravel pit. Preliminary discussions were held with the GRIC regarding the development of a joint long-term recharge project on the Community land. However, the site initially identified by the GRIC for this facility was found to be unsuitable.

Other disposal alternatives include the development of Aquifer Storage and Recovery (ASF) and/or vadose zone injection wells and/or reuse/recharge associated with the Eastmark development. The limitations, advantages and disadvantages of these and other disposal alternatives were addressed in a Report entitled “EMF Linear Recharge Design Concept (Carollo 2006). The feasibility of vadose zone injection wells needs to be evaluated in the upcoming Integrated Water Resources Master Plan.

Chapter 4 -Collection System Evaluation

This Chapter evaluates the collection system for current and buildout wastewater flows. The InfoSewer Hydraulic Model developed as part of this Wastewater Master Plan Update was utilized for this evaluation. The following criteria were used to evaluate the performance of all pipelines: (1) the pipelines should not surcharge at peak flow during dynamic simulation, and (2) the water depth should not be greater than 80% of pipe diameter at average daily flow in a static model run. Table 4-1 lists the City's existing lift stations as part of the collection system. Table 4-2 and Table 4-3 list the existing diversion structures and sulfide control stations, respectively.

4.1 Model Calibration

The purpose of model calibration is to match the flow in the model with the flow monitoring data in the field by adjusting the manhole loadings in the model. In this study, the flow data from FlowDar flow monitoring sites (see Figure 4-1), water reclamation plants and SROG meters from January 2017 to December 2017 were utilized for model calibration. The manhole loadings were allocated based on the water accounts data from January 2017 to December 2017. It was assumed that a certain portion of water consumption ends in the sewer collection, and the wastewater is discharged to the closest manhole.

Each flow monitoring site has a sub-basin area with the wastewater generated in this sub-basin area flowing to it. For each sub-basin area, the total monthly average water consumption was calculated from the water accounts data. A wastewater to water ratio was calculated by dividing the monthly average sewer flow at the flow monitoring site by the total monthly average water consumption in the corresponding sub-basin area. The ratios from all the sub-basins were then applied to the manhole loading allocation. The manhole loadings allocated this way generate steady-state model flow that matches the monthly average sewer flow at the flow monitoring sites, water reclamation plants and SROG meters.

4.2 Model Simulation with Buildout Scenario

Additional flow calculated for the buildout scenario in Chapter 2 was added to the existing manhole loadings. Improvements were added to the new development areas and septic areas to accommodate the wastewater flow that would be generated from these areas. Buildout flows were calculated using the same wastewater to water ratios used in model calibration for current flows and the buildout water demands used in the Water Distribution System Model. Based on the results of the modeling, the infrastructure improvements required at buildout are shown in Exhibit B. For existing sewer lines, only the gravity sewer lines 12 inch and larger are shown in Exhibit B. For proposed future sewer lines, only sewer lines that will be the City's responsibility are shown.

Table 4-1. City of Mesa Collection System Lift Stations

Lift Station ID	Name	Address	Q (GPM)	TDH (ft)	No. of Pumps	To be Expanded? Yes/No
LS1	Alma School	2743 S Alma School Rd.	1400	25	2	No
LS2	Broadway	2506 W. Broadway	220	11	2	No
LS4	Hermosa Vista	4233 E. Hermosa Vista	350	29	2	No
LS5	Center St.	2329 N. Center	286	40	2	No
LS6	Noche De Paz	2738 S. Noche De Paz	1200	35	3	No
LS8	Ranier	4341 N. Ranier Cir.	100	35	2	No
LS9	Star Valley	3820 E. Shenandoah	800	90	2	No
LS10	Eagle Crest	7260 E. Eagle Crest Dr.	320	24	2	No
LS11	Van Guard	6718 E. Van Guard St.	300	25	2	No
LS13	Williams Gateway	6833 E. Pecos Rd.	1000	27	2	No
LS14	Warner	7011 E. Warner Rd.	1500	125	2	No
LS15	Lehi Crossing	2545 E. Lehi Rd.	530	83	2	No
LS16	Granite Mnt	8747 E. Regina Cir.	350	35	2	No
LS17	Desert Place	7119 E Elliot Rd.	361	27	3	No

