ATTACHMENT M: PUBLIC PROCESS AND COMMENTS AFTER JUNE 2019

PUBLIC COMMENTS AND CONCERNS

Since the City Council decision on March 7, 2019, SLCPU has been working with Wilkinson Ferrari on public engagement. The following meetings took place:

1. October 22, 2019 4th Avenue Well First Facilitated Working Group Meeting
2. December 2, 2019 4th Avenue Well Second Facilitated Working Group Meeting
3. February 27, 2020 4th Avenue Well Third Facilitated Working Group Meeting
4. March 16, 2020 4th Avenue Well Virtual Facilitated Working Group Meeting
5. March 30, 2020 4th Avenue Well Virtual Community Open House

For the full meeting summaries, please see Attachment N. All public comments received after June 2019 are included in this attachment. See Attachment N for public comments received prior to June 2019.

From: Lisa Livingston
To: Cindy Gubler
Cc: Briefer, Laura; [redacted]
Subject: (EXTERNAL) Re: Reply To Comments
Date: Monday, April 13, 2020 8:07:06 PM

Concerning the drinking fountain- the problem is not that people can get a drink. The problem is that it will be used as a bathing station. I have seen it at the drinking fountain by Memorial House and also in the creek in the park that the building will be located. Please do not put a drinking fountain in.
Lisa Livingston

On Mon, Apr 13, 2020 at 7:27 PM Cindy Gubler <[redacted]> wrote:

> All,
>
> After sending out my last two emails, I had a few people respond and provide input and ask questions. I've included what was emailed to me at the end of this memo so all of you can see what correspondence I have received. Based on the emails received and where we are in the process, I want to share information on the two things that were brought up – the brick color and noise mitigation. Again, thank you all for your time and interest in the project.
>
> In regards to the brick color, residents during the process have voiced a range of opinions about the brick color that should be used on the building. Some have said they like red, others said they like Ottinger Hall's brick color, and others have said they like buff or colors found in the park area. As color is a matter of personal preference, the stakeholders may never completely agree on color choice. Therefore, given this range of input, CRSA has recommended golden buff brick be used with dark gray accents. CRSA believes it is the best design option because aesthetically it looks good in a variety of seasons, it is reflective of the brick found in the area and the materials used in the park area, and it will make the building appear smaller and blend into the area. SLCDPU has listened to all the input received by residents including the recent emails, and have decided to continue moving forward with the golden buff brick and CRSA's recommendation.
>
> In regards to sound mitigation, the architects at CRSA and engineers at Bowen Collins who specialize in this type of work have developed a mitigation approach for the sound of the pump house. They know the project must meet the County's regulation for noise, which is to be no more than 50 decibels at the property line, but are working to get it as low as possible and believe that 30 decibels might be obtainable. The building will have a brick exterior, a cavity of air that is also a sound insulator, an insulation layer, and then grouted CMU concrete blocks for a total wall thickness of approximately 15 5/8 thick. Each of these layers reduce the noise coming from the building. Based on their professional experience and judgement and modeling of the design, CRSA and Bowen Collins have determined that it is a better approach to mitigate noise than to build a 12-inch plus concrete wall as suggested by one of the residents. The building also has been designed with no windows. Instead brick shapes and patterns that represent windows are part of the building design. Another element of the noise mitigation approach, is that during normal day-to-day operations, workers will enter the building into the room that does not contain the motor and then enter the pump room through an interior door, thus this will mitigate and help prevent noise from escaping. The doors are being selected based on their sound mitigation properties and sound modeling. In addition to acoustical louvers that will bring air into and out of the building, vented baffles are being designed and selected to reduce the noise coming from the vents. Other sound mitigation elements being considered, include sound boots, lined ductwork, geometry of

the duct work, and sound absorptive materials all which can reduce sound transmission. Currently, sound mitigation elements are approximately at 75 percent design. CRSA and Bowen Collins will continue working on the sound mitigation design (specifically baffeled louvers and vents) to reduce the decibel levels as far below 50 as possible. Once the building is constructed and is operating, the noise levels will be tested. At this point, the engineering team will determine if additional fine tuning is needed and will have appropriate engineering staff to assist. As modeling and planning may not capture the building as it will actually operate on its specific site this final step has been contemplated.

Please let me know if you have any additional questions for SLCDPU, CRSA or Bowen Collins. SLCDPU is planning to be on the Historic Landmark Commission's (HLC) agenda in May and does not plan to hold additional stakeholder meetings prior to the HLC. Please provide any further comments to me or to the HLC in May. I'll let you know more details about this meeting once it is confirmed.

Sincerely,

Cindy Gubler

RECENT RESIDENT EMAILS RECEIVED

Shane Franz
Mon 4/13/2020 12:12 PM

Craig, is this the building you are referring to?

It has been painted yellow but you can see the original brick on the sides. I would call the brick an earth tone cinnamon- this has enough earth tone to be okay with me but it will sure stand out. There is indeed "modern" yellow brick and I'm concerned that we don't get that.

I had an interesting conversation with an architect relative and he said that the building should disappear and retain or even add to park users. He said the design proposed is about 150 years old. He was concerned that it will feel like a big wall. He would like to see it sunk 4' and reclaim the space above for the park. Trellises and greens could help the wall problem.

I asked about including a place to get a drink and he thought that was a great idea. I shared the neighbors concern for homeless people having a drink and he said that water is the basis for life- should we really be using that as a weapon?

Anyway- food for conversation.

Thank you,
Shane franz

Shane Franz
Mon 4/13/2020 11:59 AM

Thank you very much for the detailed reply Craig. I do indeed appreciate that. I'll look at the details shortly and let's keep in touch. Thank you, Shane.

Craig Ogan
On Apr 13, 2020, at 11:22 AM

Thank you, Shane, for including me in the letter you sent to Cindy Gubler requesting a meeting of the "advisory public engagement group" about sound engineering and design on the 4th Avenue & Canyon Rd water treatment plants.

Your concerns about sound should be addressed by SLC DPU before they take this to the City Council, as it was the Council who mandated "Smaller, Safer and Quieter" design. They received your note and should respond, somehow, to you.

This issue of "sound" therefore should be specifically petitioned to the City Council. The Historic Landmarks Commission, by their admission, have nothing to say about engineering. So I suggest making sure your letter gets to the honorable Christopher Wharton and to SLC Council Staff to get that question asked of SLC DPU.

The brick and other accouterments of the building are legitimate issues for SLC Historic Landmarks Commission. I suggest you make sure you get something in writing to Kelsey Lindquist in SLC Planning, who prepares the document package for HLC members and be prepared to make a comment at the meeting (whether in person or cyber is up in the air right now).

I'm agnostic about the brick color and other things you mention as I have no background in this area. I do know, some share your objection while others do not. The choice of "yellow" is probably predicated on the study of the palette used in the redesign of City Creek Parks and Memory Grove after the flood and tornado. This was discussed in meetings two and three of the public engagement group. The study indicated that gray, beige, light brown and sand stone tones predominate.

Incidentally, there are yellow brick finished residences in the canyon, three of which are north of your Rental Property on Canyon Road.

Thanks for your involvement. Let me know of any interaction on the sound and brick issues.

I have copied Evan Smith, Dave Jonsson and Linea Noyes as they responded to your note; Cindy Cromer as she was the author of the palette study and Cindy Gubler so she can facilitate response on the sound issue either directly to you or in a meeting. If she chooses a meeting with the group, I will attend.

Craig S. Ogan
272 Canyon Road
[redacted]

NOTE: Craig Ogan and Cindy Gubler had a phone conversation. Cindy wanted to find out if Craig had taken a poll of what brick colors the residents.

David Garcia
Mon 4/13/2020 10:48 AM

Hi Cindy,

There was a page in the March 30 Virtual Open House presentation which showed several variations of design 3A.

I thought any of the designs on that page were excellent.

The following pages showed three views of one variation of 3A with, to my eye, an ugly yellow-tone color.
Anything other than yellow! It's dingy. It looks bad from Canyon Road, from 4th Avenue, and in the winter.

Any other voices regarding choice of color?

David Garcia

Linnea Noyes
Sat 4/11/2020 2:03 PM

I agree with Evans' comments and appreciate the expertise behind Shane's concerns. I sent in comments about the brick and design after the last virtual meeting, but would appreciate being able to see a review of everyone's comments - I keep wondering if I somehow missed that? - as well as how SLPU intends to address the comments, concerns, and recommendations of the neighborhood.

LInnea

Evan Smith
Sat 4/11/2020 11:52 AM

I too believe that if there are enough people with concerns we should have the chance to reconvene and discuss the final design.

Personally, I think the architects have listened to us and our concerns about the aethetics of the building for the most part, but I too am flummoxed at how they arrived at the the decision to create a **yellow** pump house.

Shane Franz
On Apr 10, 2020

Cindy,

I am requesting another meeting and that the design be reviewed and modified.

I am concerned that sound mitigation has not been considered as it should be. In fact, there is no mention of it in the document yet this is one of the residents top three concerns (small, silent, appropriate.)

The building structure needs to be 12"+ thick solid reinforced concrete with a concrete top of similar thickness, Windows need to be eliminated as they provide for high sound transfer- we need it silent not "soft glow emanating". Doors need to be solid and have substantial mass with no glass. (Again, glass provides for substantial sound transfer.). Interior room around the motor needs to be a separate room with an additional set of interior doors to dampen sound. Need to see detailed engineering design of louvers and baffle system as this is a source of high sound transfer as well.

Need to see interior plan. Several chapters in the text "master handbook of acoustics, 6th ed, by Everest and Pohlmann deal with this (chapter 16+). Essentially this is the same problem as building a quiet recording studio to keep sound out, except in this case we wish to contain the sound. Has the building and design been analyzed by an acoustic engineer? Can we get those results? Room size and shape is critical as sound modes can be accentuated, and if not properly designed the building can turn into a cavity resonator amplifying certain frequencies. The motor is a broad spectrum noise generator and keeping this noise contained is a very difficult problem. This is like trying to contain the sound of diesel locomotive, except unlike a locomotive that will leave,

this sound is present day and night. It can't be designed lightly.

Separately, concerned that modern materials and selection has been misinterpreted. Want the modern elements (70s lighting, modern doors, projected aluminum coverings over doors and windows, and 80s brick design stack) out. We do not need soft light emanating or a feel of human inhabitance- we DO want ZERO sound emissions. (I do appreciate what the architect is trying to do with the interior light, but not at the expense of noise emission through those windows and doors.) The design goal is timeless. This is not a place to make an architectural statement. (Projected aluminum coverings have been so over used recently that in 5 years people will say: "that's so 2015., what Starbucks did they steal those from?") The building should meld with the surroundings and not appear out of place according to documents regarding historical preservation I have received from SLC planning. The design goal should be to look at the building and NOT have architectural elements reveal when it was built, as it is in such harmony with the surroundings.

Neighbors have expressed to me the need to see more detail and more discussion on brick color choices. (Can't think of a yellow brick building anywhere in the area- most brick is sandstone to red). I wholeheartedly agree with the neighbors we need to examine options.

When could we get a copy of the interior plan? Similarly for the acoustic engineering study?

While we have made some wonderful progress, I do NOT believe the design and plan are to a point where they can be put fourth to the historical commission. Please remember, this is outside our front door and in our dear public park- if it were outside your home wouldn't you want the same consideration?

Look forward to our follow up meeting.

Sincerely,

Shane Franz
212 N Canyon Road
[redacted]
Sent from my iPhone

Cindy Cromer
Fri 4/3/2020 5:15 PM

Cindy-Thanks for the speedy reply. The color of the brick makes a huge difference to me because the building cannot be unobtrusive if it is red. The only strong color ever on the island at any time is green. Mostly, the island is grey and brown. We have never seen the dull winter landscape in a rendering, only the snow scene, which is not typical. So I will write a rant about how there is not a single red brick IN the park space from 2nd Avenue to the end of the Freedom Trail, and actually beyond that.

Craig wants to send out an image of the design going forward. I would have to say that it is some color of brick with the design in 3A. It is NOT decided that the yellow brick is the preferred option apparently. I will listen to the YouTube video this weekend to see if I can hear something definitive. The pdf just indicates to me that the issue of color has not been decided. I'll be back in touch on Monday.

Sincerely, cindy

NOTE: Cindy Cromer and Cindy Gubler had a phone conversation between these two emails. Cindy Cromer was confirming what 3A brick color option was going forward.

Cindy Cromer
Wed 4/1/2020 5:15 PM

Cindy – I was able to see the presentation on Monday but could not participate in the questions. I typed questions but they apparently did not show up at the other end. I am not on Facebook. I have used Zoom and Webex successfully in recent weeks, but obviously needed more instruction on Facebook for a group.

I am disappointed that SLCPU is moving forward with a material which does not occur anywhere in the park spaces....red brick and is out of sync with the colors on the 4th Avenue islands much of the year. We saw a snow scene at the open house. That is not what the park looks like most of the time between November and the end of March. I will craft the questions that I couldn't get into the conversation and submit them to the larger group. One of them had to do with budget adjustments from Covid-19 and I received Laura's thorough answer to that question.

So there is another message coming. I just wanted you to know that I had difficulty with Facebook as a way to gather. Zoom and Webex seem to have limits on how many people can participate which would certainly be contrary to the meaning of an open house.

Sincerely, cindy c.

Cindy Cromer
Fri 4/3/2020 7:58 AM

Holly and Cindy G. – As Cindy already knows, I flunked Facebook for the Open House. I could hear and see the presentations but couldn't participate in the Q and A. In the process of trying to summarize the meeting on 3/30, we've come up with a discrepancy about the proposed materials moving forward. Cindy's message indicates 3A, but 3A is shown in red brick in the 3/16 materials and in both red and yellow brick for the open house on 3/30. I can't find any text committing to one color over the other. (Maps and drawings are notoriously vulnerable to different interpretations.)

Can you clarify more precisely which materials will be used in 3A moving forward? Sincerely, cindy

Linnea Noyes
Wed 4/1/2020 5:06 PM

Cindy,

These are my comments in response to the latest renditions of the pump house:

1. I like the overall building design and use of rock on the wall..

2. We want the building to blend in, and I believe the gold would do the opposite.I would much prefer to see the brick used be more like Ottinger Hall. The soft reds and grays of Ottinger would be a nice middle ground.

3. I do not like the 'grids' above the windows and doors. Again, something more neutral and less eye catching please.

4. There is a lovely bridge in the park between 3rd and 4th Avenue that is worth considering for its design elements: It is mainly stucco, with stone pillars, sandstone tops on the pillars, and steel rails across the top of the bridge. I believe a stucco building with similar accent elements could also

work.

