Comparison of Multifamily Sector Water Use Across Cities in Phoenix-Metro Area

Contract No. 2020-3113IGA
Phase 3c – Third Update/briefing of project status

Overview of Status of Project Tasks

✓ Completed	Task 1: Signed Contract – Phoenix & Consultant
✓ Completed	Task 2a: Consultant Market Survey
➢ In Progress	Task 2b: Onsite Water Conservation Checkups
➢ In Progress	Task 3: Aerial Landscape Coding
○ Pending Receipt of Data	Task 4: Statistical Analysis/Summary Report of Total Water Use

The city began procedures to procure a vendor to develop and provide a GIS spatial layer of multifamily water user parcels dissolved into their respective multifamily developments within the Town of Gilbert and Cities of Avondale, Glendale, Goodyear, Phoenix, and Tempe water service areas.

Two GIS Technicians completed 50 percent of the landscape coding by of the 2020 LiDAR imagery using Trimble eCognition software.

See more details below.

Task 2a: Consultant Market Survey

The contract with Keen Independent Research LLC is considered finalized. The consultant provided its final dataset and resource summary on May 16, 2024. Physical characteristics and contact information for 965 were randomly sampled properties out of a total of 9,903 Multifamily (MF) developments in Phoenix, Goodyear, Avondale, Tempe, and Glendale. Data was collected via phone calls, online/web research (including commercial real estate online platform Reonomy).

The consultant did not include adequate indoor/outdoor water feature information in the dataset provided and the consultant was not able to coordinate with any MF properties to conduct onsite water conservation checkups. MF water use and efficiency trends, therefore, cannot be determined with the current dataset provided by consultant. However, the city will continue to pursue alternate strategies to collect this data and perform the onsite checkups. **Figure 1 - Distribution of MF Developments by Type, Build Period, and Municipality** shows the distribution of multifamily developments in the dataset.

Figure 1 - Distribution of MF Developments by Type, Build Period, and Municipality

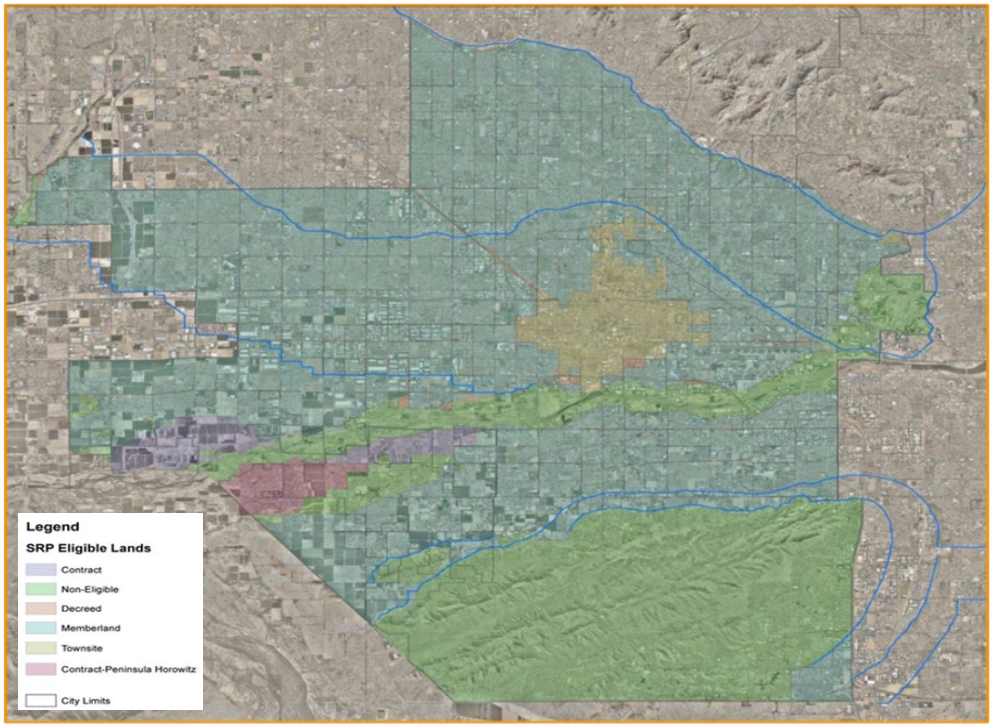
MF Development Type	Avondale	Glendale	Goodyear	Phoenix	Tempe	**Total**
Multi Family (General), Post-1995	15	34	52	289	67	457
Multi Family (General), Pre-1995	33	263	2	2,310	275	2,883
Duplex, Post-1995	0	2	0	260	3	265
Duplex, Pre-1995	26	78	0	1,865	259	2,228

