STUDY SESSION
Rain Monitoring Systems
CITY HALL, Fifth Floor
6801 Delmar Blvd., University City, Missouri 63130
Monday, October 13, 2025
6:00 p.m.

AGENDA

1. **MEETING CALLED TO ORDER**

At the Study Session of the City Council of University City held on Monday, October 13, 2025, Mayor Terry Crow called the meeting to order at 6:00 p.m.

In addition to the Mayor, the following members of Council were present:
Councilmember John Tieman
Councilmember Steven McMahon
Councilmember Lisa Brenner
Councilmember Dennis Fuller
Councilmember Bwayne Smotherson
Councilmember Stacy Clay; *(excused)*

Also in attendance were City Manager Gregory Rose; City Attorney John F. Mulligan, Jr.; Todd Thompson, Chair of the Stormwater Commission, and Phil Eastin, Commission member.

2. **CHANGES TO REGULAR AGENDA**

None

3. **PRESENTATION REGARDING RAIN MONITORING SYSTEMS**

Mr. Rose stated that tonight we have the pleasure of hearing from the Stormwater Commission, who recently provided Council and the community with greater insights into their Rain Monitoring System.

Mayor Crow thanked Commissioners Eastin and Thompson for coming this evening.

Mr. Thompson stated that he is Chairman of the Stormwater Commission, and Mr. Eastin, a member of the Commission, will be making this presentation.

Commissioner Eastin stated that as a newbie on the Commission, he has the honor of presenting this request for funding for the Stormwater Monitoring Systems.

Overview

While the handout provided to Council has some neat pictures of systems installed by the Commission, the gist of this presentation is that since the 2015 flood, the Commission has been working to provide granular information that would make monitoring and warnings more accessible to the public.

In 2019, the Commission installed its first level sensor in the river, and today, they have nine operating sensors.

Rain Gauges
In 2020, the Commission installed three sets of rain gauges in the river to measure rainfall and river levels. Dr. Bob Criss developed algorithms that allowed the Commission to use those measurements to calculate with a high level of accuracy what the predictive water or flood levels are in the River des Peres.

New Capabilities
Over the last year, the Commission has installed radar level sensors in the river that correlate with the rain gauges and provide online data that is collected every five minutes, and when the rate of rainfall increases to an inch per hour, the data collection rate increases to every minute. This data is then fed into an algorithm that predicts the water levels of the river.

Predicted Water Levels
Graphs were developed for different events that occurred in April 2024, July 2024, November 2024, and July 2025, to show the predictive and actual levels of rain collected in the data system. The red line depicted on the April 2024 graph represents the predicted level, and the blue line represents the observed level. What it illustrates is that the Commission was able to predict the river level with 95% accuracy to show when it is going to flood with a 30-minute warning system. To put that in perspective, 97% of the National Weather Service tornado warnings have an approximate 16-minute warning time, and the Commission has developed 95% accuracy for flooding with a 30-minute warning time. This system will correlate with the National Weather Service's Community Monitoring Systems, which impacts the federal insurance for U City residents in the floodplain.

Today, all of this data is being managed by one person, Dr. Criss, who is kind of the Commission's walking, talking computer. Therefore, it is important to move forward with the automation of this system.

Request for Funding
The Commission has developed two Phases to address the identified shortcomings and complete these needed improvements.

Phase I
Phase I runs on two databases called W2 Data Live; a cellular database that the Commission pays an annual fee to maintain. This database includes the Fondriest instrumentation, the rain gauges, and the radar level sensors. When the Commission attempted to install cameras, they learned that Fondriest did not have cameras and that they would not allow the Commission to put its own camera system in place. As a result, the Commission started working with a local IoT (Internet of Things) company called iNeighborhoods, which has a 4G IoT system located at their office in the Greek Temple, one at the high school that looks down on the river, one at Brittany Woods, and one on Olive near Lindbergh. This allowed the Commission to establish a communication system.

The next step is to have iNeighborhoods convert the Fondriest data and all of the algorithms being managed by Dr. Criss onto their system and combine them into one software package, so the Commission will have its own private network that continuously operates to collect data. The cost to do this is $7,950; $7,000 to iNeighborhoods, and a $950 license fee for iNeighborhoods to access the W2 Data Live information.