Respectfully,

Linnea S Noyes

Jill Van Langeveld
Wed 4/1/2020 10:05 PM

Thank you, Cindy, for sharing the virtual meeting particularly for people like me. I kicked myself because I remembered at noon after it was all over. Either emails or virtual meetings are fine with me just so we continue the dialogue. If you plan another virtual meeting I will be sure to set an alarm on my phone so I won't miss it again. Appreciate the Department for taking this time to bring in the neighbors who are so affected by this project and really listening to them. I've been really impressed.

Thank you again (I'm a broken record)
Jill

Lindquist, Kelsey

From: Cindy Gubler <cindy@wfandco.com>
Sent: Wednesday, April 29, 2020 4:20 PM
To: Briefer, Laura; Stewart, Jesse; Wagner, Dawn; Kirk Bagley; Mullen, Holly; Lindquist, Kelsey
Subject: (EXTERNAL) Fw: Public Hearing, Design, 4th Ave & Canyon Rd Water Treatment Plant, announced - Median Parkway Policy
Attachments: 20200429ResidentialGuidelinesMmedianParkways.PNG

From: Kurt A. Fisher [redacted]
Sent: Wednesday, April 29, 2020 4:01 PM
To: Craig Ogan; Cindy Gubler
Subject: Re: Public Hearing, Design, 4th Ave & Canyon Rd Water Treatment Plant, announced - Median Parkway Policy

Craig and Ms. Gubler, I only anticipate filing a motion for an exparte emergency order from the HLC over the weekend requiring the Planning Department to revise its evaluation criteria by Wednesday before the hearing. While I do not plan to oppose the application, I made it clear in the November meeting (the P and Z Department Officer and Planner Lindquist were present) that I would appeal any HLC order based on evaluation criteria that does not include the Planning and Zoning Guidance that prohibits above ground structures City median parkways. I did mean what I said, but I doubt they or WFC took it seriously. This has also been covered in my prior letters dated June 19 and December 4, 2019 previously sent to P and Z and the DPU. The City Residential Design Guidelines for Historic Districts provide, in part:

"Landscaped Medians or Parkways. Parkway are large grassed or treed medians that line the center of a street, such as along 600 East in Central City, and on 1200 East and 200 South in the University district. They provide a unique historical landscape amenity and are often used as recreational or leisure spaces. They markedly enhance and unify the character of both the street and that part of the district. _Where they are found, parkways add a unique character to the streetscape, and consequently should remain._ Where they have been removed, consider their reinstatement. (id at Part II, Design Guidelines, p. 1:10, italic emphasis added)."

The quotation appears at folio page 78 of the "City Residential Design Guidelines in Historic Districts". A screen capture of the quoted material is attached. "A Preservation Handbook for Historic Residential Properties and Districts in Salt Lake City" (accessed June 19, 2019) url: http://www.slcdocs.com/historicpreservation/GuideRes/ResidentialGuidelines.pdf

.

I expect that this "keep median parkways unchanged" criteria will be omitted by P and Z as they have in all prior versions of the evaluation grid.

This is not intended as delay or oppose the current version of the project, but to advocate that the HLC should include in any order that this is a one-off exception that with no precedential value with respect to any future project in any City median parkway. I want to stress again that if that exception is not included by express language in the final HLC order, I will appeal the order. There is a four to six months of delay in the timeline since June 2019 that is solely attributable to the DPU. And to paraphrase Ms. Karras and the DPU from the October 2019 meeting regarding the DPU's no-negotiation policy, "It is my policy to not negotiate on this matter." The only other thing that I am looking at is whether the lighting design in the final filed application is ambiguously defined or appears excessive. Best Regards - Kurt

> As you probably know your written comment will still be in the permanent
> record, just not available to the commissions before the meeting.
>
> My suggestion for that circumstance is to write a long response for the
> record then create a 2 minute comment from the key points and deliver it
> orally at the meeting.
>
>> On Apr 28, 2020, at 2:27 PM, Kurt A. Fisher [redacted]
>> wrote:
>>
>

Lindquist, Kelsey

From: Norris, Nick
Sent: Wednesday, April 29, 2020 9:47 PM
To: Lindquist, Kelsey
Subject: Fwd: (EXTERNAL) $th Ave. Well & Pump House

Sent from my iPhone

Begin forwarded message:

From: Linnea Noyes [redacted]
Date: April 29, 2020 at 9:41:35 PM MDT
To: Historic Landmark Comments <historiclandmarks.comments@slcgov.com>
Subject: (EXTERNAL) $th Ave. Well & Pump House

To the Historic Landmarks Commission:

These are my comments in response to the latest renditions of the pump house:

1. I like the overall building design and use of rock on the wall. I appreciate the nod to the historical nature of this neighborhood.

2. The Golden Buff color chosen for the brick appears to be yellow or gold. I object to this choice for the following reasons:

To me it is a very unattractive color.

Golden Buff is a brick usually used on commercial buildings and has a utilitarian feel, which in my mind does not honor the surrounding residential and park context.

The building design has some welcome charm which could be enhanced by the brick chosen, perhaps something more typically residential?

The bridges, walls, and other structures in the park are earthy colors of grey, brown, beige, and sandstone. It seems like this building would stand out less if its color was similar to other structures in the park.

If golden tones are insisted upon, could the color be more natural, like the color of wheat, for instance?

I would support stucco, stone, or sandstone used in the building's exterior in lieu of brick, which might seem more natural when considering other structures in the park.

3. I'm wondering if there is something that would appear more neutral and less eye catching than the current grids on the upper windows?

Thank you for your consideration.

Respectfully,

Linnea S Noyes
204 N. Canyon Road

05072020 Staff Report Comment,

4th Ave & Canyon Road Water Treatment Plant.

Craig S Ogan
272 Canyon Road
Salt Lake City, Utah 84103

It has been two years since SLC Public Utilities started the process to build a water treatment plant in City Creek Parks. Since that time a couple of the HLC board members who saw the first presentation are gone.

To the new members I want you to know how important HLC has been in this process.

HLC, then, heroically lived up to its mandate. Without HLC doing its job, a 2100 square foot site, using outdated and dangerous technology housed in an ugly building would have destroyed a historic park and changed the nature of the Residential Pocket on Canyon Road, a place the City Creek Master plan mandated the City should nurture and protect.

A former HLC member looked at the DPU officials, who legally can do just about anything they want with that property, and said, “If it weren’t this department, but rather a private developer, we throw you out of the room.” One member, took umbrage and asked “How dare you bring this design to us.” A subsequent “reworked” design was called, “putting lipstick on a pig.”

The August 2018 hearing gave the neighborhood time to organize and bring enough pressure to bear to get us to today’s presentation. Thank you to the Greater Avenues Community Council and the Capitol Hill Neighborhood Council for passing motions decrying the inappropriateness of the original plan. Our City Council Member, Christopher Wharton, listened to us and sponsored a 2019 City Budget Motion to require DUP to return to the Council with a smaller, safer and quieter design based on “community engagement.”

That’s how we got here tonight. Sounds simple, but it took a great deal of effort, planning, lobbying, showing up and arguing on the part of the lovers of the Park to get DPU to engage in a process which resulted in the plan you will consider. It really shouldn’t have been that hard.

But the fight was first joined at the HLC table, and the struggle was fraught. New and old commissioners, you were the 300 Spartans at Thermopylae. You took your mission seriously and you held the line. Thank you for what you did for us.

We hope that a lesson of community and constituent consultation was learned and no neighborhood will have to struggle with Salt Lake City Corporation, the way we did, to be heard.

Gmail **Craig Ogan** [redacted]

(no subject)

3 messages

[redacted] Tue, Apr 28, 2020 at 3:39 PM
To: [redacted]

Looks more like a mausoleum. The color of deer shit in the spring when they eat wet grass. Was this an architect's idea or some flunky at Public Utilities?

Sent from AOL Mobile Mail
Get the new AOL app: mail.mobile.aol.com

Craig Ogan [redacted] Tue, Apr 28, 2020 at 4:52 PM
To: [redacted]

Evan smith feels the same way. Can I forward your comment to him?

> On Apr 28, 2020, at 3:39 PM, [redacted] wrote:
>
> [Quoted text hidden]

Craig Ogan [redacted] Wed, Apr 29, 2020 at 11:40 AM
To: cindy cromer <[redacted]

From john jansen

Craig S. Ogan
272 Canyon Road
Salt Lake City, Utah 84103
[redacted]
[Quoted text hidden]

Virus-free. www.avast.com

Gmail

Craig Ogan [redacted]>

Re: Robin Public Hearing, Design, 4th Ave & Canyon Rd Water Treatment Plant, announced

Robin Carbaugh [redacted] Wed, Apr 29, 2020 at 12:18 PM
To: Craig Ogan [redacted]

How obivious does the community want this building to be? It is a public building, not a residence and in my opinion should integrate not replicate residential setting.

Questions on the color.

- Why this color? Is this purely the city department + designers aesthetic choice or were other considerations factored into brick color selection? Yes / No
- What do y'all known about the sites' natural light and shadows? How might natural light and shadows be informing the color choice?
- How might brick color influence other elements, like the need for more or less outside artificial lighting? If the brick is darker, will more artificial lighting be required?
- Given that sight lines are now obstructed from N-S and E-W, was brick color considered as an element of Crime Prevention Through Environmental Design (CPTED)?
- What will this building and its material colors look like throughout the seasons? What do you imagine this building and material will look like in the fall? Same for the entire winter.
- This building has heat sensitive mechanics. Lighter brick is less heat absorbant than a darker brick, how does material choice this factor into the energy and environmental goals of the city?
- What about the history, historical materials and color might be informing this color selection?
- This is a distinct public building, not a home. Do those who dislike the proposed color think it should have a more nearby residential color palette?
- Lastly, did the architects obtain a deal on the light yellow brick and simply make a cost basis decision in choosing this color?

Rather than stand out harshly on the site, I believe the yellowish brick choice aims to compliment and integrate, rather impose, against the bridge rock wall and park setting. Wondering if there are examples of other buildings with this same color brick that could be shared by the designers or public utls?

Robin

Carbaugh Associates, inc.
Salt Lake City
Improving lives by creating places where people and nature thrive together

ROBIN CARBAUGH, President
EMAIL I: [redacted]
PHONE: [redacted]

This e-mail may contain information that is privileged or confidential. If you are not an intended recipient, immediately notify this community building, planning and design company by replying to this message, and then delete the communication from any computer or network system. This e-mail does not create a relationship with you if you are not already a client of this planning and design corporation

[Quoted text hidden]

From:	Cindy Gubler
To:	Briefer, Laura; Stewart, Jesse; Mullen, Holly; Wagner, Dawn; Stewart, Brad; Kirk Bagley; John Ewanowski; Zach Clegg; Lindquist, Kelsey
Subject:	(EXTERNAL) Resident Comments
Date:	Friday, April 17, 2020 4:26:21 PM

All,

Here are all the comments I've received from residents regarding the last two emails I sent out about meeting again, the brick color and sound mitigation measures. There have only been a couple more comments since the last time I sent out this log to all of you.

David Garcia
Tue 4/14/2020 9:27 AM

OK, Cindy, thank you for the extensive response to the color and noise items. As always, your efforts are appreciated. With respect to color, in imagining the winter scene in a darker tone, the presence of the building would be much more pronounced. Good point, in going for a lighter tone. Buff? In terms of personal preference, I hope there is a low-level presence of yellow. And of course, the point being made that there will never be a consensus; close enough is good enough. David Garcia

Shane Franz
Mon 4/13/2020 8:27 PM

Attaching links to the interstate brick catalog for golden buff brick for reference.

https://www.interstatebrick.com/projects/byu-bio-chem-bldg-emperortm

https://www.interstatebrick.com/projects?f%5B0%5D=im_field_product_colors_tr%3A87

Lisa Livingston
Mon 4/13/2020 8:07 PM

Concerning the drinking fountain- the problem is not that people can get a drink. The problem is that it will be used as a bathing station. I have seen it at the drinking fountain by Memorial House and also in the creek in the park that the building will be located. Please do not put a drinking fountain in.

Lisa Livingston

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Anyway- food for conversation.

Thank you,
Shane franz

Shane Franz
Mon 4/13/2020 11:59 AM

Thank you very much for the detailed reply Craig. I do indeed appreciate that. I'll look at the details shortly and let's keep in touch. Thank you, Shane.

Craig Ogan
On Apr 13, 2020, at 11:22 AM

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This issue of "sound" therefore should be specifically petitioned to the City Council. The Historic Landmarks Commission, by their admission, have nothing to say about engineering. So I suggest making sure your letter gets to the honorable Christopher Wharton and to SLC Council Staff to get that question asked of SLC DPU.

The brick and other accouterments of the building are legitimate issues for SLC Historic Landmarks Commission. I suggest you make sure you get something in writing to Kelsey Lindquist in SLC Planning, who prepares the document package for HLC members and be prepared to make a comment at the meeting (whether in person or cyber is up in the air right now).

I'm agnostic about the brick color and other things you mention as I have no background in this area. I do know, some share your objection while others do not. The choice of "yellow" is probably predicated on the study of the palette used in the redesign of City Creek Parks and Memory Grove after the flood and tornado. This was discussed in meetings two and three of the public engagement group. The study indicated that gray, beige, light brown and sand stone tones predominate.

Incidentally, there are yellow brick finished residences in the canyon, three of which are north of your Rental Property on Canyon Road.

Thanks for your involvement. Let me know of any interaction on the sound and brick issues.

I have copied Evan Smith, Dave Jonsson and Linea Noyes as they responded to your note; Cindy Cromer as she was the author of the palette study and Cindy Gubler so she can facilitate response on the sound issue either directly to you or in a meeting. If she chooses a meeting with the group, I will attend.

Craig S. Ogan
272 Canyon Road
Salt Lake City, Utah 84103
[redacted]

NOTE: Craig Ogan and Cindy Gubler had a phone conversation. Cindy wanted to find out if Craig had taken a poll of what brick colors the residents.

David Garcia
Mon 4/13/2020 10:48 AM

Hi Cindy,

There was a page in the March 30 Virtual Open House presentation which showed several variations of design 3A.

I thought any of the designs on that page were excellent.

The following pages showed three views of one variation of 3A with, to my eye, an ugly yellow-tone color.
Anything other than yellow! It's dingy. It looks bad from Canyon Road, from 4th Avenue, and in the winter.

Any other voices regarding choice of color?

David Garcia

Linnea Noyes
Sat 4/11/2020 2:03 PM

I agree with Evans' comments and appreciate the expertise behind Shane's concerns. I sent in comments about the brick and design after the last virtual meeting, but would appreciate being able to see a review of everyone's comments - I keep wondering if I somehow missed that? - as well as how SLPU intends to address the comments, concerns, and recommendations of the neighborhood.

