



**CITY OF FLAGSTAFF**  
**WATER COMMISSION**  
May 20, 2021  
**Virtual Meeting**  
**SUMMARIZED MINUTES**

**MEMBERS PRESENT**

Ward Davis  
Ben Ruddell  
Timothy Bowers  
Malcolm Alter  
Miranda Sweet (Council Rep)

**MEMBERS ABSENT**

Elizabeth Christy

**STAFF PRESENT**

Erin Young  
Marion Lee  
Tamara Lawless  
Ed Schenk  
Lisa Deem  
Bill Case

**OTHERS PRESENT**

Ernie Marks  
Don Bills  
Jack Rathjen  
Allen Haden  
M Wasserman  
Henry Moore  
Chelbi Stromblad  
Duke MacArthur  
Mallory Rakowksi

**I. CALL TO ORDER**

Vice Chair, Ward Davis called the meeting to order at 4:07 p.m.

**II. APPROVAL OF MINUTES – April 15, 2021**

Moved by Timothy Bowers and seconded by Malcolm Alter to approve the meeting minutes of April 15, 2021. Motion carried unanimously

**III. PUBLIC PARTICIPATION –**

Don Bills, Retired USGS Hydrologist & AZ Hydrological Society's Mentor Coordinator – Announced the Mentor 2021 Awardee, Mallory Rakowksi, Majoring in Environmental Engineering.

**IV. NEW BUSINESS**

**A. Water Services Water Consumption and Demand GIS -Prototype – Erin Young**

The ability to view water use data spatially affords staff and the community with a powerful tool useful for exploring water use patterns and informing decisions. Water Services contracted with EHS Support, LLC to develop the first spatial water use and water demand geographic information system (GIS) tool. Water consumption is available by meter, by neighborhood, by customer class, by zoning and Flagstaff Regional Plan place type. Water Services is required to track water demand for all vacant and developable lands within our service area. This tool allows staff to match actual water use data in many forms to inform water demand needs.

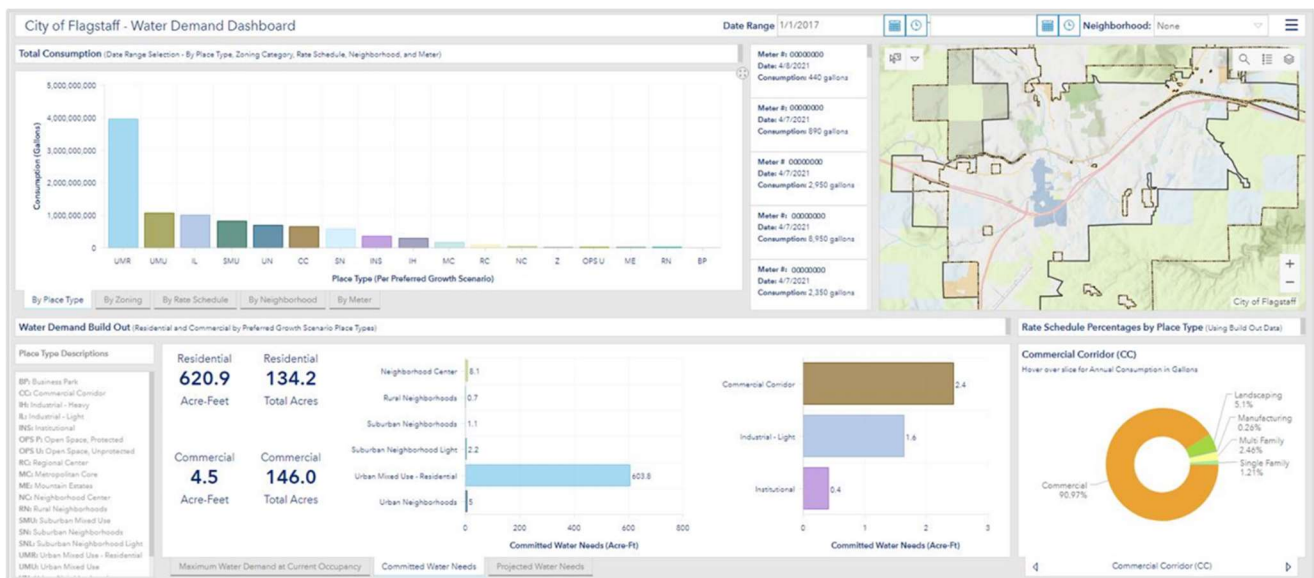
The completed version is a prototype. Staff will work with the tool over the next 6 months or so to work out the bugs and determine what additional functionality is desired. In terms of a forward facing GIS

for the community to use from the City’s website, staff are interested to hear from the Water Commission what data would be interesting to the public, to the research community.