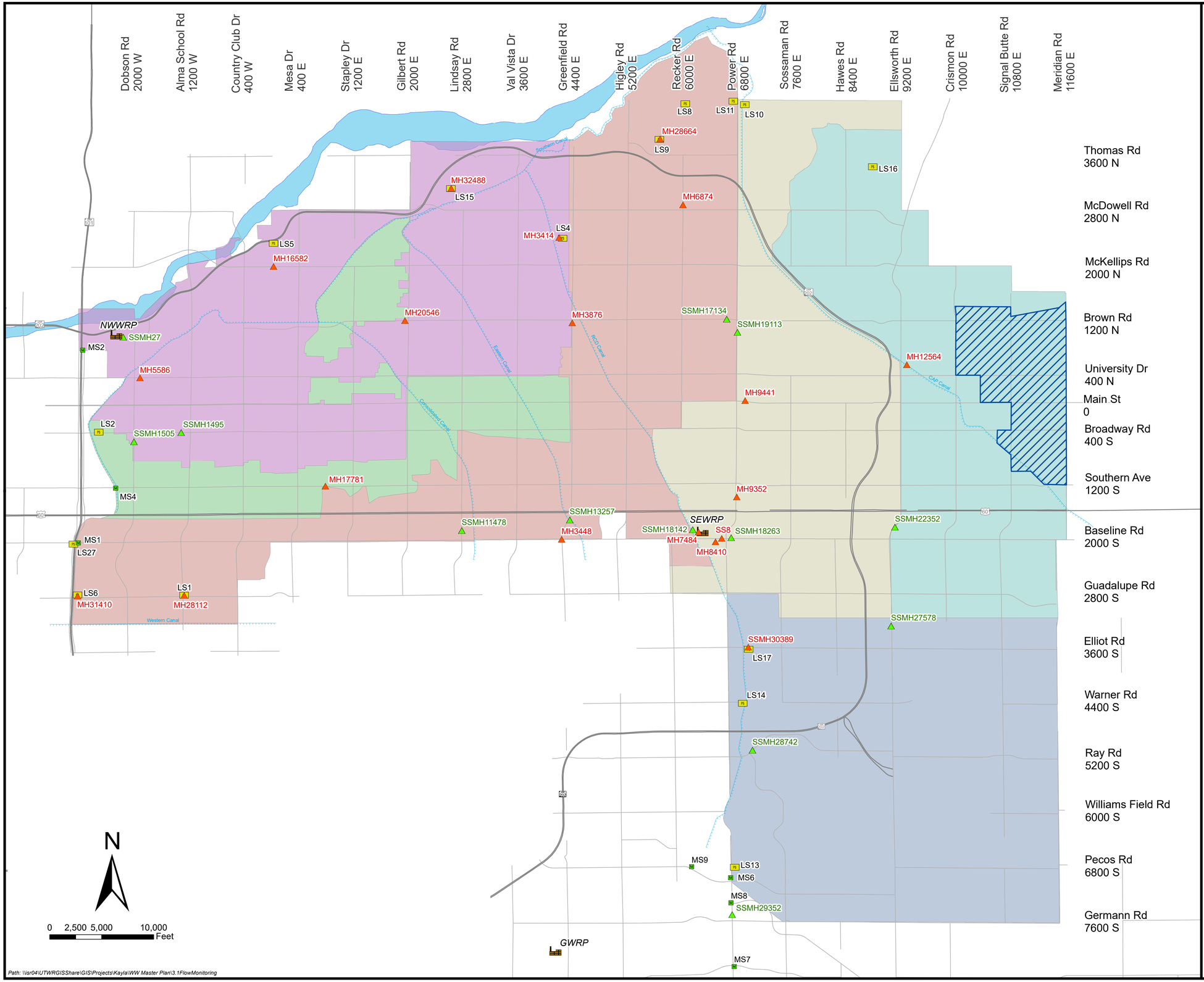
Table 4-2. City of Mesa Collection System Diversion Structures