LInnea

Evan Smith
Sat 4/11/2020 11:52 AM

I too believe that if there are enough people with concerns we should have the chance to reconvene and discuss the final design.

Personally, I think the architects have listened to us and our concerns about the aethetics of the building for the most part, but I too am flummoxed at how they arrived at the the decision to create a **yellow** pump house.

Shane Franz
On Apr 10, 2020

Cindy,

I am requesting another meeting and that the design be reviewed and modified.

I am concerned that sound mitigation has not been considered as it should be. In fact, there is no mention of it in the document yet this is one of the residents top three concerns (small, silent, appropriate.)

The building structure needs to be 12"+ thick solid reinforced concrete with a concrete top of similar thickness, Windows need to be eliminated as they provide for high sound transfer- we need it silent not "soft glow emanating". Doors need to be solid and have substantial mass with no glass. (Again, glass provides for substantial sound transfer.). Interior room around the motor needs to be a separate room with an additional set of interior doors to dampen sound. Need to see detailed engineering design of louvers and baffle system as this is a source of high sound transfer as well.

Need to see interior plan. Several chapters in the text "master handbook of acoustics, 6th ed, by Everest and Pohlmann deal with this (chapter 16+). Essentially this is the same problem as building a quiet recording studio to keep sound out, except in this case we wish to contain the sound. Has the

building and design been analyzed by an acoustic engineer? Can we get those results? Room size and shape is critical as sound modes can be accentuated, and if not properly designed the building can turn into a cavity resonator amplifying certain frequencies. The motor is a broad spectrum noise generator and keeping this noise contained is a very difficult problem. This is like trying to contain the sound of diesel locomotive, except unlike a locomotive that will leave, this sound is present day and night. It can't be designed lightly.

Separately, concerned that modern materials and selection has been misinterpreted. Want the modern elements (70s lighting, modern doors, projected aluminum coverings over doors and windows, and 80s brick design stack) out. We do not need soft light emanating or a feel of human inhabitance- we DO want ZERO sound emissions. (I do appreciate what the architect is trying to do with the interior light, but not at the expense of noise emission through those windows and doors.) The design goal is timeless. This is not a place to make an architectural statement. (Projected aluminum coverings have been so over used recently that in 5 years people will say: "that's so 2015., what Starbucks did they steal those from?") The building should meld with the surroundings and not appear out of place according to documents regarding historical preservation I have received from SLC planning. The design goal should be to look at the building and NOT have architectural elements reveal when it was built, as it is in such harmony with the surroundings.

Neighbors have expressed to me the need to see more detail and more discussion on brick color choices. (Can't think of a yellow brick building anywhere in the area- most brick is sandstone to red). I wholeheartedly agree with the neighbors we need to examine options.

When could we get a copy of the interior plan? Similarly for the acoustic engineering study?

While we have made some wonderful progress, I do NOT believe the design and plan are to a point where they can be put fourth to the historical commission. Please remember, this is outside our front door and in our dear public park- if it were outside your home wouldn't you want the same consideration?

Look forward to our follow up meeting.

Sincerely,

Shane Franz
212 N Canyon Road
[redacted]
Sent from my iPhone

Cindy Cromer
Fri 4/3/2020 5:15 PM

Cindy-Thanks for the speedy reply. The color of the brick makes a huge difference to me because the building cannot be unobtrusive if it is red. The only strong color ever on the island at any time is green. Mostly, the island is grey and brown. We have never seen the dull winter landscape in a rendering, only the snow scene, which is not typical. So I will write a rant about how there is not a single red brick IN the park space from 2nd Avenue to the end of the Freedom Trail, and actually beyond that.

Craig wants to send out an image of the design going forward. I would have to say that it is some color of brick with the design in 3A. It is NOT decided that the yellow brick is the preferred option apparently. I will listen to the YouTube video this weekend to see if I can hear something definitive. The pdf just indicates to me that the issue of color has not been decided. I'll be back in touch on Monday.

Sincerely, cindy

NOTE: Cindy Cromer and Cindy Gubler had a phone conversation between these two emails. Cindy Cromer was confirming what 3A brick color option was going forward.

Cindy Cromer
Wed 4/1/2020 5:15 PM

Cindy – I was able to see the presentation on Monday but could not participate in the questions. I typed questions but they apparently did not show up at the other end. I am not on Facebook. I have used Zoom and Webex successfully in recent weeks, but obviously needed more instruction on Facebook for a group.

I am disappointed that SLCPU is moving forward with a material which does not occur anywhere in the park spaces....red brick and is out of sync with the colors on the 4th Avenue islands much of the year. We saw a snow scene at the open house. That is not what the park looks like most of the time between November and the end of March. I will craft the questions that I couldn't get into the conversation and submit them to the larger group. One of them had to do with budget adjustments from Covid-19 and I received Laura's thorough answer to that question.

So there is another message coming. I just wanted you to know that I had difficulty with Facebook as a way to gather. Zoom and Webex seem to have limits on how many people can participate which would certainly be contrary to the meaning of an open house.

Sincerely, cindy c.

Cindy Cromer
Fri 4/3/2020 7:58 AM

Holly and Cindy G. – As Cindy already knows, I flunked Facebook for the Open House. I could hear and see the presentations but couldn't participate in the Q and A. In the process of trying to summarize the meeting on 3/30, we've come up with a discrepancy about the proposed materials moving forward. Cindy's message indicates 3A, but 3A is shown in red brick in the 3/16 materials and in both red and yellow brick for the open house on 3/30. I can't find any text committing to one color over the other. (Maps and drawings are notoriously vulnerable to different interpretations.)

Can you clarify more precisely which materials will be used in 3A moving forward? Sincerely, cindy

Linnea Noyes
Wed 4/1/2020 5:06 PM

Cindy,

These are my comments in response to the latest renditions of the pump house:

1. I like the overall building design and use of rock on the wall..

2. We want the building to blend in, and I believe the gold would do the opposite.I would much prefer to see the brick used be more like Ottinger Hall. The soft reds and grays of Ottinger would be a nice middle ground.

3. I do not like the 'grids' above the windows and doors. Again, something more neutral and less eye catching please.

4. There is a lovely bridge in the park between 3rd and 4th Avenue that is worth considering for its design elements: It is mainly stucco, with stone pillars, sandstone tops on the pillars, and steel rails across the top of the bridge. I believe a stucco building with similar accent elements could also work.

Respectfully,

Linnea S Noyes

Jill Van Langeveld
Wed 4/1/2020 10:05 PM

Thank you, Cindy, for sharing the virtual meeting particularly for people like me. I kicked myself because I remembered at noon after it was all over. Either emails or virtual meetings are fine with me just so we continue the dialogue. If you plan another virtual meeting I will be sure to set an alarm on my phone so I won't miss it again. Appreciate the Department for taking this time to bring in the neighbors who are so affected by this project and really listening to them. I've been really impressed.

Thank you again (I'm a broken record)
Jill

KURT ALLEN FISHER
P.O.B. 11753
Salt Lake City, Utah 84147-0753
[redacted]
[redacted]

May 30, 2019

VIA EMAIL: mayor@slcgov.com
Honorable Jacqueline M. Biskupski
Office of the Mayor
SALT LAKE CITY CORPORATION
451 South State Street
Salt Lake City, Utah 84111

Cc:
VIA EMAIL: chris.wharton@slcgov.com
Chris Wharton, District 3 Councilperson

VIA EMAIL: holly.mullen@slcgov.com
Holly Mullen, DPU Community Engagement Manager

Re: Request that the Mayor invoke Utah Code Annotated § 79-3-202(f) to request siting technical assistance from the Utah Geological Survey with respect to the Department of Public Utilities ("DPU") proposed 4th Avenue Chemical Treatment Plant (the "Well")[1] at approximately 4th Avenue and 200 North Canyon Road, Salt Lake City, Utah
DPU Detailed Project No. 5132268-2015-0213[2] in Mayor's 2019-2020 Budget

Mayor Biskupski:

The Salt Lake City Department of Public Utilities ("DPU") has become overly fixated on the siting Option 2b[3] for the proposed Well at approximately 200 North Canyon Road in Salt

[1] Salt Lake City Department of Public Utilities. 2019. Information Website on 4th Avenue Well Project (url: https://www.slc.gov/utilities/fourth-avenue-well-project/, accessed May 2019).

[2] Department of Public Utilities 2019-2020 Line Detail Budget, April 28, 2019 (url: https://stories.opengov.com/saltlakecity/published/MSDLeN3_f and File: Attachment 1 - draft Proposed Public Utilities FY2019-20 Budget.pdf at page 33, Attachment "A" hereto.

[3] Memorandum by David E. Hansen, Hansen, Allen and Luce, Inc., to B. Stewart, Salt Lake Department of Public Utilities, re: 4th Avenue Well Assessment (hereafter "HAL Report") (url: https://docs.wixstatic.com/ugd/80b28b_3607f771b2984d63a44ce7a4c3d1c7a9.pdf).

Lake City. The DPU has not given sufficient weight to substantial cloudburst flooding and earthquake risks[4] at the proposed 4th Avenue and 200 North site.

I attribute the agency's preference to this site to be the result of the sunk costs problem. The DPU's proposed 2019-2020 budget[5] reveals that agency DPU has already spent $464,636 on the 4th Ave Well project in direct costs and a total of $200,000 in common administrative costs, of which I allocated 60% or $120,000 to current expenditures, for the sum of $584,636 in current expenditures. The DPU proposes to expend the sum of $3,100,000 in direct costs on the Well during 2019-2020 and another $1.5 million in five-year common administrative costs, of which I allocate 60% to the 4th Ave Well or $900,000, for a total five year project cost of $4,584,636. Current sunk costs of $584,636 represent 12.8% of total five year project costs. Those sunk costs have been incurred before the first brick has been moved at the 4th Avenue and Canyon Road proposed site.

Independent expert geotechnical siting advice is needed and is available from the Utah Geological Survey[6] pursuant to Utah Code Ann. §79-3-202(f). That section authorizes, conditioned a request from a local municipality, to "assist local and state agencies . . . *at the request of state agencies or other governmental agencies, [to] review the siting of critical facilities . . .*" (*id, emphasis added*).

The DPU proposes to build the chlorine chemical treatment plant at level of the existing grade in the geologic streambed of City Creek Canyon. The site was underwater during the 1983 high-snowpack runoff of flooding with a peak flow of 331 cubic feet per second. The structure is vulnerable to foundation undermining, structural failure, chemical release and-or a toxic chlorine gas release from a 2,400 cubic feet per second cloudburst flood. In 1945, a cloudburst flood of that size that came down Perry's Hollow and "M" and "N" streets in 1945 and moved 300 lb. boulders, grave headstones and eight cars from the cemetery to South Temple (Salt Lake Telegram August 20, 1945). City Creek is at risk of a similar catastrophic cloudburst flood that destroyed downtown Farmington in 1923. *See* references in Attachment "B".

The soils on which the plant is proposed to be built are susceptible to ground liquefaction and horizontal ground movements of 0.3 to 1 meters during the Wasatch Front's expected to greater than 6.75 magnitude earthquake (references in Attachment "C"). The chemical plant's foundation or the outflow connections to its chlorine storage tank could fail during such an earthquake resulting in residents and first responders having to cope with both a 500 to 900 gallon chlorine spill and-or toxic chlorine gas release as they dig their neighbors out from underneath their homes.

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[4] Letter by Kurt Fisher to Holly Mullen, Communications and Engagement Manager, DPU, dated May 25, 2019, re: flooding risk, Attachment "B" hereto; Letter by Kurt Fisher to Holly Mullen, Communications and Engagement Manager, DPU, dated May 26, 2019, re: supplemental note on seismic risk, Attachment "C" hereto.

[5] Attachment "A".

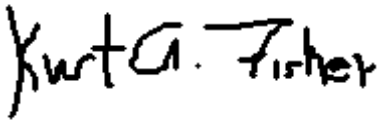
[6] ; William Keach, Utah State Geologist, billkeach@utah.gov; Mark Milligan, P.G., Geologist, Utah Geological Survey, (801) 537-3326, MarkMilligan@utah.gov.

I request that you *sua sponte* exercise your executive power to request Utah Geologic Survey assistance in reviewing the siting of the proposed critical facility - 4th Avenue Option 2b chemical treatment plant site at 4th Avenue and Canyon Road. A review by an independent expert will quickly reveal that the proposed well should be moved to the May 9 open house Option 2c site in the park at State and Canyon Road in a redesigned anti-terrorist and earthquake hardened structure, admittedly at a higher cost.

Our able DPU Director Briefer proposes the chemical plant 4th Avenue and Canyon Road out of a desire to conserve public funds. But sometimes engineers get fixated on economic efficiency. That is when citizen oversight, in form of your office's powers, is most needed.

Please feel free to contact me with any questions regarding this matter.

Very Truly Yours



Kurt A. Fisher

Attachments

A - Excerpt from DPU Detailed Line Budget

B - Comment to DPU on Flooding Risk

C - Supplemental Comment to DPU on Earthquake Risk and Liquefaction

Talking Points for June 4th Council Budget Hearing and June 6th Historic Landmark Commission (HLC) Hearing. K. Fisher June 1, 2019

1) **Solutions - recommendations**:

   a) Condition approvals prohibiting building at 4 Ave site:

   i) Condition appropriation and HLC exception permit on the DPU moving the Well to the park at State Street and Canyon Road. *Expressly condition the appropriation to prohibit building at 4th Ave and Canyon Road*. An underground transmission line would be built from the existing 4th Ave well borehole to a separate chemical treatment plant. Plant would be redesigned to be more flood, earthquake and terrorist resilient.

   ii) Condition on requiring the DPU and-or Mayor's office requesting critical facility siting assistance – which if free – from the Utah Geologic Survey.

   iii) Condition on directing the DPU to apply to the RDA for a supplemental loan or grant to move the Well via an interlocal agreement.

   b) Fund another 1.5M USD to move the Well:

   i) Raise DPU water, sewer and lighting rates by 8 mills.

   ii) Defer other DPU projects in the 2019-2020 budget from one year and reallocate more money to move and build the Well.

   iii) Have the Council and Mayor in their capacity as the RDA Board and Director make a loan or grant to move the Well. The CBD is the primary beneficiary and should contribute more in proportion to what it will receive.