Triplex, Post-1995	0	0	0	38	3	41
Triplex, Pre-1995	13	80	0	1,281	97	1,471
Quadruplex, Post-1995	0	1	0	27	0	28
Quadruplex, Pre-1995	14	186	0	1,358	220	1,778
Cooperative, Pre-1995	0	0	0	12	0	12
Mobile Home Park, Pre-1995	12	25	1	155	7	200
Nursing Home, Post-1995	4	44	18	136	8	210
Nursing Home, Pre-1995	1	59	0	245	25	330
Totals	**118**	**772**	**73**	**7,976**	**964**	**9,903**

Task 2b: Onsite Water Conservation Checkups

A "Cost Sharing Agreement" was signed with Salt River Project for $35,000 to expand the number of Onsite Multifamily Water Conservation Checkups focusing on "On-Project" MF developments. SRP is specifically interested in determining "On-Project" land use density. See **Figure 2: SRP Lands Within Phoenix.**

Figure 2: SRP Lands Within Phoenix



Prior to performing onsite water conservation checkups, it was necessary to develop a list of multifamily developments that would agree to have staff come onsite to interview development staff, interview third party servicers, and inspect the property. From July 2023 to January 2024, an unpaid intern developed a script and performed phone surveys of multifamily development managers to obtain agreements for future water efficiency checkups. **Figure 3 - Multifamily Phone Survey Summary** and **Figure 4 - Multifamily Phone Survey Results** summarizes the results of the phone survey.

In return for agreeing to participate, a Water Efficiency Checkup Report would be provided which might help them qualify for fixture, cooling tower, or turf removal rebates and the Green Business Leader Program with the City of Phoenix. See https://www.phoenix.gov/publicworks/green-business.