Diversion Structure ID	Location	Type of Structure	Installation Date	Rehabilitation Date
DS1	East bank of the RWCD canal approximately 300 ft northwest of Baseline Rd.	Diversion Structure	1985	2018
DS2	Located on the CMI at the NE corner of 8th St and Riverview.	Diversion structure	1985	2004
DS3	Located at the entrance to the NWWRP	Diversion structure	1985	2009
DS6	Located in west bound Broadway 200 ft east of 56th St.	Diversion Structure	1985	2009
DS8	Located in the west bound fast lane of Baseline Rd 380 ft west of Power Rd.	Diversion Structure	1996	2004
SS 9	Located in west bound Broadway 60t West of 56th St.	Diversion Manhole	1985	2010
DS10	Located in N May along south side of Rio Salado Pkwy	Diversion manhole	1985	
DS11	Located in sidewalk along south side of Rio Salado 400' west of May	Diversion manhole	1985	
DS12	Located in Rio Salado 400' east of May	Diversion manhole	1985	
DS13	Located in Evergreen at Rio Salado	Diversion manhole	1985	
DS14 & 15	Positioned on the 24” line, this pair of manholes are located just north of 8th St. on the west side of Riverview	Diversion manhole	1985	2002
DS16	Northside of Baseline west of Greenfield	Diversion Structure	1999	2006
DS19	NE corner of Horne and Baseline	Diversion Structure	1988	2004
DS20	Located in the intersection of 2nd Ave and Extension	Diversion manhole	1970	2008
DS21	Located on the CMI at the intersection of Extension and Broadway	Diversion manhole	1987	2008
DS22	North and center of intersection at Broadway and Lindsay	Diversion Structure	1964	
DS23	Located on 10" sewer in Power at University	Diversion manhole	1989	

Diversion Structure ID	Location	Type of Structure	Installation Date	Rehabilitation Date
DS25	Located in the intersection of 8th Ave. and Extension	Diversion manhole	1970	2008
DS28	Northside of intersection at Ellsworth and Baseline	Diversion Structure	2003	2010
DS30	Siphon inlet structure in the intersection of College and Baseline Rds in Tempe	Siphon inlet	1987	2002
DS35	South manhole in the intersection of Gilbert and University	Diversion manhole	2005	2010
DS36	Located west of the intersection of Emerson and Baseline	Diversion Structure	1987	2007
DS37 &38	Located in the intersection of Brown and Greenfield	Diversion manhole	2004	2010
DS39	Located in Horne approx. 75' S. of Southern	Diversion manhole	1977	2005
DS40	In the PUE north of Baseline Rd. 300 ft west of Power Rd	Diversion Manhole	2005	
DS41	Located in the north bound lanes of Power Rd approximately 1000 ft north of Guadalupe	Diversion Manhole	2005	
DS42	Located in the east bound lanes of Guadalupe approximately 1200 ft east of Power Rd.	Diversion Manhole	2005	
DS43	East side of Ellsworth at SRP Powerline	Diversion Structure	2006	
DS45	NW corner of Lindsay and Baseline Road	Diversion Structure	1999	2006
DS50	Located in SW corner of SEWRP in plant road adjacent to sulfide control station	Diversion Structure	2015	
DS51	Intersection of Power and Brown	Splitter Manhole	1983	2009
DS52	Intersection of Ray and Mountain	Diversion Manhole	2009	
DS53	Intersection of Recker and University	Splitter Manhole	1971	2009
DS55	Located in left westbound lane of Brown approx. 190 ft. west of Val Vista	Diversion Structure	2011	
DS57	Intersection of Broadway and Power	Diversion Manhole	2007	

Table 4-3. City of Mesa Sulfide Control Stations (SCS)

SCS ID	Name	Address	Year Installed	Rehab Year	Technology
SS1	Alma School	2713 S. Alma School Rd	2005	2020	Chemical - Ferrous
SS2	Horne	1103 S. Horne	2005	2020	Chemical - Ferrous
SS3	Noche de Paz	2738 W. Noche de Paz	2004	2019	Chemical - Ferrous
SS4	Pecos	9203 E. Pecos Rd	2012	2027	Chemical - Ferrous
SS5	Ivyglen	425 W. Ivyglen St.	1993	2008	Chemical - Ferrous
SS6	Ranier	4341 N. Rainer Cir	1990	2005	Chemical - Ferrous
SS7	Vanguard	6718 E. Vanguard St	1992	2007	Chemical - Ferrous
SS8	Star Valley	3820 N. Shenandoah	2004	2019	Chemical - Ferrous
SS9	SEWRP	6212 E. Baseline	2005	2020	Chemical - Ferrous
SS10	6th Street	210 E. 6th Street	2001	2016	Chemical - Ferrous
GWRP	GWRP	4400 S. Greenfield	2000	2015	Chemical - Ferrous
SS13	Eagle Crest	7260 E. Eagle Crest Dr	1998	2013	Chemical - Ferrous
SS15	Center	2395 N. Center St	2003	2018	Chemical - Ferrous
SS17	FF5	3522 E. University Dr	2007	2022	Chemical - Ferrous
SS18	Ellsworth	9197 E. Florian Ave	2005	2020	Chemical - Ferrous
SS19	Las Sendas	2702 N Sossaman Rd	2007	2022	Chemical - Ferrous
SS20	Granite Mountain	8747 E. Regina Cir	2008	2023	Chemical - Ferrous
SS21	Hermosa Vista	4233 E. Hermosa Vista Dr	2010	2025	Chemical - Ferrous
SS22	Lehi Crossing	2545 E. Lehi Rd	2011	2026	Chemical - Ferrous
SS23	Desert Place	7119 E Elliot Rd	2014	2029	Chemical - Ferrous
SS24	Brooks	310 S Brooks Rd	2014	2029	Chemical - Peroxide