Chelbi Stromblad, GIS Analyst provided a presentation on the Water Consumption & Water Demand Model Development Project. Numerous data were collected, received, and reviewed with the focus on water use database.

- All relevant data files are now stored within a geodatabase
    - Meter Locations
    - Meter Readings
    - Categorized Parcel Layers
    - Base Layers (Neighborhoods and Other Boundaries)
    - Water Demand Information
  - Housed on the City of Flagstaff’s Environmental Systems Research Institute (ESRI) Portal
- With the new geodatabase in place, along with the water demand information, staff are now able to develop the City of Flagstaff’s Water Demand Dashboard.

### Visualization



Ernie Marks, thanked Erin Young and the City of Flagstaff for working with EHS Support LLC.

Ward Davis added the model would be helpful for the Rate Study Consultants and if its considered officical to meet the criteria for doing evaluations of current and expected income. Erin said they do not expect to make much progress from here but it can be looked as a tool for other things.

## V. OLD BUSINESS

### A. Reclaimed Water Aquifer Seepage Study Results & Discussion – Erin Young

Water Services is conducting several projects to inform how the City elects to manage uncommitted reclaimed water. The City's Integrated Master Plan Water Policies (2014) encourages the use of renewable resources (Policy C6) through recharge and recovery of reclaimed water to the underground storage system – the regional C aquifer. Natural Channel Design was awarded a contract in May 2019 to complete an analysis of channel seepage rates and flow profiles along segments of Bow and Arrow wash, Sinclair wash, Switzer Canyon wash, and the Rio de Flag downstream of the I-40 wetlands.

Recharge and recovery occur naturally (de facto reuse) with the discharge of uncommitted reclaimed water to the Rio de Flag from wastewater treatment plants (in Flagstaff we have the Rio de Flag and Wildcat Hill Water Reclamation Plants) and subsequent pumping of groundwater wells that are located down-gradient of the discharge point. Recharge and recovery when intentional are permitted by the Arizona Department of Water Resources as a water management option. In the case of Flagstaff, a recharge permit would offset groundwater approved in the City's Designation of Adequate Water Supply.

Water Resource Management is primarily concerned with the most efficient ways to manage water supplies. For recharge and recovery, the most efficient way to prevent water loss from evaporation or evapotranspiration (ET) is to find locations where water seeps into the ground and below the phreatophyte zone (below the uptake zone of plant roots) fairly quickly. Water Services understands where a project may have multiple benefits, however, where some evaporation or ET losses are worth the benefit. The objective of this study was to compare seepage rates within three washes that intersect the City's reclaimed water distribution pipeline, to seepage rates in the Rio de Flag downgradient of the Rio de Flag Water Reclamation Plant. The information will be used by staff to present options for aquifer recharge and recovery and associated benefits of the different sites. In the grand scheme of reclaimed water management, there is still a larger question of whether aquifer recharge and recovery through groundwater wells is the preferred management methods when we think of the best and highest use of the City's uncommitted reclaimed water. Concurrent with this project is the Reclaimed Water Master Plan.

Allen Haden, Natural Channel Design presented the study results of the Aquifer Recharge Feasibility Study Infiltration Evaluation. The project stream locations are Bow & Arrow Wash, Rio de Flag, Sinclair Wash and Switzer Wash.

#### **Issues:**

- Conduct steady flow infiltration studies at 500 & 100 gpm for Bow and Arrow Wash, Sinclair Wash and Switzer Wash
- Conduct year-long fluctuating flow study at Rio de Flag I-40 plant

#### **Goals:**

- Estimate infiltration rates and permeability properties of the streambeds at the locations tested
- Determine if potential releases will have significant effects on stream bed morphology
- Determine surface flow extent given the range of test flows
- Identify natural or manmade inflection points thresholds or boundaries that control seepage rate or recharge
- Develop stage-discharge rating curve models for the test sites.