Figure 3 - Multifamily Phone Survey Summary

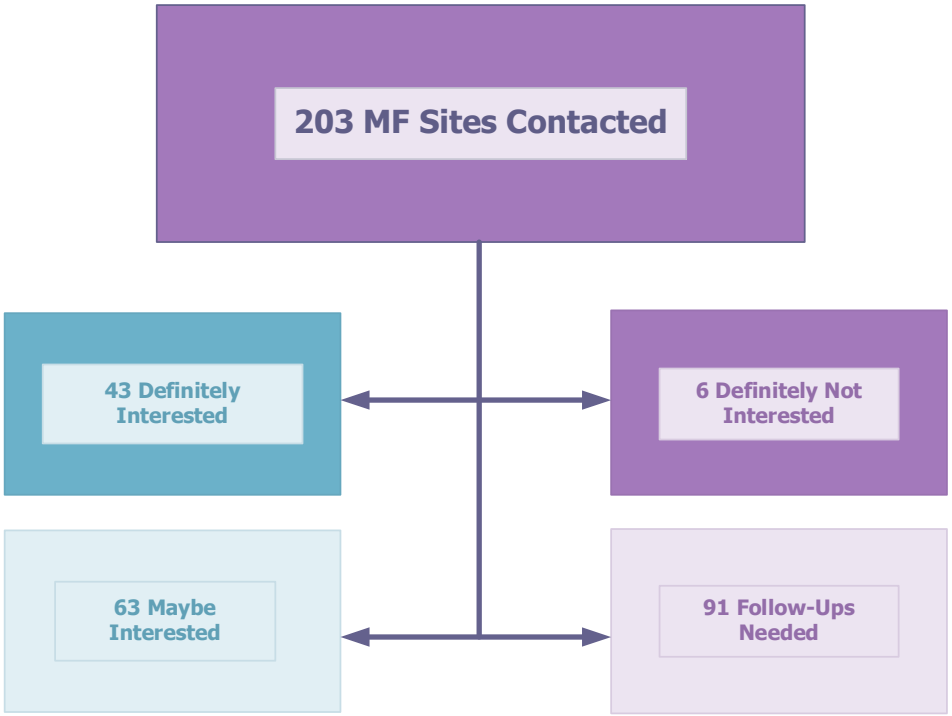


Figure 4 - Multifamily Phone Survey Results

Agreed to Checkup?	Primary SIC Description	Post 1995	Pre 1995	WE Checkups Performed
Yes	Apartments	1	34	9
Yes	Condominiums	1	2	2
Yes	Mobile Homes-Parks & Communities	1	0	0
Yes	Nursing & Convalescent Homes	3	1	0
Maybe	Apartments	0	58	1
Maybe	Mobile Homes-Parks & Communities	1	0	0
Maybe	Nursing & Convalescent Homes	3	1	0
Total Yes or Maybe		**10**	**96**	**12**
Left a message; follow-up needed	Apartments	3	44	0
Left a message; follow-up needed	Condominiums	3	1	0
Left a message; follow-up needed	Mobile Homes-Parks & Communities	4	0	0
Left a message; follow-up needed	Nursing & Convalescent Homes	3	0	0
Left a message; follow-up needed	Retirement Communities & Homes	1	0	0
Wrong Info; follow-up needed	Apartments	2	20	0
Wrong Info; follow-up needed	Condominiums	1	1	0
Wrong Info; follow-up needed	Mobile Homes-Parks & Communities	1	1	0
Wrong Info; follow-up needed	Nursing & Convalescent Homes	5	0	0
Wrong Info; follow-up needed	Retirement Communities & Homes	1	0	0
Total Follow-ups needed		24	67	0
No	Apartments	1	5	0
Totals		**35**	**168**	**12**

Twelve (12) Onsite Multifamily Water Conservation Checkups were previously completed. Of the twelve, two sites were terminated due to safety concerns.

The city had several meetings with Planning and Development Department (PDD) who will be identifying at least six (6) multifamily developers to partner with the city by installing submeters which would parse out specific water uses, i.e. indoor versus outdoor. These partners would also assist the city gaining access for onsite water efficiency checkups on the properties and MF units.

Task 3: Aerial Landscape Coding

Aerial landscape coding to determine outdoor water intensity requires 1.) merging or dissolving individual multifamily parcels which make up each multifamily property into single entity identifiers within ArcGIS, and 2.) applying eCognition to 2015 and 2020 LiDAR and NAIP dataset imagery.

Figure 5: Parcel Level Water Intensity Landscape Coding depicts examples of landscape coding levels for single family parcels. The same water intensity levels will be applied to entire multifamily properties using Trimble eCognition and Lidar software once the city has obtained a Geographical Information System (GIS) spatial layer of dissolved multifamily properties.

Figure 5: Parcel Level Water Intensity Landscape Coding

In August 2025, the city began procedures to procure a vendor to develop and provide a GIS spatial layer of multifamily water user parcels dissolved into their respective multifamily developments within the Town of Gilbert and Cities of Avondale, Glendale, Goodyear, Phoenix, and Tempe water service areas. Procurement of a vendor should be completed by January 2026. See **Figure 6: Example of Multifamily Property Occupying Multiple Parcels**.