Legend

- Current Flow Monitoring Site
- Future Flow Monitoring Site
- Metering Station
- Reclamation Plant
- Lift Station

Sewer Drainage Basins

- GWRP
- ME01 (SROG)
- ME02 (SROG)
- NWWRP / ME03 (SROG)
- SEWRP
- SEWRP / GWRP

Other Features

- Highway
- Street
- Canal
- Arizona Water Co. Area
- Salt River

mesa·az

City of Mesa
Wastewater Master Plan

Figure 4-1
City of Mesa
Flow Monitoring Program

March 2018

Chapter 5 -Infrastructure Improvement Plan (IIP)

5.1 Introduction

This chapter summarizes and details the Infrastructure Improvement Plan (IIP) for this Master Plan Update.

5.2 Recommended Improvements

The 2018 Wastewater Master Plan Update provides a comprehensive set of recommended improvements to the City's wastewater collection and treatment infrastructure required to meet projected growth only from 2018 through Buildout (2040). These improvements are discussed in the following sections:

- Plant Expansion
- New Relief Sewers
- Collection System Expansion
- Sewer Extensions to Unsewered Areas

Rehabilitation and replacement of existing infrastructure that benefit existing customers will be addressed outside the Master Plan as part of annual CIP planning.

5.2.1 Plant Expansion

The City owns and operates three Water Reclamation Plants: the Northeast Water Reclamation Plant (NWWRP), the Southeast Water Reclamation Plant (SEWRP), and the Greenfield Water Reclamation Plant (GWRP). The GWRP is a shared facility with the towns of Gilbert and Queen Creek. Mesa is also a member of Sub-Regional Operating Group (SROG) along with the Cities of Glendale, Phoenix, Scottsdale, and Tempe, and sends a portion of the wastewater generated within the City to the regional 91st Avenue Wastewater Treatment Plant (WWTP), which is operated by the City of Phoenix. A summary of the current and Buildout design capacities of these facilities is presented in Table 5–1. The required design capacities are based on flow projections presented in Chapter 2 and capacity evaluation presented in Chapter 3.

5.2.1.1 Greenfield Water Reclamation Plant Expansion

Table 5-1 shows projected flows to the GWRP and proposed plant capacities at Buildout. GWRP needs one more expansion (Phase IV Expansion) after the current expansion (Phase III Expansion) is complete. The proposed future 10-mgd expansion (i.e., the Phase IV Expansion) will increase Mesa's capacity to 24 mgd for liquid treatment and 32 mgd for solids treatment.

Table 5-1 Mesa Wastewater Treatment Facilities Design Capacities

Wastewater Facility	Design Capacity (mgd)	
	Current	Buildout
NWWRP	12.0	12.0
SEWRP	8.0	8.0
GWRP [1]	Liquid: 4.0 (Phase III: 14.0) Solids: 12.0 (Phase III: 22.0)	Liquid: 24.0 (Phase IV[2]) Solids: 32.0 (Phase IV)
SROG 91st Ave WWTP	26.5	26.5
Total	50.5(Including Ph III at GWRP: 60.5)	70.5

Notes:

(1) GWRP is currently undergoing a 10 mgd expansion. The numbers in parenthesis for current flows indicate the capacity of the plant when Phase III Expansion will be complete in 2020.
(2) Phase IV Expansion is planned for completion by 2028.

5.2.2 Relief Sewers

The Infrastructure Improvement Plant includes relief sewer projects that will be required to provide adequate sewer capacity to convey build-out flows. Relief sewers are planned in areas that may experience surcharging at wet weather condition or diurnal peak flow during dry weather condition, or water depth greater than 80% of the pipe diameter at average flows, based on Buildout hydraulic modeling.