Phase I Detailed Breakdown

a) Use the WQ Data LIVE Data API to port data from the SWC Fondriest devices to the
b) iNeighborhoods platform.
c) Use the WQ Data LIVE Data API to port data from the adjacent USGS rain gauges to the iNeighborhoods platform.
d) Change from 5-minute to 1-minute sampling rate if > SWC rain rate.
e) Change from 1-minute to 5-minute sampling rate if < SWC rain rate.
f) Data would be displayed in numerical or graphical format.
g) Additional yearly cost for the WQ Data LIVE Data API - $ 950.
h) iNeighborhoods development cost ~ $ 7K.

Phase II

Phase II will consist of automating the 5-minute intervals so that when there's 1 inch of rainfall in the river basin, data will start being collected every 1-minute. Conversely, when the rain rates go away, it will revert to the 5-minute interval. The rationale for this concept is that you can only collect and manage so much data because there is a cost associated with storing it. Currently, the Commission is spending about $3,000 a year, or $55.00 a month, to store nine pieces of equipment. With the implementation of Phase II, half of this amount will go to the Fondriest System, and the other half will go to iNeighborhoods to automate the full notification of flood warnings. With 95% accuracy, the Commission's predictability rate is a little high, but they believe that when it comes to flood levels, it's better to be a little over-predictive than under-predictive.

Even though no funding is being requested today, the final piece is the Red Alert. The goal is to take any human element out of the equation by establishing a fully automated system that sends out river-weather data alerts directly to cell phones or other notifications to the public and all interested parties.

Phase II Detailed Breakdown

a) Implement the Bob Criss flood prediction algorithm.
b) Data would be displayed in a graphical format.
c) Implement yellow alert status if > SWC yellow alert rain rate.
d) Implement red alert status according to the Criss prediction algorithm.
e) iNeighborhoods development cost ~ $ 7K

Commissioner Eastin stated the cost to complete these improvements is approximately $20,000.

- $7,000 for Phase I development - one-time cost,
- $7,000 for Phase II development - one-time cost, and
- $6,470 recurring annual fees for the Fondriest system and iNeighborhoods' plan

Councilmember Smotherson posed the following questions to Commissioner Eastin:

Q. How many active cameras does the Commission have?

A. *We have three active cameras, and a fourth one is owned by a private citizen that we also have access to.*

Q. Are all of these cameras currently active?

A. *Yes.*

Q. Are they available to the City?
A. *Yes, they are.*
Q. How can the community view these cameras?
A. *We have a website where the rain gauge information, the river level sensor information, and pictures are available to the public.*
Q. Is that also available on the City's website?
A. *I don't think so. I think it's only available on the Stormwater Commission's website.*
Q. Once this funding is approved, how soon will it be made available to place on the City's website?
A. *That would be up to the City.*

Mr. Rose stated that since the Commission is using public funds, there has to be appropriate oversight to ensure that the public, as well as the Fire Department, has access. He then asked Commissioner Eastin if he knew who the Fire Department should work with to gain access to their system? Commissioner Eastin stated that this proposal is based on providing the Fire Chief with the information he needs to access the system. But currently, the primary contact would be Bob Criss, because he's constantly managing the City's rainwater and river levels. He stated the ultimate goal is to have the Fire Chief of his staff activate a code yellow warning to generate awareness about an impending flood, and a code red warning for danger; similar to the National Weather Service's tornado warnings.

Mr. Rose stated that he would follow up on who the lead person will be and provide Council with the Commission's website address. He stated that the Fire Department already oversees the Commission's Code Red Application, so additional funding may not be needed for that type of system. Hopefully, they will be able to incorporate what they are currently doing with the Fire Department.

Councilmember Tieman stated it has been his honor to work with the Stormwater Task Force and Commission, and he would like to point out a couple of things to reinforce what has already been said. If you look at the graphs, what you'll see is that the algorithms they have developed that can track and predict the possibility of a flood are almost identical to the actual outcomes, which should be taken into account. This is not overly idealistic, pie-in-the-sky environmentalism; this is environmentalism that can save lives. Therefore, he thinks what they are asking for is cheap at any price. Councilmember Tieman thanked all of the scientists and engineers for allowing an old schoolteacher and poet to sit alongside them and observe this extraordinary work.