Figure 6: Example of Multifamily Property Occupying Multiple Parcels

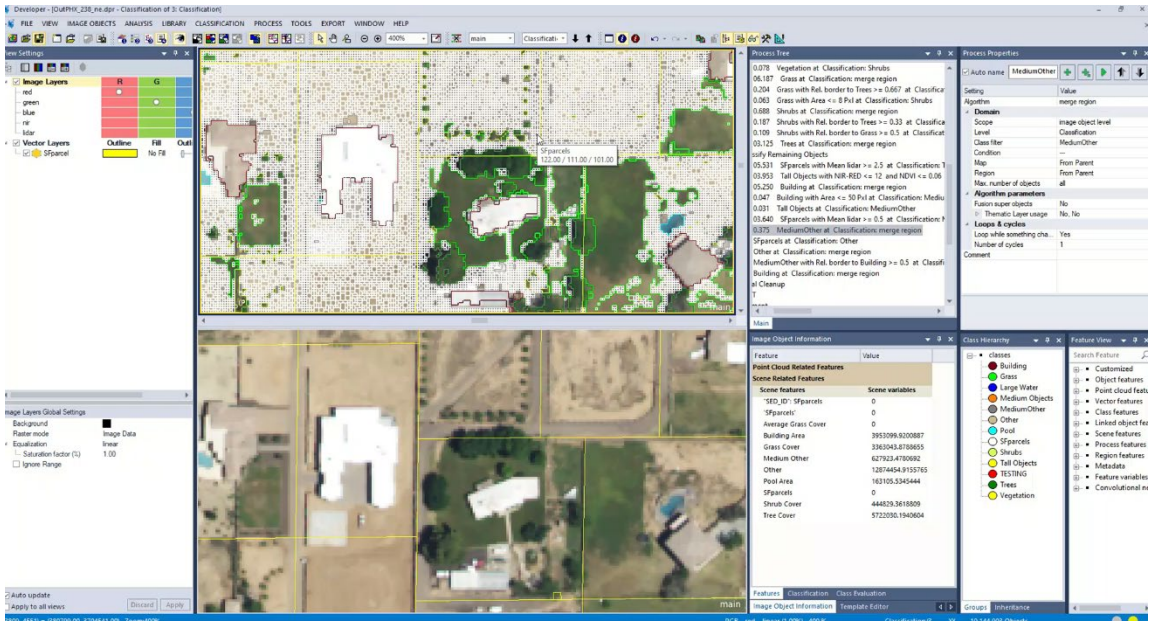
The city continues its work classifying landscapes of all Phoenix-Metro properties using Trimble eCognition and Lidar software. A complete set of 2015 aerial landscape has been coded. The anticipated completion date for the 2020 dataset is the end of the 3rd Quarter of 2026 which will allow city staff to begin comparing changes over time. The city is also monitoring for availability of 2023 LiDAR data and matching NAIP datasets; however, the city will not obtain that data until 2027, after this study has concluded. Once the 2023 dataset is received, we start the process again with 2023 LiDAR allowing the city to compare three (3) full landscape classification datasets over a 9-year period.

The city received thousands of 2020 LiDAR files in an unusable format. Two GIS Technicians were tasked with manually converting into a usable format, namely nDSM files. Specifically, 1) convert LAZ files to LAS files, 2) convert LAS files to create DEM files, 3) convert LAS files to create DSM files, and 4) convert DEM and DSM files to create nDSM files. This work began last July 2023, with a six-month interruption, and was resumed in July 2024.

GIS Technicians were also tasked with determining which NAIP aerial set (2019 or 2021) provided better results with the 2020 LiDAR: On March 17, 2025, they reported that 2019 aerial year provides greater accuracy. This makes sense because 2020 was a very hot, dry summer in the midst of COViD during which there was massive tree canopy die off very evident in the 2021 NAIP aerials. Therefore, LiDAR was seeing canopy in 2020 that was no longer there in 2021 resulting in less accurate classification if we use that aerial year.

2020 LiDAR file conversion is now complete, and 2020 aerial landscape coding using eCognition for each quarter quad is approximately 50% complete. Our goal is to be entirely done with classification and accuracy assessment by March 2026. See **Figure 7: Aerial Landscape Coding Using eCognition Software.**

Figure 7: Aerial Landscape Coding Using eCognition Software



Task 4: Statistical Analysis/Summary Report of Total Water Use

Initiating statistical analysis and report writing is contingent upon acquisition of the following multifamily datasets and spatial layers:

- multifamily property attributes,
- dissolved parcel layer
- aerial landscape coding
- historic water consumption from each participating municipality
- planned MF development layer or list from each participating municipality, SRP "On Project" service boundary layer
- table of SRP "On Project" parcels

The cities of Avondale, Glendale, Goodyear, and Tempe have committed to participating in the study. A draft report with preliminary demographics, outline, and placeholders has been started by Phoenix staff. The draft report is currently 20 pages.

Finally, the project timeline was updated, and a portion of the timeline appears in **Figure 8: - Project Timeline Phase 3b Through 3d.** showing 2nd Quarter of 2025, Phase 3c through 1st Quarter of 2027, Phase 3e.

Figure 8: - Project Timeline Phase 3c Through 3e