5.2.3 Collection System Expansion

As mentioned before, a hydraulic analysis of the wastewater collection system was performed for Buildout (2040) demands to determine the extent of system expansion that will be required to accommodate projected growth in the wastewater service area. This analysis assumed that all areas currently served by septic systems will be connected to the City system by Buildout. Recommended collection system expansion and relief sewers include approximately 37 miles of gravity sewer, ranging in size from 8” to 36”, and 4,300 feet of 8” force main. Also, two additional lift stations are planned for the Buildout as follows: (1) the Higley lift station; and, (2) a 6-mgd Pump-back station at Baseline and Greenfield Road along with a 3-mile long 20” force-

5.2.4 Sewer Extension to Unsewered Areas

Areas that are within City of Mesa Service area requiring sewer access ("Septic Areas") have been identified. Projects needed to provide sewer extensions to these areas are shown in Attachment B and have been included in the IIP.

5.3 Infrastructure Improvement Plan (IIP)

Table 5-2 summarizes the capital improvements that are recommended in each bond period. Table 5-3 is a detailed, itemized list of all capital improvement projects. The proposed wastewater infrastructure improvements plan is shown in Exhibit B.

Table 5-2. Wastewater Infrastructure Improvement Plan Summary

Category	2014 Authorization	2020 Authorization	2024 Authorization	2028 Authorization - 2040	Total
Wastewater Treatment					
Wastewater Treatment Plant Expansion			$76,382,000		$76,382,000
Collection System					
Relief Sewers		$1,298,000	$4,778,000	$1,359,000	$7,435,000
Collection System Expansion to Serve Growth	$2,211,000	$71,959,000	$5,687,000	$1,002,000	$80,859,000
Sewer Expansion to Septic Tank Areas	-	$3,811,000	$3,581,000	$4,989,000	$12,381,000
TOTAL (1)	$2,211,000	$77,068,000	$90,428,000	$7,350,000	$177,057,000

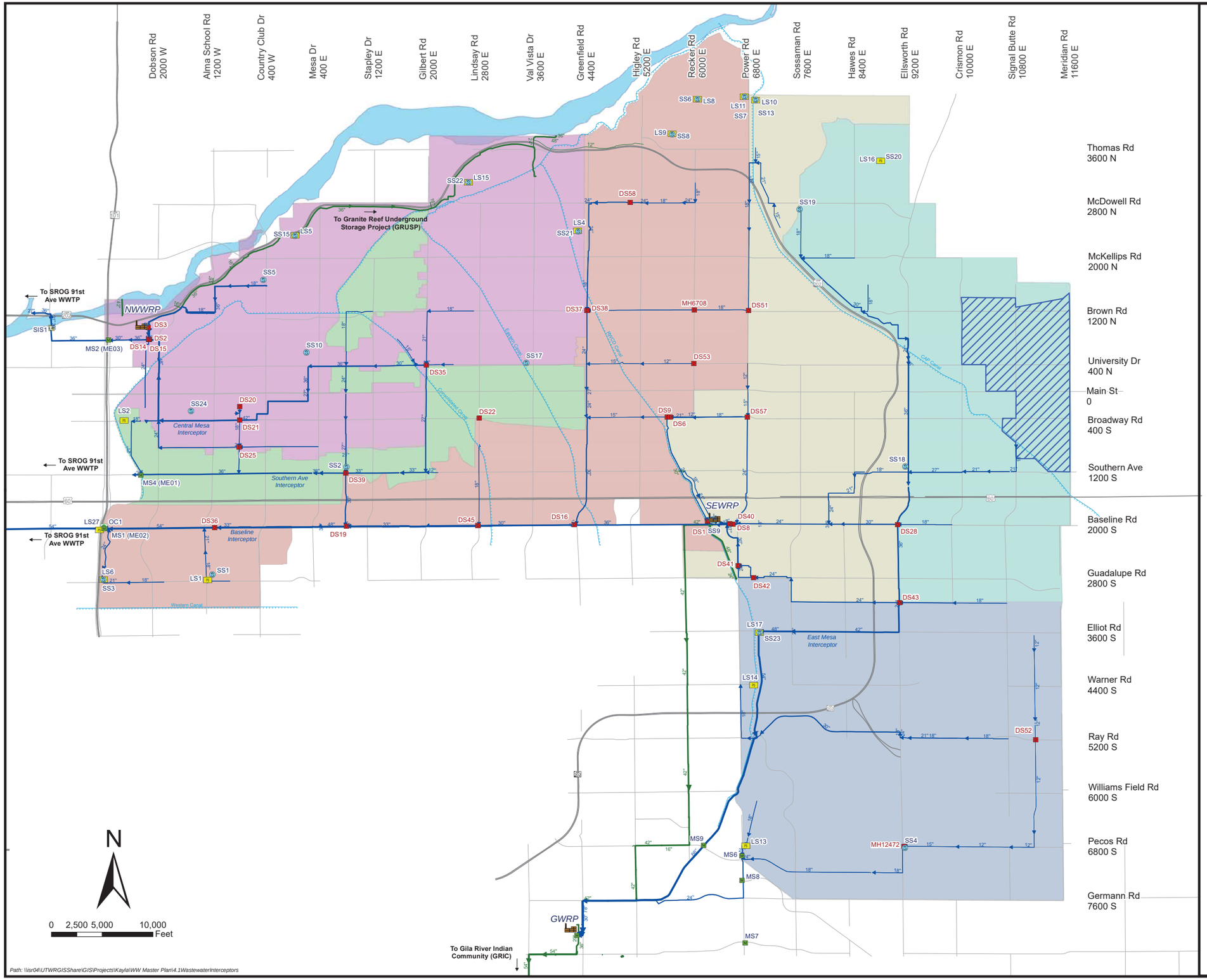
Note:
(1) All costs presented are in Jan 2018 dollars (ENR CCI = 10,746).