Councilmember Fuller stated that he is one of the older liaisons and sitting down with these guys was always a great educational experience. Eric Stein was also an early member of this Commission who helped initiate all of this instrumentation with Bob Criss. Unfortunately, he lost his battle about a year ago, but he would like to recognize him again tonight. Councilmember Fuller then asked Mr. Rose what needs to happen next to get this project going? Mr. Rose stated that the budget process will kick off in January, so the City's liaison for this Commission will work with them to ensure that a proposed budget is created for Council's consideration.

Councilmember Brenner stated that what we have seen tonight is a group of dedicated community members working for free who have developed this amazing system. This does not happen everywhere, so I think we all need to rejoice about how well our community works together.

Mayor Crow posed the following questions to Commissioner Eastin:
Q. I get the accuracy, and I certainly get the hours that the Commission has put in on this system. But is it correct that as we sit here today, everything that happens goes through Dr. Criss, and then it kind of stops until he communicates with the Fire Department?
A. *Dr. Criss monitors the rates of rain and then kicks the algorithms in. But the timing of the instrumentation is always available to the Fire Department, whether it's at a 5-minute steady state or a 1-minute conditional warning.*
Q. So, right now, there is no point in time where Dr. Criss might be at dinner while we are waiting for something to happen?
A. *No, this information is always available.*

Mayor Crow stated that while he appreciates the budget process, as he is looking at his colleagues and realizes what we have all been through as a community, he's not certain that we necessarily need to wait until June for the entire budget process to be completed for such a small request. So, as long as this meets the City's criteria for contracts, he thinks a signature authority or Council authorizing a supplemental request would be warranted. He stated we've all seen what has happened to our neighbors, friends, and residents, so we may want to consider moving this forward.

Councilmember Smotherson stated he thinks the public's ability to access the visuals generated by these cameras is a critical first step. Commissioner Eastin stated that this information is already available. Councilmember Smotherson stated that the next step would be the public's ability to access that information. Commissioner Eastin stated as engineers and scientists, they look at the quantitative data; the numbers, because that's what creates their picture. However, they recognized that numbers would be hard for the Fire Chief to discern, which is why the cameras; that provide qualitative data, were put in place. So, this data has been functional and available since the beginning of this year.

Commissioner Eastin stated he has been working in the area of water equipment for a long time and has spent a lot of time installing systems. But with these new technologies, particularly the microprocessors and computers they are dealing with, seldom will you find equipment that you can plug in, turn on, and operate as expected.
So, there are always a lot of tweaks that the Commission has been working on all year. They started installing the level sensors last Thanksgiving, completed that task in April, and installed all of the cameras by June of this year. So now they've got two systems operating and are really anxious to put this all into one bucket because it is going to make everybody's life easier. He stated that their system is not built to the standards of the National Weather Service's Community Credit System, but it will have an impact on flood insurance for the residents of U City. So, it's a big ask, that may not happen, but their goal is to have this up and running by the end of the year.