2) Problems - 4th Ave site and design:

a) **Earthquake Risk** – During a predicted 6.75 magnitude or greater earthquake, ground liquefaction could cause the building to fail, breach the chemical sodium hypochlorite (bleach) storage container, and result in neighbors have to deal with a chlorine gas cloud and-or chemical spill while the digging their neighbors out from the rubble.

b) **Flooding Risk** – The 4th Avenue site is in the geologic streambed of City Creek. Although City Creek at this point bypassed by the 1910 conduit and flood protection was upgraded after the 1983 flood, the site is a risk for cloudburst flooding of 2,400 cubic per second, as occurred at Perry's Hollow in 1945. Possible cloudburst flows are multiple times beyond the capacity of existing flood protection control structures.

c) **Management Factors** – The DPU has already spent about $500,000, including common project administrative overhead, on siting and construction preparations. The Council should put a stop to the debate and direct the DPU to concentrate on a more technically and socially optimal site.

d) **Terrorist Risk** – The unique siting at the mouth of Canyon Road makes the chemical treatment plant too an attractive target for a terrorist attack in which the sodium hypochlorite stored inside would be used as one part of a binary chemical weapon. This siting constraint is unique to Memory Grove and does not extend to the other proposed treatment plant at "U" and 5th Avenue, also in the 2019-2020 budget.

e) **Building Design** – On May 9, the DPU proposed a smaller building (30 x 60 feet) in response to neighborhood input. This industrial facility is intrinsically incompatible with the historic neighborhood. It could be resized and redesigned to make it more earthquake, flood, and terrorist design. That is the inherent design dilemma that cannot be resolved at the 4th Ave site. Those engineering trade-offs are solvable at the proposed, but more expensive, relocation site.

3) **Rebuttal: Equity Justification and the Increased Cost of Relocation:** In 2016, the Council waived at least $7.1 million in developer fees in order to spur high density growth in the CBD, but claims will now be made that there is not enough money to move the Well. Now that the growth is here, water infrastructure upgrades for water quality and higher water pressure are needed for the CBD. If built at 4th Ave and if surrounding property values decline 8%, property owners will lose an estimated at $992,000. The Well primarily benefits the CBD, and the CBD should be required to contribute to moving the Well in proportion to the benefits that the CBD will receive.

4) **Images and multimedia**

a) **What happens when irresponsible teenage boys mix small amounts of sodium hypochlorite and ammonia -** https://youtu.be/56hxLYWIKfs?t=36

b) **What happens when irresponsible teenage boys mix small amounts of sodium hypochlorite and brake fluid -** https://youtu.be/iwhzbiPuLS8?t=81

c) **Cloudburst Flooding**

i) **Salt Lake Telegram, August 20, 1945.**

STORM COSTS S. L. $300,000

378129

City Digs Out After Rain, Wind, Hail, Flood Strike

Salt Lake City Monday was digging out from under the debris and repairing damage from Sunday night's record wind-rain-hail storm and flood, as unofficial estimates placed the damage between $300,000 and $400,000.

Damage at the Salt Lake airport alone was expected to top $100,000, with 35 planes reported damaged or destroyed and 2500 windowpanes in hangars and buildings shattered.

Severe damage was reported to the City cemetery by Mayor Earl J. Glade, who estimated the loss there alone would reach between $60,000 and $75,000.

No estimates were available on damage to private property throughout the city, although Mayor Glade said damage to city streets and installations would "run into several thousands of dollars."

Mayor Glade made his estimates after a tour of the city's north bench and the airport, where the storm struck hardest.

"Damage to the municipal airport buildings and hangars will total $25,000 at least," he said.

"One can hardly imagine what the storm did unless he has surveyed the picture," he concluded.

Water still was standing in some streets where storm sewers were clogged and pedestrians were treading gingerly over layers of clay and silt several inches deep in some near downtown streets.

Fallen trees and broken limbs lay across sidewalks, and barrels, tin cans and soggy paper were strewn across well-tended walks and lawns, bearing testimony to the passage of refuse-laden waters sweeping across the city from the canyons.

Hundreds of windows were smashed, auto tops damaged and flowers and shrubbery damaged by hailstones in the north and west sections of the city.

The near-hurricane storm was confined to within a few miles of Salt Lake, with considerable variation in intensity found even within the city. It was part of a "storm front" which moved in from Idaho Sunday. Other points reported light showers, but the thunderstorm activity was confined mainly to Salt Lake, Davis, Weber and Utah counties.

Hailstones "as big as eggs and golf balls" were routed in drifts several inches deep on the west side, and windows in the north and west sides of buildings smashed. In some instances the window cases were washed away.

Huge 'Front'

A huge "front" of water was observed first about a block west of the Salt Lake Memorial mausoleum on 11th ave. From there it rushed across the Salt Lake City cemetery to N street, swinging over and down N street.

Damage to the cemetery included five trees blown over, headstones and flowerbeds washed away and deep gullies across some plots. Some graves were disturbed.

Parked cars were moved three blocks and a section of street paving 10 feet square was swept away. Boulders "as big as motor baskets" were deposited on South Temple and north bench streets.

Sidewalk Chunks

A three-foot wall of water rushed down M street from Lindsey Gardens, carrying with it 200 and 600 pound boulders and washing eight cars a block down the street. Large chunks of sidewalk paving were torn loose.

Six horses were washed away at a stable near the gravel pit near Ivy canyon. One was found drowned, but the others were still missing.

Hurricane gusts of wind, ranging up to 80 m.p.h., were reported at the airport, where damage as-

See Page 2, Column 1

Workers and trucks of Salt Lake City streets department continue work of cleaning mud, trees and huge boulders left in wake of a huge storm which roared into the city from the west Sunday night. Workers here are cleaning at 1st ave. and M st.

Resembling a battle front airfield after heavy strafing by enemy planes, these aircraft at Salt Lake airport Monday were listed in the over $100,000 damage caused there by Sunday's storm. Two planes were lifted over an eight-foot fence by wind.

Some of the damage caused by roaring walls of water sent rushing through the Salt Lake City cemetery during Sunday night's storm is shown in this general view picture of the burial ground. Mayor Earl J. Glade estimated cemetery damage at over $60,000.

ii) **Salt Lake Telegram, August 24, 1918.**

PROPERTY DAMAGED BY BIG CLOUDBURST

Serious damage to private property in the vicinity of West Capitol and Wall streets was caused by last night's cloudburst. The city street department went into action this morning to clear up the debris washed down by the flood. Hundreds of dollars of damage will be caused to private property, according to an announcement made today by W. P. Gillespie, superintendent of the city street department.

Front lawns, gardens and even cellars were inundated today by a layer fo silt and debris a foot deep in some places. It was reported that debris had been carried as far as Second West street.

Dr. Wooley's summary of the event as reported in the August 24, 1918 Deseret News, stated that "great boulders were carried several blocks" and that silt at 200 West was 1 foot deep:

Great boulders were carried several blocks, and lawns and roadbeds were washed out or covered with debris. Storm centered on hill north of State Capitol. Silt carried to Second South Street was 1 foot deep. (DN Sept. 24, 1918.)

KURT ALLEN FISHER
P.O.B. 11753
Salt Lake City, Utah 84147-0753
[redacted]

June 4, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com
Historic Landmark Commission
SALT LAKE CITY CORPORATION
451 South State Street, Room 326
Salt Lake City, Utah 84111

Cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)

Re: 4th Avenue Well's Failure to Comply with Salt Lake Code Requirements
Comment to Historic Land Commission ("HLC") on 4th Avenue Pump Applications by the Department of Public Utilities ("DPU") at approximately 200 North Canyon Road, Salt Lake City, Utah (the "Well")[1]. HLC PLNHLC2018-00557 and PLNHLC2018-00558

Sirs:

Salt Lake City Department of Public Utilities proposed Well at approximately 200 North Canyon Road in Salt Lake City fails to comply with Historic Overlay District factors of Salt Lake City Ordinance 21A.34.020-H-4(a)(1-3) regarding height, width and massing[2] and the Special Use Exceptions factors of Salt Lake City Ordinance 21A.52.060 *et seq*., General standards.[3]

The proposed Well design does not comply with the above named standards because of a staff review process failure. SLC Ordinances 21A-34-010F(d)(13), "Materials Submitted With Application", requires that the application[4] include, "[a]ny further information or documentation as the Zoning Administrator deems necessary in order to fully consider and analyze the application." The site is subject to commonly known flooding and seismic hazards that will materially

[1] Salt Lake City Department of Public Utilities. 2019. Information Website on 4th Avenue Well Project (url: https://www.slc.gov/utilities/fourth-avenue-well-project/, accessed May 2019).

[2] url: https://www.sterlingcodifiers.com/codebook/getBookData.php?chapter_id=49078#s928576) "Building Form and Scale . . . . (1) Height: . . . . (2) Width: . . . . (3) Massing . . . ." *See* Briefing Materials Attachment I for related staff conclusions on these factors.

[3] url: https://www.sterlingcodifiers.com/codebook/getBookData.php?chapter_id=49087#s1122188 . *See* Attachment J of the briefing materials for staff conclusions.

[4] *See* Attachment A of the briefing materials.

affect its future engineering design and approval by the Building Department pursuant to the International Building Code (IBC-2015). Detailed site-specific flood and seismic analysis is normally required in subsequent Building Department proceedings, but – as in the instant matter - where the hazards are obvious, an early site-specific flood and seismic analysis would have better defined the minimum height, width, mass and floor-above-grade requirements. No such analysis appears in the Commission's record. In this instance, the Zoning Administrator abused his discretion by not requiring that the applicant provide an early site specific geotechnical seismic hazard[5] and flood hazard analysis[6].

As a result of this review process failure, the height, width, and mass requirements submitted by the Applicant and under consideration by the Commission are hypothetical and largely imaginary. If this Commission approves the proposed design, in future Building Department proceedings, the building officer will very likely require a redesign and a large increase in the size of the physical structure. The Zoning Administrator should have required early seismic hazard and flood analyses, and the Administrator's failure to request those early reports is fatal to the special use exception application. .

In light of these administrative process failure, at its June 6th hearing the Commission should defer action on the Special Use Exception application; should refer the matter back to staff to require early site-specific seismic and flood risk reports. With that information, the Applicant can reevaluate and the Commission will have sufficient information on whether the height, width, mass and grade placement of a redesigned structure meets the requirements of Salt Lake City Ordinances 21A.34.020-H and Salt Lake City Ordinance 21A.52.060.

Additionally, the proposed design does not comply with Salt Lake City Ordinance 21A.52.060(F) regarding environmental pollution[7]. As noted in my comment on terrorist attack risk,[8] some antiterrorist security measures are required by Department of Homeland Security regulations at 6 C.F.R. Part 27. Staff and applicant agent comments (included in the Briefing Materials) admit that due to the nature of the proposed site, it was impractical to install security fencing normally required to prevent theft, vandalism or terrorist attacks on the chemical facility:

> Typically, culinary well buildings are completely enclosed with fencing to reduce the threat from potential vandalism, theft, and terrorism. The limited space available significantly prevents the ability to properly secure the location.[9]

[5] IBC Section 1612, discussed below.

[6] IBC Section 1803, discussed below.

[7] "The proposed use and development will not cause material air, water, soil or noise pollution or other types of pollution."

[8] Letter by K. Fisher dated May 21, including in the May 31 version of the Briefing Materials.

[9] August 2018 DPU Staff Comment at 4 in the Briefing Materials.

The Bowen Memorandum also recognized the infeasibility of erecting security fencing at the site:

> Fencing to restrict access to the well site is normally recommended to prevent vandalism or other unauthorized access. Due to the location of the well and the minimal existing set-backs, fencing does not appear to be feasible.[10]

A chemical release during a terrorist attack on this unsecured facility is an "other types of pollution" within the meaning of 21A.52.060(F), and the Special Use Exception application fails on this element.

The remainder of this comment provides background and supporting evidence concerning the administrative process failure alleged above.

A building officer can and will conclude that an IBC flood analysis is required, and zoning staff could have ordered a FIRMs supplemental flood analysis. The concept drawing for which the applicant seeks a special exception permit shows a building constructed at grade despite the fact that the 4th Avenue site has been subjected to repeated flooding from City Creek since 1860 and is located in the middle of the geologic stream bed of City Creek. My letter dated May 28 regarding high snow-melt flooding and cloudburst flooding provides other, credible data that the site has and will continue to be flooded at rates higher than 1 per every 100 years.[11][12]

Facially, the staff and applicant's action was lawful. The IBC *building permit* application process typically only requires that an applicant conduct a site-specific floodplain study if the proposed site is listed as a hazard zone on FEMA floodplain maps. Those maps are called "FIRM"s. An excerpt from the FIRMs map for the 4th Avenue and Canyon Road site[13] are shown in Figure 1, and a special flood hazard zone – that would automatically trigger a site-specific floodplain review –

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[10] Bowen Collins and Associates, circa August 2018, at 3, re: Salt Lake City Planning Commission Assessment Memorandum (hereafter the "Bowen Memorandum") (url: https://docs.wixstatic.com/ugd/80b28b_0e07c5f9e8ff4047a4bd9405ee4d95cf.pdf). The Bowen Memo is also in the Briefing Materials.

[11] Letter by K. Fisher dated May 25, 2019, included as Attachment B in May 28th Letter with Attachments "A" through "E" (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190528WellTransHistoricLandMarkCommFinalwAttach.pdf).

[12] The May 25 letter on flooding should be restored to your Briefing Materials by June 6. Inexplicably, Commission staff deleted and reordered parts of my letter of May 28 as included in the May 31 version of your Briefing Materials. On June 4, I requested staff to restore the letter with all attachments. In the interim, the above url will provide the Commission members with a copy. https://msc.fema.gov/portal/home

[13] FIRMS Map 49035C0144H downloaded June 2, 2019, effective August 2, 2012 (url: https://msc.fema.gov/portal/home).

appears about 400 feet north of the proposed structure. As published, the FIRMs for the site implies that there is less than 1 in 100 year chance of a flood occurring at the site.

Figure 1 – FIRMs for the 4th Avenue Site. The project location is marked with a star.

FIRMs maps are not fixed regulatory documents; they are generated at the national level. The IBC and Salt Lake City ordinance acknowledge that FIRMs can be to general and might need amendment to deal of local conditions. Section 1612 of the IBC provides that a *building officer* can utilize other waterway data sources to decide a FIRMs in not accurate and then require the applicant to prepare a site-specific flood analysis. Salt Lake City Ordinance 18.68.070, Administrative Firm Amendment,[14] permits a planner and-or building officer to initiate a FIRM amendment investigation whenever there are "conflicts between the mapped boundaries and actual field conditions" (*id*). A registered professional engineer is retained by the applicant and consultation by the City Floodplain Administrator, a "person designated by the director of the department of public utilities to direct the decision making process technical review by the City."[15] Where a hazard is found, the building or zoning officer can require an engineering redesign solution that addresses the revised level of risk.

Here, the Zoning Administrator had the discretionary power to request the applicant to prepare a FIRMs site-specific flooding analysis. The Administrator choose not to do so and the result is a proposed structure that has insufficient mass and size to protect the health, life and safety of the public from flooding risk.