### Summary of Switzer Wash

- Apparent excess infiltration to the sanitary sewer system during the summer test, and then a
- Lack of infiltration over a very long reach during the winter test. The discharge passed the stormwater detention basin near Rt. 66 and reached the 4<sup>th</sup> Street & Butler intersection.

### Summary of Bow & Arrow Wash

- The Bow & Arrow wash study showed that it can infiltrate over 1000 gpm over a relatively short reach.
- Likely infiltration directly through limestone. Long-term potential for sinkhole enlargement
- Additionally, there was a small headcut that formed downstream of this sinkhole. Temporary repairs were made with hand placed stones

### Summary of Sinclair Wash

- The Sinclair wash study showed that it can infiltrate 500 gpm over 5700 ft and that 770 gpm would go into the I-40 wetlands and then into the Rio de Flag for an additional 2300 ft. If chosen for a 500 or even 1000 gpm sustained flow location, minor work would need to be performed to fix some bank erosion and could end up benefitting the wetlands and the Rio de Flag.

### Summary of Rio de Flag

- The Rio de Flag showed that it can regularly infiltrate up to 1000 gallons per minute over an approximate 15,000-foot reach. While evapotranspiration and evaporation at the wetlands and pond were a concern prior to this study, we have shown that the losses due to those effects is relatively small and would decrease if sustained flows could be introduced to the wash. The relatively large soil/water contact of the wetlands provides a better morphology for infiltration than the confined and steeper channel.

### Summary of Infiltration Rate

Infiltration Rate comparison between reaches (gpm/ft)

Test Location	Loss (gpm/ft)								
	Rio de Flag		Bow & Arrow Wash			Switzer Canyon		Sinclair Wash	
Test Name	Summer	Winter	250	500	770	Summer	Winter	550	770
Weir 1	0.052	0.126	0.139	0.019	0.041	0.289	0.171	0.236	0.223
Weir 2	0.089	0.068	0.270	0.341	0.473	0.175	0.219	0.079	0.06
Weir 3	0.015	0.024		0.207	0.000	0.039	0.096	0.069	0.059
Weir 4/end of flow	0.019	0.031		0.189	0.560	0.143	0.005	0.062	0.06
Weir 5							0.030	0.136	0.082
End of Flow							0.022	0.092	0.083

### Conclusion:

- This study conducted during relatively dry period with little stormwater runoff

- Stasis of infiltration rates likely provides a good relative measure of infiltration but long term rates may vary with soil conditions
- Most rapid infiltration is along Bow and Arrow Wash in association with shallow limestone bedrock
- Infiltration of the target flows is achievable in the chosen reaches
- While infiltration is apparent, recharge to aquifer is not quantified by this study
- Current model suggests that ET losses in the wetland and riparian area are a relatively small proportion of the infiltration budget
- The existing well on Rio de Flag below I 40 wetlands is a valuable tool for a long-term study if this area is utilized for recharge

Ward Davis asked Erin how the study fits into the big story since we do not know where seepage goes. Erin said this is just one piece of the study and staff can look at different methods to find this out. The objective of this study was to compare seepage rates within three washes that intersect the City's reclaimed water distribution pipeline, to seepage rates in the Rio de Flag downgradient of the Rio de Flag Water Reclamation Plant. This information will be used to present options for aquifer recharge and recovery and associated benefits of the different sites. The next step is prioritizing what the options are through the Water Commission and City Council on the use of reclaimed water. Staff will not invest any more funds in the recharge and recovery option. Don Bills added the I-40 Well was drilled near Rio de Flag Wastewater Plant and there is borehole video on the well drilling. Added that the video showed direct infiltration or direct streaming of water through fractures. There is also a small sink hole in the area.

## **VI. INFORMATIONAL ITEMS TO/FROM THE CHAIR, COMMISSION OR STAFF**

### **A. Annual Report to the Water Commission – Overview – Lisa Deem**

Lisa highlighted a few things that will be in the Report to the Water Commission. The report should be available next month.

## **VII. ADJOURNMENT**

Timothy Bowers moved to adjourned at 5:40 p.m. and seconded by Ward Davis.