Table 5-3. Wastewater Buildout Infrastructure Improvement Plan (IIP)

Project No.	Project Description/ Location	Project Justification	Trigger	New or Parallel Relief Sewer Diameter (in)	Length (ft)	Project Cost ($)			
						2014 Authorization	2020 Authorization	2024 Authorization	2028 - Buildout
Wastewater Treatment Plant Expansion									
WRP-6	GWRP Phase IV Expansion	Phased expansion of the GWRP to provide wastewater treatment capacity for east Mesa	Mesa Flow to SEWRP and GWRP exceeds 20.0 mgd AADF	N/A	N/A			$ 76,382,000	
Relief Sewers									
1	18"-27" Pecos Rd Sewer from Ellsworth Rd to Power Rd	Insufficient pipe capacity based on build-out estimated flows		18/21/27	16,650			$4,778,000	
2	15" McKellips Rd Sewer from Gilbert Rd to Stapley Rd 15" Stapley Rd Sewer from McKellips Rd to McClean Rd	Insufficient Capacity based on Projected 2020 Flows	Site Flow Monitoring to Confirm Capacity Limitation	15	10,565		$1,298,000		
3	15" Recker Rd Relief Sewer from Virginia to Longbow	Insufficient pipe capacity based on 2040 estimated flows	Site flow monitoring to validate capacity limitation. Note: Projected flow estimates are based on an industrial load in the entire TRW area in the land use plan. Actual flows could be significantly lower, eliminating the need for this improvement	15	3300				$724,000
4	12" Country Club Dr. Sewer from McKellips Rd to McClellan Rd 12" McKellips Rd Sewer from Center St to Country Club Dr	Insufficient pipe capacity based on 2040 estimated flows	Site flow monitoring to validate capacity limitation	12	5180				$635,000
Collection System Expansion to Serve Growth									
5	12" Thomas Rd Sewer from 54th St. to N. Higley Lift Station	Provide service to currently undeveloped areas of north Mesa.	New Development upstream of proposed project	12	4750			$382,000	
6	N. Higley Lift Station and 8" force main from Thomas Rd to 56th St	Provide service to currently undeveloped areas of north Mesa.	New Development upstream of proposed project	8	3435			$964,000	
7	10" Sewer extension from intersection of Thomas Rd and Gilbert Rd to Lehi Crossing Lift Station	Provide service to future development northwest of Lehi Rd to Gilbert Rd.	New Development upstream of proposed project	10	6310		$736,000		
8	12" Signal Butte Rd Sewer from south of Southern Ave to U.S. 60	Provide service to currently undeveloped areas of east Mesa	New Development upstream of proposed project	12	2310			$343,000	
9	12" Sewer along U.S. 60 from Meridian Rd to Signal Butte Rd	Provide service to currently undeveloped areas of east Mesa	New Development upstream of proposed project	12	5250			$769,000	
10	12" Mountain Rd Sewer from South of Southern Ave to U.S. 60	Provide service to currently undeveloped areas of east Mesa	New Development upstream of proposed project	12	1695			$361,000	
11	12" Baseline Rd Sewer from Meridian Rd to east of Signal Butte Rd	Provide service to currently undeveloped areas of east Mesa	New Development upstream of proposed project	12	4970				$1,002,000
12	12" Mountain Rd Sewer from south of U.S. 60 to Baseline Rd	Provide service to currently undeveloped areas of east Mesa	New Development upstream of proposed project	12	2530			$357,000	
13	18" Warner Rd Sewer from Ellsworth Rd to EMI	Provide service to Williams Gateway/GM Proving Grounds area of southeast Mesa	New Development upstream of proposed project	18	13230		$2,981,000		