[14] url: https://www.sterlingcodifiers.com/codebook/getBookData.php?chapter_id=49032.

[15] Salt Lake City Ordinances 18.68.020.

A building officer can and will conclude that an IBC seismic analysis is required. A similar process governs the geotechnical risk of earthquake. Seismic risks do not preclude construction. The IBC based on national earthquake risk maps[16] imposes supplemental load design requirements that depend on the proposed use of the structure. The proposed structure is a chemical plant. The IBC has two types of classifications based on type-of-use that are related to the Well: the Well is a Class III structure that houses toxic chemicals or is a Class IV structure that is used to maintain water pressure[17]. Class III and IV risk buildings can only be reduced to a Class II structure requiring lower physical reinforcement based on a site-specific hazard assessment. No such site-specific analysis is in Attachment "A" of the Briefing Materials.

The second type of IBC classification related seismic risk at the proposed Well site is based on expected ground accelerations from national maps. Seismic Design Class A has the lowest accelerations during an earthquake; Class F the highest anticipated accelerations. Various online calculators simplify the process of determining risk and load factors applicable to a United States address.[18] The Applied Technology Council seismic map risk calculator indicates that the proposed 4th Avenue Well site is Seismic Class D.[19]

Under Section 1803 of the IBC, a *building official* must require a geotechnical analysis of the risk of seismic shaking and liquefaction for any Class D site.

In the instant matter, the Zoning Administrator had the discretionary power to request an early site-specific geotechnical assessment. One will be required in subsequent building permit proceedings. Your commentator has provided sufficient evidence in the record as to unique seismic risks that may be accounted for by national maps. No site specific geotechnical report appears in the Briefing Materials before the Commission.

The Administrator choose not to do require a geotechnical report and the result is a proposed structure that has insufficient mass and size to protect the health, life and safety of the public from seismic risk.

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[16] USGS. U.S. Seismic Hazard Maps. (url: https://earthquake.usgs.gov/hazards/hazmaps/); IBC § 1613.

[17] IBO § 1604.

[18] Applied Technology Council Hazards by Location Application. Accessed June 3, 2019 (url: https://hazards.atcouncil.org/).

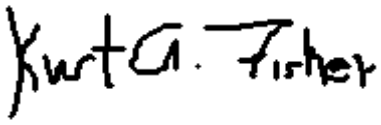
[19] ATC Report dated June 3, 2019, Attachment "A", hereto.

Motion recommendation: At the June 6th hearing, the Commission should reject the application and require staff and the applicant to:

1) Submit a site-specific flood analysis that conforms to the IBC;
2) Submit a site-specific geotechnical analysis that conforms to the IBC;
3) Submit an antiterrorist attack analysis (6 C.F.R. Part 27);
4) Consistent with the results of those reports, the applicant should resubmit a redesigned chemical facility, if modifications are needed; and,
5) If a redesign requires greater height, width or mass, the Commission encourages the applicant to consider relocating facility described in the Hansen, Allen and Luce, Inc. report of April 2019.

The proposed Well should be moved to the May 9 open house Option 2c site[20] in the park at State and Canyon Road in a redesigned anti-terrorist and earthquake hardened structure. The DPU's May 9 concept design is a danger to the community and to first responders.

Very Truly Yours



Kurt A. Fisher

Kaf

Attachments

A – ATC Report on Seismic Risk Design Classification

[20] Memorandum by David E. Hansen, Hansen, Allen and Luce, Inc., to B. Stewart, Salt Lake Department of Public Utilities, re: 4th Avenue Well Assessment (hereafter "HAL Report") (url: https://docs.wixstatic.com/ugd/80b28b_3607f771b2984d63a44ce7a4c3d1c7a9.pdf).

Hazards by Location

Search Information

Address: 207 N Canyon Rd, Salt Lake City, UT 84103, USA

Coordinates: 40.77429989999999, -111.88631900000001

Elevation: 4411 ft

Timestamp: 2019-06-04T00:45:10.106Z

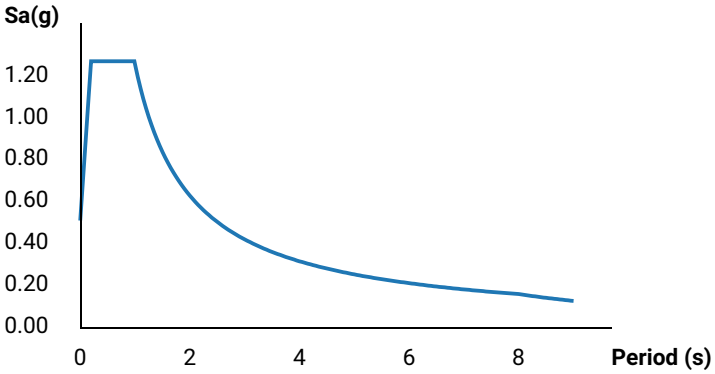
Hazard Type: Seismic

Reference Document: IBC-2015

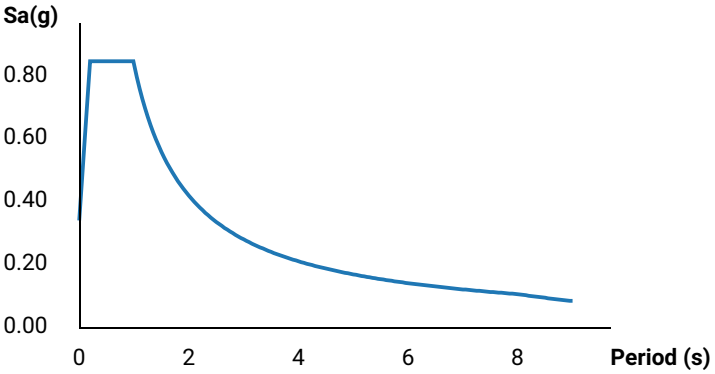
Risk Category: IV

Site Class: E

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	1.411	MCE_R ground motion (period=0.2s)
S_1	0.522	MCE_R ground motion (period=1.0s)
S_{MS}	1.269	Site-modified spectral acceleration value
S_{M1}	1.254	Site-modified spectral acceleration value
S_{DS}	0.846	Numeric seismic design value at 0.2s SA
S_{D1}	0.836	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	0.9	Site amplification factor at 0.2s
F_v	2.4	Site amplification factor at 1.0s
CR_S	0.825	Coefficient of risk (0.2s)

CR_1	0.816	Coefficient of risk (1.0s)
PGA	0.602	MCE_G peak ground acceleration
F_{PGA}	0.9	Site amplification factor at PGA
PGA_M	0.541	Site modified peak ground acceleration
T_L	8	Long-period transition period (s)
SsRT	1.411	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.71	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	2.416	Factored deterministic acceleration value (0.2s)
S1RT	0.522	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.64	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.018	Factored deterministic acceleration value (1.0s)
PGAd	0.881	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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KURT ALLEN FISHER
P.O.B. 11753
Salt Lake City, Utah 84147-0753
[redacted]

June 12, 2019

VIA EMAIL: council.comments@slcgov.com
Salt Lake City Council
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Salt Lake City, Utah 84111
cc Via Email: Jackie Biskupski, mayor@slcgov.com

Chris Wharton, District 3 council person, chris.wharton@slcgov.com
Holly Mullen, DPU Community Engagement Manager, holly.mullen@slcgov.com
Kelsey Lindquist, Planner, Historic Landmark Commission., Kelsey.lindquist@slcgov.com

Re: Is Moving the 4th Ave Well a Feasible Alternative?
General Comments to the Salt Lake City Council

Sirs:

On June 4th, the Council informally requested that the Administration prepare a report addressing alternatives to the Department of Public Utilities ("DPU") proposed 4th Avenue and Canyon Road Well.[1] This letter identifies key decision making points concerning the feasibility of moving the 4th Ave Well to a new nearby site as reflected in prior documents and meetings regarding the Well from the viewpoint of this Avenue resident's viewpoint. Reference is made to the "pro and con" analysis in the agency's consultant report by Hansen, Allen and Luce at pages 9-11.[2]

1) The Administration's planned alternatives report should be an engineering "can do" document and not an engineering "can't do" evaluation.

If the Administration's planned alternatives report which will be primarily prepared by the proponent Department of Utilities is simply going to be a recitation of the agency's conclusions in prior public documents, it will not be helpful to the Council's decision making

[1] "As part of the unresolved issues discussion, the Council discussed the associated infrastructure located approximately at 4th Avenue and Canyon Road. The well serves as a critical water supply for downtown. The Council unanimously asked the Administration to come back to the Council with alternatives addressing and incorporating community concerns such as building size, impact, and noise. The Council also supported funding an outside engineering resource to review possible construction alternatives and to report on the incorporation of public feedback." RDA Board and Council Meeting – Recap for June 4, 2019 (https://www.slc.gov/blog/2019/06/04/council-june-4-council-and-rda-board-meeting/).

[2] Memorandum by David E. Hansen, Hansen, Allen and Luce, Inc., to B. Stewart, Salt Lake Department of Public Utilities, re: 4th Avenue Well Assessment (hereafter "HAL Report") at 15 (url: https://docs.wixstatic.com/ugd/80b28b_3607f771b2984d63a44ce7a4c3d1c7a9.pdf).

process. The DPU's has proposed the most cost-efficient engineering design,[3] but that may not be the most socially optimal design for the City.[4] The DPUs engineers are ethical, highly skilled professionals who are obligated to provide unbiased advice.[5] There is a hypothetical risk here that the agency's views will be unconsciously biased by a desire to anchor the public debate close to the proposal that it has been pursuing for a year.

It is important that the alternatives memorandum give a fair independent engineering evaluation of alternatives. It should be an engineering "can do" document and not simply a repeat of the agency's prior "can't do" conclusions. In the event that the report is a "can't do" recitation of prior conclusions, the Council should remain open to "funding an outside engineering resource to review possible construction alternatives"[6] in order for the Council to obtain the best advice.

A "can do" engineering report evaluating moving the Well will undoubtedly conclude that that alternative will be more expensive and will take more time to construct, as the HAL Report does.[7] As noted below, there is a sufficient funding stream and alternatives could be found to pay more – the stasis of decision is whether the Council will fund constructing a water treatment facility that is worthy of a great United States city or whether the facility will be done on the cheap and to the detriment of property values of the immediate surrounding Memory Grove residential pocket homeowners, to the non-economic detriment of benefit of general City park users, and to the future public safety of City residents during a future flood event.

The further Administration Report should fairly present the best estimate costs of various options. The conclusion of which option is reasonably, socially and-or economically fiscally responsible should be left in these premises to the Council.[8]

---

[3] Memorandum by B. McIntire to K. Lindquist, Salt Lake City Planning Department dated August 30, 2018, re: Open House Public Comment Responses (hereafter "August 2018 Comments") (url: https://docs.wixstatic.com/ugd/80b28b_0bc4214b1c61450897cfbd5cc5a0e6ee.pdf). "The design which was submitted in the Planning Application was arrived at because it is fiscally responsible . . . SLCDPU is held accountable by all of its customers and the City Administration to be fiscally responsible" (*id* at 1-2).

[4] Your commentator disputes the current DPU design should be considered the cost baseline. Your commentator contends that the DPU has omitted the important element of a three foot or higher flood protective wall around the chemical treatment plant required by state drinking water regulations. A more realistic baseline design would cost more than the DPU's current $3.6 budget request. The protective wall was in the DPU's August 2018 version; but then was deleted.

[5] As I have separately related to the Department, the civil engineering and related professions within and that consult with the Department deserve all City residents' highest esteem and gratitude. The complex engineering marvel that is our City is a result of their expertise and professionalism.

[6] n. 1, above.

[7] HAL Report at folio page 15.

[8] n. 3, above.

2) Preserving the valuable asset of the Well's production is a key decision making factor.

As noted in a previous comment, the maximum future economic value of water to be sold from the Well over a 75 year time horizon is about $325,000,000, undiscounted to present value, and about $84,000,0000, discounted to present value.[9] Between 80-100 percent of northern parts of the downtown summer season water comes from the Well.[10] Depending on the mode of moving the chemical treatment facility to a new nearby site, there may be no impact of the current production if a transmission line is constructed from the existing well site or there may be a contingent risk if a new well borehole is constructed at a new site.

3) Risk to Well Productivity from Drilling a New Borehole.

The HAL Report identifies this risk with a weight towards the view that boring a new well would have a moderate or high risk that the newly bored well might not be as productive. During the May 9, 2019 DPU open house on the Well, P.E. Hansen orally stated to me that wells might be drilled within a 300 foot radius and might not be as productive. This concern is repeated in the Bowen First Memorandum of August 2018.[11]

On June 5, 2019, I attended the regular monthly open-community meeting of the Greater Avenues Community Council. That meeting was attended by Genevieve Atwood, a geologist and former head of the Utah Geologic Survey. Although not a hydrologist, Ms. Atwood reported that she consulted with her former hydrology-geologic colleagues. Those unidentified experts informally commented that the aquifer was broad at the mouth of City Creek Canyon. Accessing an equally productive nearby site was likely. Obviously, this third-hand report has less weight than the HAL Report's conclusion. This conflicting hearsay report provides additional back-matter supporting the Council's decision to request a further review.

Your commentator, who does not have construction, hydrology, or drilling expertise, feels that improved drilling technology can significantly reduce to eliminate the risk to well productivity, if it is necessary to drill a new borehole. Since the 1990s, horizontal borehole and horizontal drilling has significantly matured. Horizontal borehole and horizontal drilling technology using optical gyroscope navigation can place the end of a new borehole within 2% per 1,000 feet of drilling distance of the existing borehole. A borehole can be placed, again at a greater expense, within feet of the existing take-off point in the aquifer.

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[9] Fisher Letter-Comment dated June 8, 2019.

[10] McIntire August 2018 Memo. at 1 ("Northern areas of downtown receive 80-100% of their water from this well in the summer months.").

[11] Bowen, Collins and Associates, circa August 2018, re: Salt Lake City Planning Commission Assessment Memorandum (hereafter the "Bowen First Memorandum") (url: https://docs.wixstatic.com/ugd/80b28b_0e07c5f9e8ff4047a4bd9405ee4d95cf.pdf). "[T]here is always the risk of what yield the City would get with drilling a well in a new location. The existing well produces approximately 4,000 gpm. There is no guarantee that relocated well could provide a yield of 4,000 gpm" (*id*. at 4).