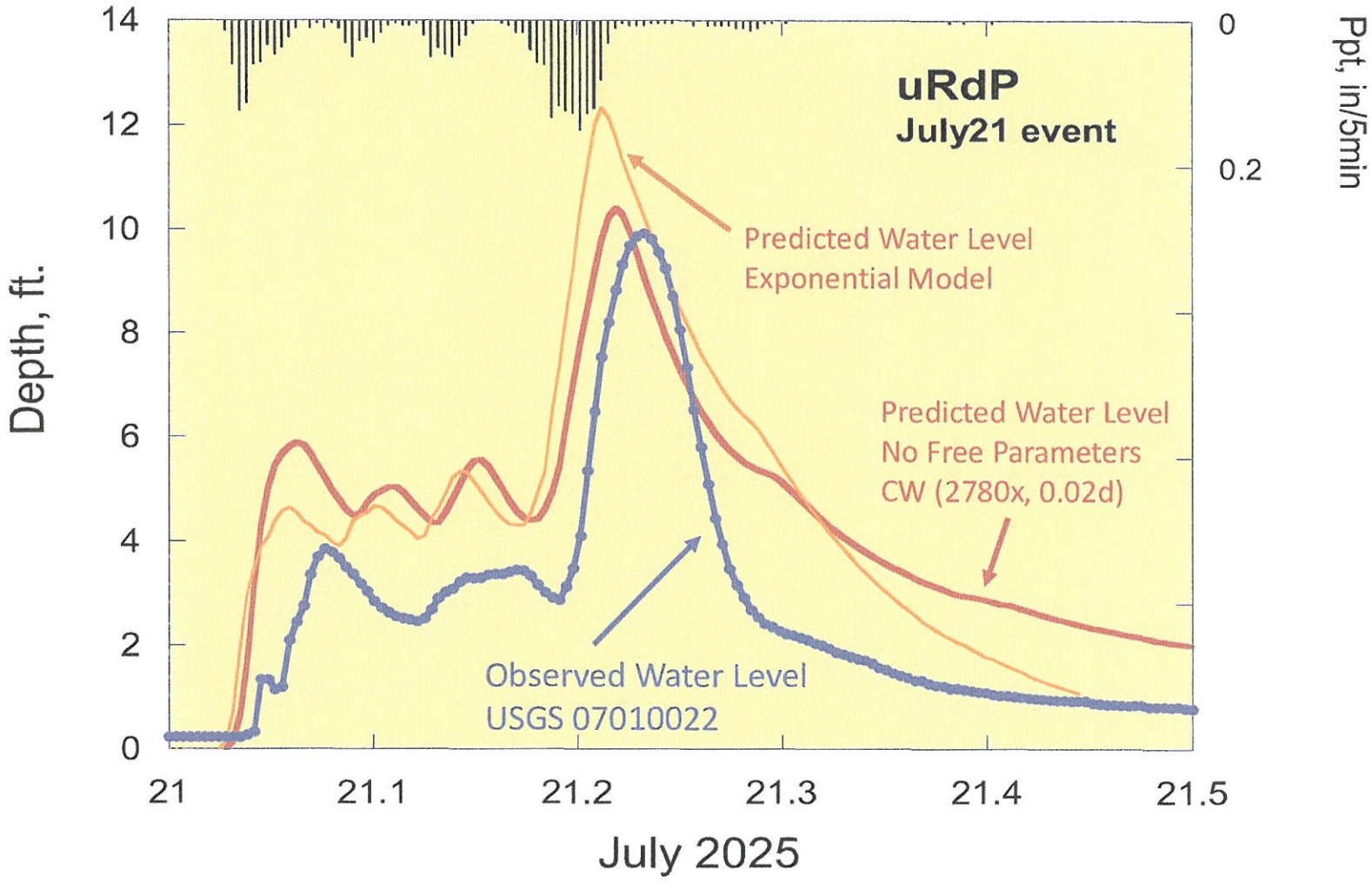
Councilmember Tieman stated that if there is any way to expedite funding for this, he would be more than happy to join in because he thinks this is a life-saving measure.