Project No.	Project Description/ Location	Project Justification	Trigger	New or Parallel Relief Sewer Diameter (in)	Length (ft)	Project Cost ($)			
						2014 Authorization	2020 Authorization	2024 Authorization	2028 - Buildout
14	12”–21” Ellsworth Rd Sewer from Elliot Rd to Ray Rd	Provide service to Williams Gateway/GM Proving Grounds area of southeast Mesa	New Development upstream of proposed project	12/18/21	8985		$2,313,000		
15	10”–18” Williams Field Rd Sewer from Ellsworth to Mountain Rd	Provide service to Williams Gateway/GM Proving Grounds area of southeast Mesa	New Development upstream of proposed project	10/12/15/18	14490		$1,312,000		
16	10” & 12” Ellsworth Rd Sewer from Ray Rd. to Williams Filed Rd.	Provide service to Williams Gateway/GM Proving Grounds area of southeast Mesa	New Development upstream of proposed project	10/12	12220		$1,160,000		
17	12” Ellsworth Rd Sewer from Williams Field Rd to Old Pecos Rd	Provide service to Williams Gateway/GM Proving Grounds area of southeast Mesa	New Development upstream of proposed project	12	4250		$582,000		
18	27” & 36” Pecos Rd Sewer from Power Rd to EMI	Provide service to Paragon 600 area of southeast Mesa	New Development upstream of proposed project	27/36	5,430			$2,511,000	
19	12” 56th St. Sewer from Thomas to Longbow Pkwy	Provide service to area west of Recker between Thomas and Longbow	New Development upstream of proposed project	12	2500		$344,000		
20	PMGA: 12” & 15” Sewer in Gateway Blvd.	Provide service to PMGA NE Terminal Area	Development of Northeast Terminal Area	12/15	7200		$1,250,000		
21	PMGA: 18” Sewer in Gateway Blvd.	Provide service to PMGA NE Terminal Area	Development of Northeast Terminal Area	18	1800	$391,000			
22	PMGA: 8” & 10” Sewer in NE Loop Rd.	Provide service to PMGA NE Terminal Area	Development of Northeast Terminal Area	8/10	4800		$595,000		
23	PMGA: 12” Sewer in Grand Canyon Dr.	Provide service to PMGA NE Terminal Area	Development of Northeast Terminal Area	12	3600		$514,000		
24	PMGA: 15” Sewer in Mustang St.	Provide service to PMGA NE Terminal Area	Development of Northeast Terminal Area	15	2000		$372,000		
25	Reclaimed Water Strategy [1]	Increase reclaimed water available for delivery to GRIC	GRIC IGA and Water Demands	36	53000	$1,820,000	$59,800,000		
Sewer Extension to Septic Areas									
26	12” McDowell Rd Sewer from Hawes Rd to 80th St	Serve area currently served by septic systems	Customers convert to Mesa's collection system	12	2315			$349,000	
27	10” 104th St. Sewer from Jensen St. to Brown Rd.	Serve area currently served by septic systems	Customers convert to Mesa's collection system	10	3920			$511,000	
28	12” Broadway Rd Sewer from Emerald Dr to Signal Butte Rd	Serve area currently served by septic systems	Customers convert to Mesa's collection system	12	4345				$533,000
29	12” Crismon Rd Sewer from Main St to Broadway Rd	Serve area currently served by septic systems	Customers convert to Mesa's collection system	12	2515				$364,000
30	12” Broadway Rd Sewer from Crismon Rd to 96th St.	Serve area currently served by septic systems	Customers convert to Mesa's collection system	12	2620				$364,000
31	12” Main St Sewer from Sossaman Rd to Hawes Rd	Serve area currently served by septic systems	Customers convert to Mesa's collection system	12	5280		$734,000		
32	10” Lehi Rd Sewer from Stapley Dr.to Center St.	Serve area currently served by septic systems	Customers convert to Mesa's collection system	10	8080		$916,000		
33	10” Brown Rd Sewer from Signal Butte to Crismon Rd.	Serve area currently served by septic systems	Customers convert to Mesa's collection system	10	5,260			$685,000	
34	10” Signal Butte Rd Sewer from McLellan Rd. to Brown Rd.	Serve area currently served by septic systems	Customers convert to Mesa's collection system	10	2,430			$316,000	
35	Other Collection Systems in Unsewered Areas	Serve area currently served by septic systems	Customers convert to Mesa’s collection system	8			$2,161,000	$1,720,000	$3,728,000

Note: 1. The cost is based on a 36-inch reclaimed water line from GRUSP to SEWRP, as a placeholder for planning purposes. However, there are other alternatives, such as a pump-back station and force-main, that will be evaluated as part of the upcoming Integrated Master Plan.