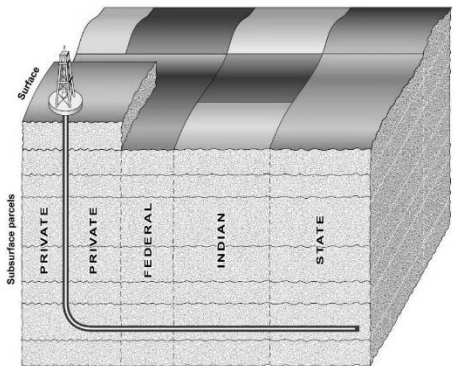


Figure 1 – Horizontal Borehole Drilling Rig and Directional Drilling Diagram. Wikipedia.

4) Risk to Well Productivity from Extending a Transmission Line from the Existing Wellhead to a New Site.

There is no risk to existing production from this option. There are engineering challenges. The main implication of this option is the added effort to route a transmission line around many subsurface interferences in the area. The main 1908 City Creek entombment conduit is a few feet from the existing well head. It may be necessary to build a small above ground pump house and pump at the existing well to draw the water to an alternative location.

The HAL Report comments that this option "[w]ould involve new pipelines and traffic disruptions" and that the "new pipeline would have to connect with existing pressure system." This was consistent with P.E. Hansen's oral comments to me during the May 9, 2019 open house – there were underground interferences, but they could be overcome with difficulty.

An August 2018 DPU staff report by DPU P.E. McIntire describes the many nearby subsurface interferences.[12]

5) The Point of Required Chlorine Injection is Unclear and Affects Whether an Initial Well Water Lifting Pump .can be separated from the Chemical Treatment and Water Pressurization Pump House.

The McIntire Report dismissed a long-transmission line from the existing line to a relocated chemical treatment facility on the grounds that "The chemicals must be injected into the well water at the source to achieve the correct dosing and contact time."[13] The McIntire Report also objected to an interim transmission line on the grounds of cost[14] because it would involve building two water pumps – one to lift the water from the existing Well borehole and a second at a separate chemical plant to raise water pressure before injection into the distribution system.

Your commentator, who again is not an engineer but a lay citizen, could find no regulatory reference supporting the contention that injection must occur at the well head. Utah

[12] The McIntire Report, n. 3, above, at 3.

[13] *Id* at 1.

[14] McIntire Report at 2 ("Both options would require property acquisitions, extensive piping, and duplicate pumps and above ground structures.").

Admin. Code. R309-505-7[15] requires that low quality water must be treated at some point before it is injected into the primary distribution system. The regulation does not appear to prohibit interim transmission for 1,000 feet before treatment at a separate chemical facility as long as the water is chemically treated before injection into the pipe distribution system.

This is a review point that the future administration report might address.

6) The Claim that there no Available City Owned Land or Private Land Nearby appears Incorrect.

The McIntire Memorandum concluded that there is no available nearby City owned land and that no private land is available.[16] The DPU took no steps to investigate the availability of nearby private land, but assuming that there was no land (*id*). The HAL Report makes reference to available land at the "Old City Hall Building north of the well" (*id*. at 5).[17]

The DPU's decision to not consider examining nearby properties may be a hasty generalization based on the agency's prior experience. The DPU's application to the Historic Landmark Commission[18] indicates that one-quarter of an acre is involved in their pending special use exception application, but that the footprint of the current proposed design requires only one-eighth of an acre.

Figure 2 show several parcels to the south of 200 North Canyon Road near State and North Temple per the Salt Lake County Assessor's Office.[19] Table 1 describes those parcel and Table 2 estimates acquisition costs based on assessor records. Parcel A is owned by Salt Lake City Corporation and has no cost. Parcel "D" is owned by the Church who might be approached to donate a portion of their land's values considering their extensive experience. Although Parcel "B" is privately owned and its irregular shape lends it to be desirable for a developer to sell. Parcel "E" is excluded as a possible alternative because its size is insufficient to accommodate a one-quarter acre facility.

[15] url: https://rules.utah.gov/publicat/code/r309/r309-505.htm#T7 .

[16] "There are no available parcels in the immediate vicinity. In order to provide the same function, a new well would need to be located within the same neighborhood. A property acquisition has not been considered by SLCDPU because it is cost prohibitive and there is no indication that any nearby properties are available" McIntire Memo. at 1.

[17] Your commentator is unsure to which property the HAL Report is referring too.

[18] DPU Application to the HLC in Attachment "C" to HLC Briefing Materials at folio page 5 (url: https://www.slc.gov/boards/historic-landmark-commission-agendas-minutes/). As of June 6, the Briefing Materials are no longer directly accessible by the public.)

[19] Salt Lake County Assessor (url: https://slco.org/assessor/new/javaapi2/parcelviewext.cfm?parcel_ID=&query=Y).

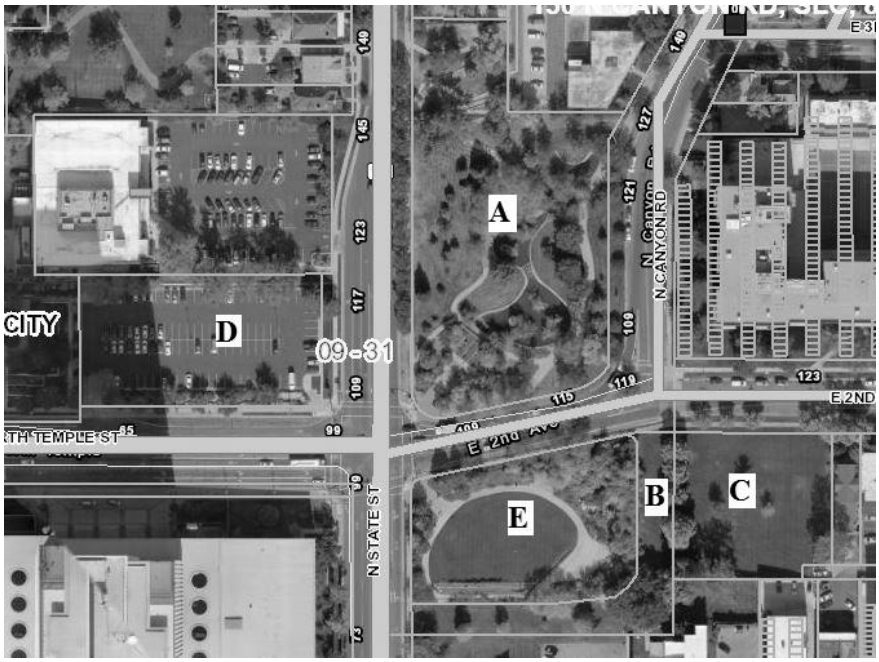


Figure 2 – Assessor Parcel Map Near North Temple and State Streets

Map Id	Assessor Parcel Id	Address	Owner	Assessed Valuation	Acres	Assessed Per Acre
A	09313530290000	110 N State	Salt Lake City Corp.	2,006,000	1.87	1,609,840
B	09313540090000	78 N State	Property Reserve, Inc.	741,000	0.46	1,610,870
C	09313790260000	124 E 2nd	Property Reserve, Inc	1,079,000	0.67	1,610,447
D	09313510210000	61 E North Temple	Corp of PB of Ch JC of LDS	2,778,000	0.95	2,924,210
E	09313540080000	115 E North Temple	Corp of PB of Ch JC of LDS	1,852,300	1.00	1,852,300
				Average		1,921,533

Table 1 - Summary of Nearby Parcels

Table 2 - Estimates of Acquisition Cost of 1/4 and 1/8 acres

Map Id	Assessed Per Acre	App. Acres	Purchase Cost	One-Half Purchase Cost
A	1,609,840	0.25	0	0
B	1,610,870	0.25	402,718	201,359
C	1,610,447	0.25	402,612	201,306
D	2,924,210	0.25	731,053	365,526
E	1,852,300	0.25	463,075	231,538
Average	1,921,533	0.25	480,383	240,192

As shown in Table 2, the DPU's conclusion that no property is available or could not be purchased at a reasonable price appears to warrant further review in the future administration report on alternatives.

7) The Well Water may not Require Chlorination as a Matter of Law. Chlorination may be Discretionary.

The Memory Grove pocket residents argue that chlorination is not required.[20] The question of whether chlorination is mandatory is governed by Utah State Office of Drinking Water regulations. A May 22, 2019 letter by the State Office of Drinking Water states that the "Division *requires* a detectable free chlorine residual . . . where treated surface water is present" (emphasis added).[21] DPU memoranda also recite this conclusion.[22]

Utah Admin. Code R309-505-7 expressly requires "low quality water" to be chlorinated if connected to a public water distribution system that contains treated surface water. [23] Utah Admin. Code R309-505-8 does not require the chlorination of "high quality water" and does not appear to expressly require, as compared to R309-505-7, chlorination when a "high quality" water well is connected to a public water distribution system containing treated surface water.

The Bowen First Memorandum notes that "It is our understanding that the water obtained from the 4th Avenue Well is sufficiently high quality as to not require direct disinfection or other

[20] Resident presentation at Greater Avenues Community Council June 5 Open Monthly Meeting, observation by K. Fisher.

[21] Letter by S. Grenlie, P.E., Utah Office of Drinking Water, dated May 22, 2019, in Attachment "C" to HLC Briefing Materials.

[22] Bowen First Memorandum at 2 ("DDW regulations require that the combined water distribution system have a detectible chlorine residual present."); Bowen, Collins and Associates Memorandum dated May 31, 2019 ("Bowen Second Memorandum"), in Attachment "C" to HLC Briefing Materials at 2 ("A chlorine treatment process will be added to the water produced by the well to meet State requirements; . . .").

[23] url: https://rules.utah.gov/publicat/code/r309/r309-540.htm.

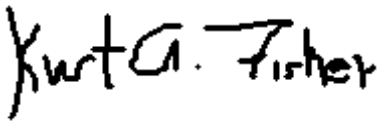
treatment."[24] This raise the issue of whether chlorination is mandatory as asserted by the DPU or is not required as asserted by the homeowners in the Memory Grove residential pocket.[25]

This is a review point that the future administration report might address.

I hope this review of the facts and issues surrounding the 4th Avenue Well site controversy is of aid to the Council and administration in focusing issues that the expected administration report might address. I hope that will aid in fully resolving the matter before the Council's June 30 budget adoption deadline.

As always your cooperation is appreciated. Please feel free to contact me with any questions that you may have.

Very Truly Yours



Kurt A. Fisher

[24] n. 11, above, at 2.

[25] Your commentator's view is that chlorination is discretionary and should be done consistent with best engineering practices and the future growth needs of the City's central business district.

KURT ALLEN FISHER
REDACTED
Salt Lake City, Utah 84147-0753
REDACTED
REDACTED

June 15, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com
Historic Landmark Commission
SALT LAKE CITY CORPORATION
451 South State Street, Room 326
Salt Lake City, Utah 84111

cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)

Re: 4th Avenue Well – Applicable Salt Lake Ordinance Requirements – Supplemental Points and Authorities concerning Master Plan and Historical Precedents - HLC PLNHLC2018-00557 and PLNHLC2018-00558

Withdrawal of Comments related to Chlorination due to UAC R309-200-5(7).

Ms. Lindquist:

This letter supplements my comment to the Historic Land Commission of June 6 regarding how the applicant's (the DPU's) proposed 4th Avenue Pump fails to comply with Salt Lake ordinance requirements. This supplemental comment concerns additional applicable ordinances and the staff evaluations prepared for the June 6th hearing.[1] I am aware that the June 6th hearing has been postponed and that further negotiations may result in a revised design being submitted; however, the following authorities and points will be relevant regardless of any pump house design that is considered by this Commission.

Effect of Salt Lake Ordinance 21A.02.040. The Staff Special Exceptions Review makes reference to Salt Lake City Ord. 21A.52.060(A), providing that "[t]he proposed use and development will be in harmony with the general and specific purposes for which this title was enacted and for which the regulations of the district were established," and staff evaluated the relationship between the proposal and the Open Space zoning ordinance.

The effect of Salt Lake Ordinance 21A.02.040 should be included in those evaluations. The ordinance requires in part that "[a]ll master plans or general plans adopted by the planning commission and city council for the city, or for an area of the city, shall serve as an advisory

[1] Staff Special Exception Review Standards, Attachment "J" to the Commission's June 6th hearing briefing materials (hereafter "Staff Special Exceptions Review"); Staff to the Commission's June 6th hearing briefing materials (hereafter "Staff Special Exceptions Review");, Attachment "I" to the Commission's June 6th hearing briefing materials (hereafter "Staff New Construction Review").

guide for land use decisions." In 1986, Salt Lake City adopted a master plan for City Creek Canyon that provided, in part, that the City would use regulations "*to ensure* that incompatible intrusions do not develop" into the historic Canyon Road residential pocket (emphasis added).[2] The Oxford Dictionary defines "ensure" as to "1. . . . make certain. 2 . . . secure (a thing for a person, etc.). 3 (usu. foll. By *against*) make safe."

This guidance suggests that the Commission should not only look at development and performance standards[3] of the existing proposal, but should also consider design alternatives that minimize the chemical treatment plant's footprint within the pocket. One alternative is a small pump house that only contains a transmission pump that will send water to a chemical treatment plant outside of the residential pocket.

Historical Precedents: Analogous public water treatment facilities have been historically located in lower City Creek Canyon include a frame water settling tank at Pleasant Valley, a brick settling building with pumps, and a value switching station. These are illustrated in an 1898 Salt Lake Tribune article.[4] Former DPU director Hooton's history of the City Creek water system[5] indicates that the brick tanks were located near the 4,598 foot elevation (Figure 1)[6] to the north and outside of the Memory Grove residential pocket.

Withdrawal of Comments Related to Chlorination: In parts of prior comments, I have suggested that there was a question concerning whether chlorination of well water is required for "high quality groundwater" under R309-505-8 (not requiring treatment) as compared to "low quality groundwater" under R309-505-7 (requiring treatment when in contact with surface waters). I withdraw those parts of prior comments. A separate Utah Office of Drinking Water regulation, R309-200-5(7), provides in part:

> DISINFECTION Continuous disinfection is recommended for all water sources. It shall be required of all ground water sources which do not consistently meet standards of bacteriologic quality. Surface water sources or ground water sources under direct influence of surface water shall be disinfected and continuously monitored for disinfection residual during the course of required conventional complete treatment *for systems serving greater than 3,300 people. . . .* (emphasis added).

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[2] City Creek Master Plan adopted April, 1986 (url: http://www.slcdocs.com/Planning/MasterPlansMaps/CC.pdf).

[3] Salt Lake City Ord. 21A-04.010(C)(2).

[4] Salt Lake Tribune. August 21, 1898. City's Water System. Utah Digital Newspapers (url: https://newspapers.lib.utah.edu/ark:/87278/s6sj2w7t).