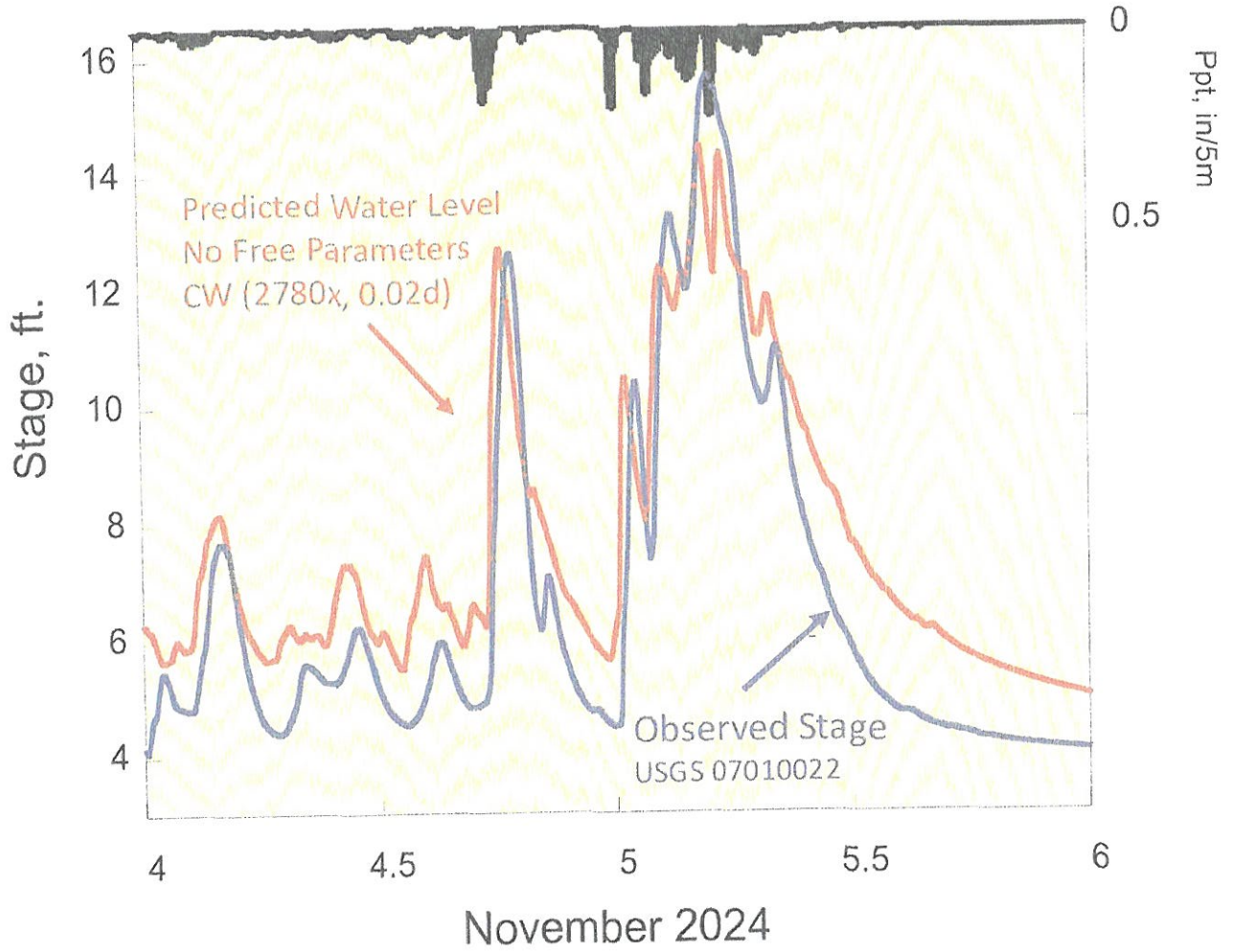
On behalf of our City Clerk, Mayor Crow stated that he would like to take this opportunity to announce that there are several commissions that don't meet very often, which require an engineer and an architect. So, if you know anybody who would like to serve their community, your recommendations would be greatly appreciated.