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Legend

- Diversion Structure
- Metering Station
- Odor Control
- Siphon Structure
- Sulfide Station
- Reclamation Plant
- Existing Lift Station
- Sewer Line
- Reclaimed Main

Other Features

- Arizona Water Co. Area
- Highway
- Street
- Canal
- Salt River

Sewer Drainage Basins

- GWRP
- ME01 (SROG)
- ME02 (SROG)
- NWWRP / ME03 (SROG)
- SEWRP
- SEWRP / GWRP

Note 1: ME01, ME02, and ME03 are SROG Metering Stations, which are labeled as MS4, MS1, and MS2 in the City of Mesa Asset Tagging System

Note 2: This map only shows sewer lines 12" and larger

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City of Mesa Wastewater Master Plan

Exhibit A
Major Wastewater Infastructure

March 2018

Dobson Rd 2000 W
Alma School Rd 1200 W
Country Club Dr 400 W
Mesa Dr 400 E
Stapley Dr 1200 E
Gilbert Rd 2000 E
Lindsay Rd 2800 E
Val Vista Dr 3600 E
Greenfield Rd 4400 E
Higley Rd 5200 E
Recker Rd 6000 E
Power Rd 6800 E
Sossaman Rd 7600 E
Hawes Rd 8400 E
Ellsworth Rd 9200 E
Crismon Rd 10000 E
Signal Butte Rd 10800 E
Meridian Rd 11600 E

Thomas Rd 3600 N
McDowell Rd 2800 N
McKellips Rd 2000 N
Brown Rd 1200 N
University Dr 400 N
Main St 0
Broadway Rd 400 S
Southern Ave 1200 S
Baseline Rd 2000 S
Guadalupe Rd 2800 S
Elliot Rd 3600 S
Warner Rd 4400 S
Ray Rd 5200 S
Williams Field Rd 6000 S
Pecos Rd 6800 S
Germann Rd 7600 S

NHIG WW
MCDOWELL WW
GREENFIELD PUMPBACK
DS1 DS2 DS3 DS6 DS8 DS9 DS14 DS15 DS16 DS19 DS20 DS21 DS22 DS23 DS25 DS28 DS35 DS36 DS37 DS38 DS39 DS40 DS41 DS42 DS43 DS45 DS51 DS52 DS53 DS57 DS58

Crosscut Canal
Eastern Canal
Consolidated Canal
RWCD Canal
CAP Canal
Western Canal

To SROG 91st Ave WWTP
To SROG 91st Ave WWTP
To SROG 91st Ave WWTP
To Gila River Indian Community (GRIC)

GWRP Expansion Phasing and Capacities

Phase	Status	Operational By (Year)	Treatment Capacity (million gallons per day)			
			Liquids		Solids	
			Total	City of Mesa	Total	City of Mesa
Phase II	Current	Current	16	4	24	12
Phase III	Under Construction	2020	30	14	38	22
Phase IV	**Build-Out**	**2028**	**50**	**24**	**58**	**32**

N

0 2,500 5,000 10,000 Feet

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Legend

- Proposed Diversion Structure
- Diversion Structure
- Metering Station
- Odor Control
- Siphon Structure
- Sulfide Station
- Reclamation Plant
- Existing Lift Station
- Proposed Lift Station
- Proposed New Force Main
- Proposed New Gravity Main
- Existing Wastewater Main
- Existing Force Main
- Existing Reclaimed Main

Other Features

- Arizona Water Co. Area
- Highway
- Street
- Canal
- Airport
- Septic Areas
- Salt River

Sewer Drainage Basins

- GWRP
- ME01 (SROG)
- ME02 (SROG)
- NWWRP / ME03 (SROG)
- SEWRP
- SEWRP / GWRP

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City of Mesa Wastewater Master Plan

Exhibit B
Buildout Wastewater Infastructure Improvement Plan

March 2018