[5] Hooton, Jr., LeRoy, J. (1986). Salt Lake City's First Water Supply. Salt Lake City, Utah at 25, Figure 1 (url: http://www.slcdocs.com/utilities/pdf files/story.pdf).

[6] 40°47'02.3"N 111°52'57.5"W (url: https://goo.gl/maps/6NmiUUEtwJKsWHX59).

Please feel free to contact me with any questions that you may have by the means listed above.

Very Truly Yours

Kurt A. Fisher

Kaf

Attached: Salt Lake City Tribune Aug. 21, 1898.

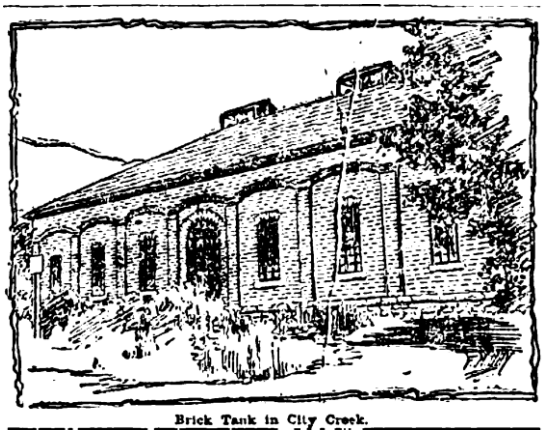


Figure 1 - Brick Tank House in City Creek Canyon from Salt Lake Tribune 1898

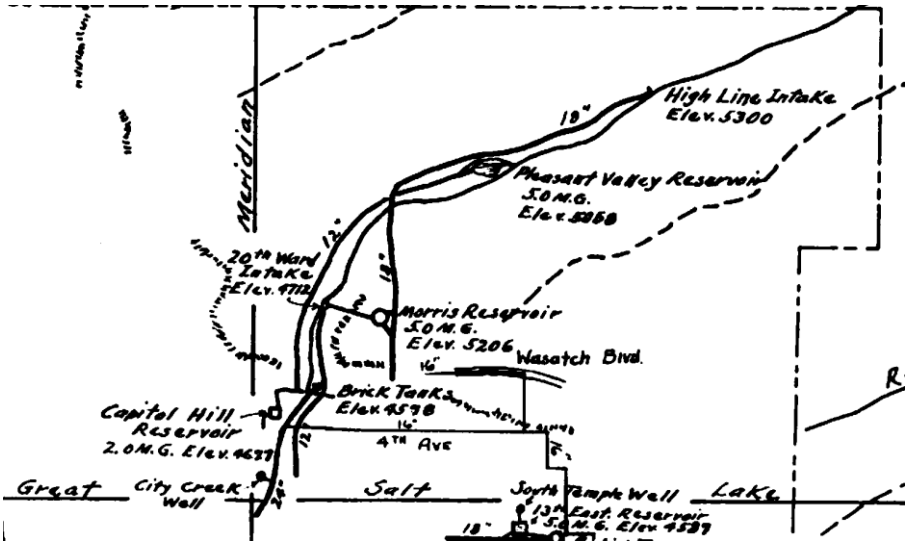


Figure 2 - - Location of Brick Tank House at Elevation 4,598 feet per Hooton (1986).

CITY'S WATER SYSTEM

Sources of Supply in City Creek, Parley's and Emigration Canyons--Methods of Distribution--Problem of Increased Supply.

Down in Kentucky, where they have a carving knife standing by the water cooler so that thirsty souls can cut the chocolate-colored beverage into sizable chunks before swallowing it, the question of a sufficient supply of the beverage does not enter into the calculation of the natives. Indeed, a very little water is popularly supposed to go a long way in the land of the blue grass and "pennyride."

Out here the sparkling rills are as sweet as those that flowed when Moses smote the rock in the wilderness and removed the dust from the throats of the Israelites. The solid rocks that form the foundation and the bone of Utah's hoary peaks have each been concealed within their fastnesses cool streams of fresh water so clear that it seems impossible for it to contain any impurities. Nature's system of filtration is here carried out on its most extensive scope. The system by which many of these streams are gathered into mains, pumping stations, reservoirs and relief tanks and distributed to Salt Lake housekeepers is intricate and interesting. From Parley's, Emigration and City Creek mountain water go through here every twenty-four hours.

The reservoir is provided with a waste-gate. It is hardly necessary to state that at this season of the year the waste gate is about as useful as the nose-ring of a Zulu.

Further up the creek, beyond the reservoir, City Engineer Kelsey has constructed a dam and a measuring weir. On the north side of the dam, where the water is deep and cool and still, dozens of handsome trout make themselves at home. They swim lazily around near the bottom and exhibit themselves as fearlessly as if they knew there is a law protecting them from wily fishermen.

The water comes all the way down from the head of the canyon. The creek stream is not very wide now. It is fed at intervals along its course by springs that trickle out of the sides of the mountains. The snow, that supplies the fluid during the spring and early summer, has entirely disappeared, and if it were not for the springs the creek bed would be as dry as a powder magazine.

City Engineer Kelsey estimates that 6,000,000 gallons of water flow over the dam every twenty-four hours. The city, however, doesn't get anything like all this water. Under a contract with the municipality the farmers living above the Jordan and Salt Lake

General View of Parley's Canyon Entrance, Showing Sentinel Rock.

canyons, the city is supplied with water.

PARLEY'S CANYON SUPPLY.

It is a long six miles over a hot and dusty road, from the city and county building to the mouth of Parley's canyon. Here, guarded by a great stone mound, aptly named "Sentinel rock," is the city's most abundant water supply. The tank, valve and screen house, under one roof, nestles close under the shadow of the rock. To the left is the reservoir, a big basin recently constructed on the most improved plans. It is eighteen feet deep, a hundred feet long by forty feet at its widest point and tapers gracefully with the canyon. The reservoir when full holds 32,000 gallons of water. At the southwest corner is a tunnel opening. This tunnel pierces Sentinel rock and empties into the screening house. Here the water roars, and tumbles and rushes into a deep well. At both entrance and exits the fluid is guarded by closely woven screens which effectually keep out any leaves, dead grass or other foliage and jetsam that finds its way down Parley's creek into the reservoir.

The screen house is as cool as the interior of a cold-storage warehouse. F. F. Brown, who watches over the place, uses it for his refrigerator, and the butter, milk and other articles there are as sweet and fresh as if they had been kept in an icehouse. Something like four million gallons of ice-cold water are emptied into the reservoir every twenty-four hours.

The Parley's Canyon Reservoir.

The canal of course loses from evaporation and seepage. There is another "leak" that causes considerable loss. This City Engineer Kelsey calls "stealage." People along the line who have no earthly right to the water take it whenever they feel so inclined, and nobody says them nay. A careful estimate gives 1,000,000 gallons per day as the loss from the sources named.

EMIGRATION CANYON.

The feature of Emigration canyon is the sump. Few people outside of the engineering profession know what a sump is. Webster's definition of the word "sump" is "the cistern or reservoir made at the lowest point of a mine, from which is pumped the water which accumulates there." The definition given by the greatly esteemed gentleman from Massachusetts does not exactly fit the city's sump, but it is close enough.

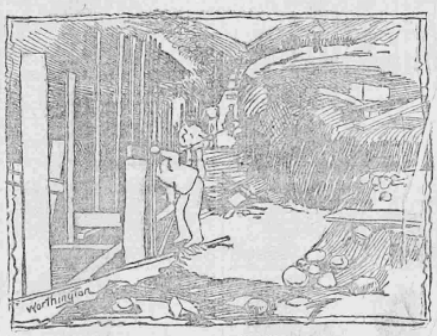
Emigration canyon is reached by a road that leads across the reservation and winds for three-quarters of a mile

Emigration Canyon, Looking North.

beyond. On the way you pass a brewery that has a little summer garden with a stuffed deer that looks as if somebody had swatted it across the back as the main attraction. A few steps beyond the brewery the canyon begins, and a mile up the canyon is the sump.

This particular sump is a sort of wooden culvert, laid across the canyon with a pump in the middle of it. Engineer James Barton is in charge. By working night and day the city gets from 150,000 to 200,000 gallons of water from the sump. It is of the surface order, coming from springs further up the canyon. When there is plenty of water the sump is not used, for then it forces itself into the pipe-line by the gravity system.

Work on the line is being pushed as rapidly as possible under a handicap of quicksand that keeps sifting into the trench in spite of all precautions against it. City Engineer Kelsey hopes



The Emigration Pipe-Line.

to complete the job within the next week or ten days. The pump will then be abandoned, thus effecting a saving of the wages of two engineers and the coal necessary to keep the fire under the boiler. The money netted to the city in this way will amount to about $15 daily.

The trench itself is 1530 feet long. It ranges in depth from seven to thirty-one feet, and the pipe to be laid in it will have a diameter of twenty-four inches. The water will go from the pipeline into another line that cuts across the canyon and through the reservation. It has a carrying capacity of 2,000,000 gallons, and has never been crowded. At the head of First South street the water flows into the Parley relief tank and from there takes the same course as the Parley water, forming part of the middle system.

Only a part of the Emigration canyon water is used for irrigation purposes. A few farmers along the line are entitled to one-seventh of the flow from Emigration creek, which does not connect with the pipeline. The other six-sevenths are owned by the First, Second and Tenth ecclesiastical wards and are used here in irrigating on the East bench. A clean has been made by other residents below the sump to all the creek water from saturday night to Monday morning, but until the matter is passed on by the courts, the validity of the claim will be in dispute.

CITY CREEK SUPPLY.

City Creek canyon is the point to which two of the three city systems look for water. It supplies the lower system, taking in the southwestern portion of Salt Lake and Capitol hill, the north bench and part of the east bench, the whole being known as the "high-line." The first station going up the canyon is the brick tank which supplies the lower system.

This tank is one of the most pretentious owned by the city. It is a handsome building, built of brick, as its name indicates, and containing two tanks, with smooth cement floors and runs down to a point below the brick tank. There it is divided in the valve-house into two lines, one running to Capitol hill and the other to the north and east benches. A reservoir on Capitol hill is filled from this line every night, thus insuring a plentiful supply of water to residents of that locality.

As in the other canyons, the City creek water is of the purest possible character. None of it is allowed to go for irrigation purposes at this season of the year, except a very small portion that trickles down the creek bed and dwindles into nothingness before it reaches the city. In the spring, when the water is high it rushes down this channel at a great rate and merges with the waters of the Jordan and Salt Lake canal at North Temple street.

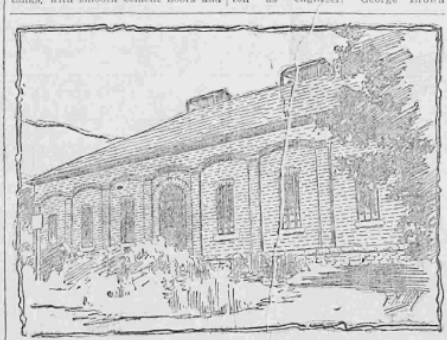
MAINS AND PIPES.

The water mains of Salt Lake if laid end to end, would reach from this city to Provo, with enough left over for lines to Ogden and Park City. In all there are 126½ miles of mains. They run in size from three to thirty-six inches, although the three-inch size is now being discarded for the four-inch main, which gives better satisfaction, where a larger pipe is not practicable.

The mains were laid under the supervision of the various waterworks superintendents. So far this year only a little more than half a mile of new pipe has been laid. Superintendent Caine has not been given the appropriations necessary, on account of the city's poor financial condition, and the work has practically been at a standstill.

There are twenty-three men regularly employed in the Waterworks department. The office force consists of Superintendent Caine and William B. Barton. Other employees are: Plumber, G. W. Kingsbury and assistant, W. W. Phillips; valve men, Thomas Allen; R. C. Brown, John Cassidy and Charles Neal; pipeman, W. J. McDonald and assistant, Henry Goddard; emergency men, H. Thompson; Henry Barnes and Col. Henry Page; at the brick tank are James McKnight, Thomas Hill and Moses Evans; John Beatty is in charge of Emigration canyon with James Barton as engineer. George Brown watches over the high line and S. F. Brown has charge of Parley's. Ed Malquist is the department blacksmith, with William Kemp as assistant. Kemp also takes care of the city horses. William H. Bells takes care of the stores.

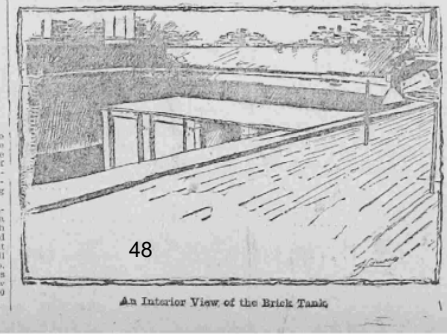
In addition to the employees named, there are three temporary water detectives who keep tab on people who sprinkle out of hours. They also look after leaky hydrants and broken stopcocks calculated to waste water. In order that their usefulness may not be impaired, Superintendent Caine prefers that his detectives remain incognito. From time to time laborers are employed in the department when extensions are being made or other work done. Their number varies from one or two to forty or fifty at a time.



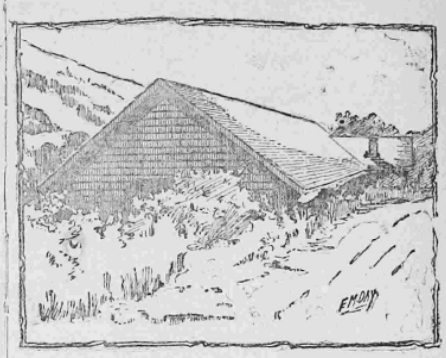
Brick Tank in City Creek.

sides. When full, these tanks hold nearly 300,000 gallons, but they are rarely, or never full at this season of the year. At 12:45 o'clock on Friday afternoon there wasn't over a foot of water in either of them. The supply is drawn out as fast as it comes in during the day, and at night enough is taken to keep the tanks from being filled.

The high-line tank is three miles further up the canyon, although its pipe



An Interior View of the Brick Tank.



Frame Tankhouse in City Creek.

IRRIGATION.

The irrigation system of Salt Lake is as interesting in its way as the other. Nearly all the irrigating water comes from Utah lake by way of the Jordan and Salt Lake canal. It enters the city near Eleventh East street, a few rods south of Eleventh South. From that point it flows north to Ninth South street and Tenth East and thence in a northwesterly direction, as the deeds say, through the city. It passes through a covered flume on Brigham street beginning at Fourth East and at the Eagle gate cuts over to North Temple street and connects with the City creek canyon aqueduct. From there the combined waters flow on down to the river.

It will be seen that an immense territory for irrigation is thus covered. A visit to the canal at its point of entrance on Thursday, showed it to be almost full of water. Before the stream reaches the point of junction at North Temple street, it is reduced to the level of a narrow brook.