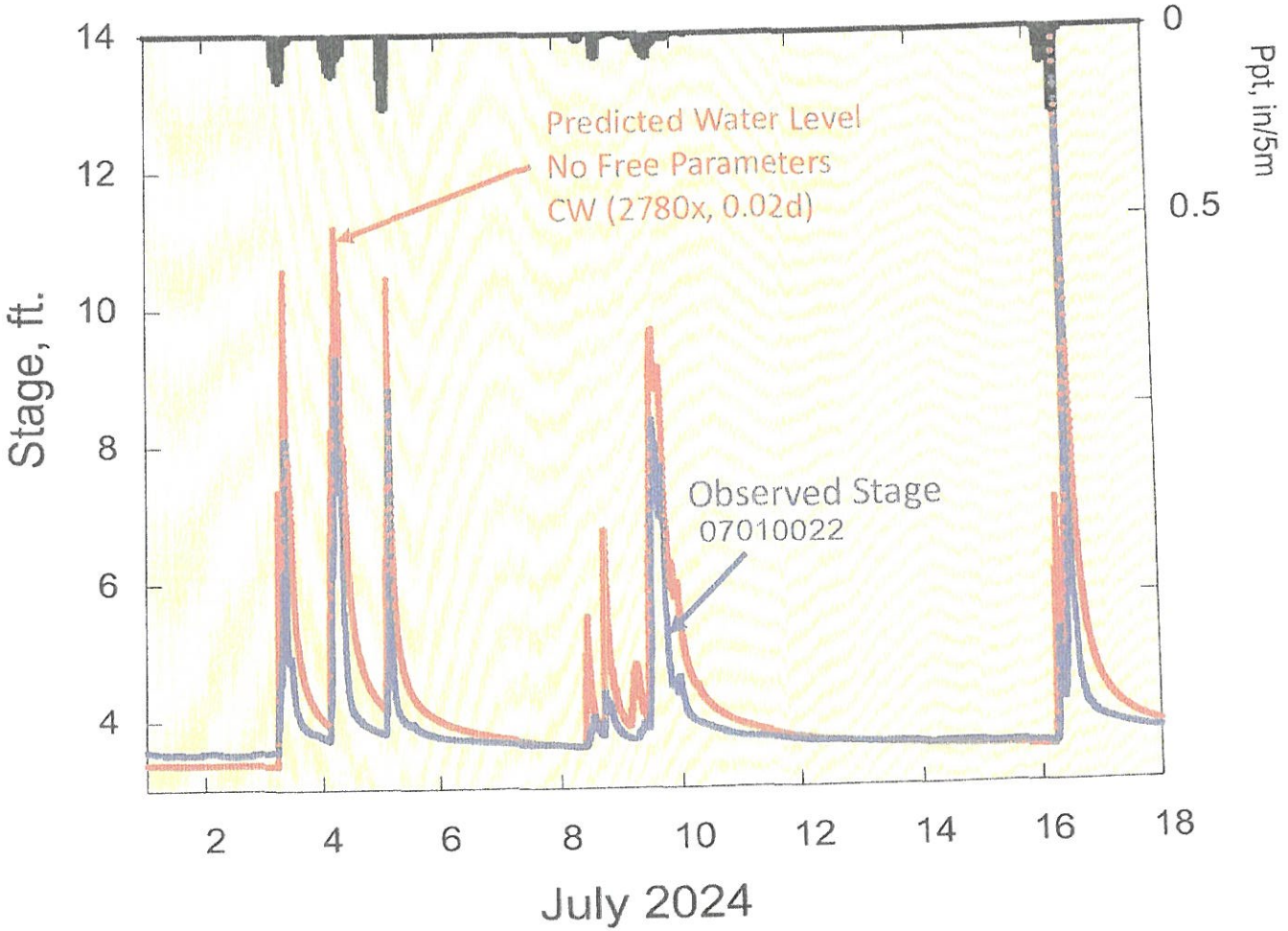
4. ADJOURNMENT

Mayor Crow stated that on behalf of all of his colleagues, he would like to express their appreciation for all of the work this Commission has done. As Councilmember Brenner noted, we truly do have a wealth of talent and knowledge in this community, so thank you very much. Mayor Crow adjourned the Study Session at 6:25 p.m.

LaRette Reese,
City Clerk, MRCC


uRdP
July21 event
Predicted Water Level
Exponential Model
Predicted Water Level
No Free Parameters
CW (2780x, 0.02d)
Observed Water Level
USGS 07010022
Depth, ft.
Ppt, in/5min
July 2025
14
12
10
8
6
4
2
0
0
0.2
21
21.1
21.2
21.3
21.4
21.5


Predicted Water Level
No Free Parameters
CW (2780x, 0.02d)
Observed Stage
USGS 07010022
Stage, ft.
16
14
12
10
8
6
4
0
0.5
Ppt, in/5m
4
4.5
5
5.5
6
November 2024


Predicted Water Level
No Free Parameters
CW (2780x, 0.02d)
Observed Stage
07010022
Stage, ft.
Ppt, in/5m
July 2024
14
12
10
8
6
4
0
0.5
2
4
6
8
10
12
14
16
18