There are hundreds of places along the route where the life-giving fluid is directed. On its passage it raises the heads of drooping trees and foliage, it causes grass to grow in waste places and gladdens the heart of the amateur gardener by assisting in the production of prize vegetables and fruit. The system of irrigation is not a happy-go-lucky one by any manner of means.

Watermaster Sedden has a deputy for each municipal ward, whose duty it is to see that no one gets water he is not entitled to. These watermasters are in charge of the diverting dams in their districts. They turn the water into various ditches at specified times, and the people of that vicinity use the water at the rate of one minute for each square rod of ground. Certain districts have certain days for irrigating and the householder who takes water on the wrong day intentionally is liable to arrest and prosecution.

View of City Creek Valvehouse.

THE QUANTITY.

The question of a sufficient supply of water bobs up before Salt Lakers every summer with a regularity as persistent as the ghost of Banquo, which is described as being non-downable. The specter walks more determinedly with each successive year in spite of theories calculated to "lay" it.

City Engineer Kelsey is responsible for the statement that more water is wasted by the city itself than by careless consumers. He argues that the supply would be ample for all reasonable purposes if proper storage tanks were built and if the water thieves were sufficiently prosecuted.

If Salt Lake continues to grow, and all good citizens pin their reputations as prophets to the prediction that it will, a vigorous water campaign must some time soon be waged. An adequate water supply is a sine qua non of municipal growth and prosperity, and unless this is acquired in some way, the progress of the city will be materially retarded.

It is stated that if a freak winter should come, that is, a winter with little or no snow in the mountains, Salt Lake would be practically as waterless as a Sahara. To obviate such a possibility, however remote, determined steps must be taken. Today, in spite of the plentiful snows of the winter, many sections of the city for several hours each day have no water.

A pipe-line down Big Cottonwood canyon, where the abundant supply never fails, even in the driest season, has been seriously talked of. To make such a work possible, many water rights would have to be bought, but the end would seem to justify the trouble and expense. Other plans have been suggested but the city has been lately in no condition to put them in operation.

The fact remains, however, that unless something is done, and done soon, Salt Lake's chance for growth will be reduced to what the sporting fraternity would call "double o in the green."

A tunnel, which is bored 200 feet into the living rock on the east side of the canyon, furnishes 500,000 gallons of the coldest water that ever came out of the ground in midsummer. It is almost too cold to drink near the entrance, and is as clear and sparkling as any filtered water on earth.

For several weeks a big force of laborers has been at work digging a trench for a pipe-line to connect with the sump. The water, which is backed up under ground by a ledge that crosses the canyon in front of it, will be tapped two feet below the sump. It is estimated that when the water is turned into the new pipe-line, the flow will be increased by at least 600,000 gallons every twenty-four hours.

KURT ALLEN FISHER
POB 11753
Salt Lake City, Utah 84147-0753
[redacted]
[redacted]

June 19, 2019

VIA EMAIL: mowens@utah.gov
Marie E. Owens, P.E., Director
Division of Drinking Water
UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY
P.O. Box 144830
Salt Lake City, Utah 84114-4830

cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)
Sam Grenlie, P.E., Utah DDW (sgrenlie@utah.gov)
Kelsey Lindquist, Senior Planner, Salt Lake City Historic Landmark Commission (Kelsey.lindquist@slcgov.com)

Re: 4th Avenue Well – 4th Avenue Well (WS017); DDW Matter No.: Salt Lake City Water System, System #18026, File #11680

Director Owens:

This letter is to request notice of any final order approving Salt Lake City construction plans related to the design of the Salt Lake City Department of Public Utilities ("DPU") proposed well at 4th Avenue and Canyon Road (the "Well") pursuant to Utah Admin. Code R309-500-6, to the final issuance of an operating permit pursuant to Utah Admin. Code R309-500-9, or the granting of any exceptions to construction standards pursuant to Utah Admin. Code R309-500-4(1)(b) and-or R309-105-6(2)(b). It is my intention to appeal any approval of permit issued by the Utah Division of Drinking Water ("DDW") for any rebuilt and expanded 4th Avenue Well design similar to those proposed by the DPU on May 9, 2019, as shown in Figure 1, on the grounds described below. I request that notice be given to me of any such final orders at the email listed above so I may exercise within 10 days, a right-of-appeal pursuant to Utah Admin. Code R305-7 *et seq* and R305-7-611.

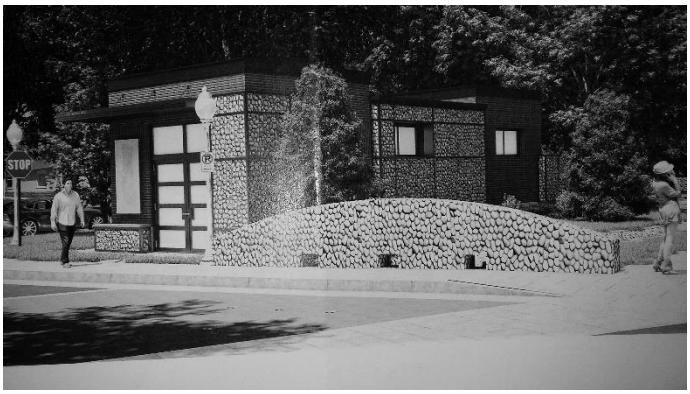


Figure 1 - Excerpt from DPU Architectural Rendering showing daytime view from south east. May 9, 2019.

The DDW may wish to consider the following additional information regarding flood and seismic risks at the proposed 4th Avenue and North Canyon Road location. I understand that the DDW and the Salt Lake City DPU are currently undergoing a pre-construction administrative review[1] of the proposed Well building construction.[2] These are non-appealable interlocutory matters. I intend to appeal any final approval of any structure in the form of the above concept design on the grounds that:

Failure to Adequately Address Flooding Risk

1) The proposed concept design is insufficiently protected against flood waters as required by Utah Admin. Code R309-540-5(1)(a), Facility Design and Operation: Pump Stations - Pumping Facilities (effective April 1, 2019),[3] which states in part, that:

> (ii) the access to the pump station shall be six inches above the surrounding ground and the station located at an elevation which is *a minimum of* three feet above the 100-year flood elevation, or *three feet above the highest recorded flood elevation, which ever is higher*, or protected to such elevations . . . (emphasis added).

There is ample historical evidence that 4th Avenue and North Canyon Road has been repeatedly flooded by the high-snow pack runoff waters of City Creek Canyon and is at risk or has been flooded by cloudburst flooding.[4] The proposed Well building is located in the

[1] Utah Code Admin. R309-500-6(2).

[2] Letter by S. Grenlie, P.E., DDW, to B. McIntire, SLC DPU, dated May 22, 2019.

[3] url: https://rules.utah.gov/publicat/code/r309/r309-540.htm.

[4] *See discussion* and supporting academic references in Letter by K. Fisher to SLC DPU dated May 25, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190525WellCommentFloodingFinal.pdf). For easy reference, the key documents and academic and research articles regarding

geological stream bed of City Creek. As a result of the 1983 state-wide floods from high-snowpack melting, the DPU's predecessor spent about $1,000,000 repairing flood damage to roads from North Temple and State Street north to Memory Grove.[5] The City replaced 1,040 feet of 6" inch pipeline excavated and damaged by flood waters between 4th Avenue and Memory Grove, 18 subsurface sewer and water connections in the area were destroyed, and the foundations of the old Brick Tank house north of Memory Grove were undermined (*id*). Historically, three cloudburst floods from nearby Salt Lake Salient canyons have sent waves of water into the city causing severe damage: the 1945 Perry's Hollow flood (2,400 cfs down M and N Streets to South Temple and moving 500 lb boulders); the 1916 Dry Canyon flood (a 4 to 10 foot wall of water went down Virginia Street and Second and Third Avenue west to 200 South and 900 East moving 1,000 to 1,500 lb boulders); and the 1918 West Capitol cloudburst flood (burying properties at 200 West in up to 1 foot of mud).[6]

To my knowledge and upon information and belief, the DPU has not submitted an application for an exception to this requirement pursuant to UAC R309-105-6(2)(b).

Failure to Adequately Address Seismic Risk

2) The proposed concept design is insufficiently protected against special seismic risks as required by Utah Admin. Code R309-500-12 - Other Permits, which states, in part that "[w]ater systems may be required to comply with other permitting requirements before beginning construction of drinking water projects or placing new facilities into service." A site specific seismic risk analysis is required for the proposed Well by the International Building Code.

The proposed chemical treatment plant is located in area that is at high risk for ground liquefaction during a magnitude 7.0 earthquake. [7] The proposed well-site and all the conceivable alternative relocation sites are located in an area where earthquake experts predict severe seismic shaking during a catastrophic earthquake.[8] Experts predict that in an anticipated 7.0 mag

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historical flooding from high-snow packs and cloudburst floods are listed with retrieval urls where available in the Addendum. Copies of documents not available by internet download are available from this writer on request.

[5] Excerpts from SLC DPU GRAMA production to K. Fisher, June 13, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190617ExcerptsfromDPUProductionre4thAveWell.pdf).

[6] *See* Addendum for historical references. Floods from both of the Perry's Hollow and Dry Fork salient side canyons are now controlled by combined road-flood structures. No such flood control structures exist in the City Creek Canyon drainage).

[7] Bartlett, S. F., Hinckley, D. W., and Gerber, T. M. (2016). Figure C-1 in: Liquefaction-Induced Ground Displacement Hazard Maps for a M7.0 Scenario Event on the Salt Lake City Segment of the Wasatch Fault Zone, Salt Lake County, Utah. Salt Lake City, Utah. (url: http://www.civil.utah.edu/~bartlett/ULAG/Liquefaction Maps Text.pdf).

[8] Wong, I., Silva, W., Wright, D., Olig, S., Ashland, F., Gregor, N., … Jordan, S. (2002). Ground-shaking Map for Magnitude 7.0 Earthquake on the Wasatch Fault Salt Lake City, Utah Metropolitan Area (Public Information Maps No. P-76). Salt Lake City, Utah. (url: https://geology.utah/hazards/earthquakes-faults/ground-shaking/); Bartlett, S. F., Hinckley, D. W., and Gerber, T. M. (2016). Figure C-1 in: Liquefaction-Induced Ground Displacement

earthquake, the ground in Memory Grove will move horizontally between 0.3 and 1.0 meters. Horizontal accelerations will be between 0.9 and 1.0 standard gravities (g_n). During such an earthquake event, there will be an estimated 2,000 to 2,500 deaths, and the estimated number of injured persons needing hospital care is between 7,400 and 9,300.[9]

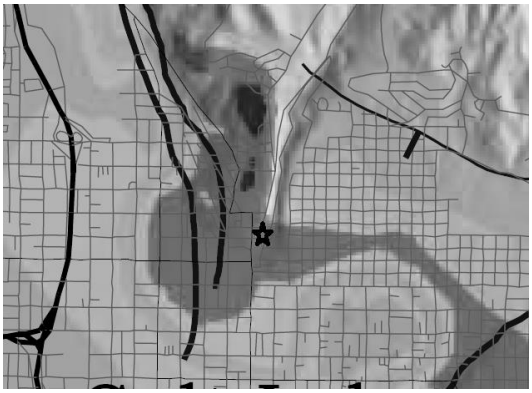

Figure 2 – Excerpt - Ground Shaking Map from Wong 2002. Notes: The proposed DPU facility is marked with a star in an MMI IX predicted shaking region. The faults to the immediate west are extensions of the Warm Springs Fault and have been active in the last 15, 000 years.

A building officer should conclude that an IBC site-specific seismic analysis is required. The IBC based on national earthquake risk maps[10] imposes supplemental load design requirements that depend on the proposed use of the structure. The proposed structure is a chemical plant. The IBC has two types of classifications based on type-of-use that are related to the Well: the Well is a Class III structure that houses toxic chemicals or is a Class IV structure that is used to maintain water pressure[11]. Class III and IV risk buildings can only be reduced to a Class II structure requiring lower physical reinforcement based on a site-specific hazard assessment.

The second type of IBC classification related seismic risk relevant to the proposed Well site is based on expected ground accelerations from national maps. Seismic Design Class A has the lowest accelerations during an earthquake; Class F the highest anticipated accelerations. Various online calculators simplify the process of determining risk and load factors applicable to

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Hazard Maps for a M7.0 Scenario Event on the Salt Lake City Segment of the Wasatch Fault Zone, Salt Lake County, Utah. Salt Lake City, Utah. (url: http://www.civil.utah.edu/~bartlett/ULAG/Liquefaction Maps Text.pdf).

[9] Earthquake Engineering Research Institute, U. C. (2015). Scenario for a Magnitude 7.0 Earthquake on the Wasatch Fault – Salt Lake City Segment: Hazards and Loss Estimates. Salt Lake City, Utah, at 3 (url: https://dem.utah.gov/wp-content/uploads/sites/18/2015/03/RS1058_EERI_SLC_EQ_Scenario.pdf).

[10] USGS. U.S. Seismic Hazard Maps. (url: https://earthquake.usgs.gov/hazards/hazmaps/); IBC § 1613.

[11] IBC § 1604.

a United States address.[12] The Applied Technology Council seismic map risk calculator indicates that the proposed 4th Avenue Well site is Seismic Class D.[13]

Under Section 1803 of the IBC, a *building official* must require a geotechnical analysis of the risk of seismic shaking and liquefaction for any Class D site.

From the DPU's concept drawings, I estimate that the chemical tank will contain approximately 2,100 gallons of concentrated sodium hypochlorite (3 foot diameter and 10 foot height). During earthquake liquefaction and container failure, the liquid chemical would then flow and mix with ground water that has pooled at the surface.

I am not an engineer; however, based on my review of the documents and concept drawings made public by the DPU, I am informed and believe that the proposed chemical treatment plant structure is not being designed to higher levels of earthquake risk that might be identified by a site-specific seismic risk assessment required in these premises by the International Building Code. To my knowledge, the DPU has not done a site-specific seismic risk analysis.

To my knowledge and upon information and belief, the DPU has not submitted an application for an exception to this requirement pursuant to UAC R309-105-6(2)(b).

Failure to Adequately Address Unauthorized Entry Risk

3) The proposed concept design is insufficiently protected against unauthorized entry as required by Utah Admin. Code R309-540-5(1)(a)(v), which requires that, "the station is protected to prevent vandalism and entrance by animals or unauthorized persons".[14] Statements made by the DPU or its consulting experts readily admit that it is not possible to comply with this requirement.[15] An initial DPU analysis done after the August meeting acknowledged that due to the nature of the proposed site, it was impractical to install security fencing normally required to prevent theft, vandalism or terrorist attacks on the chemical facility:

[12] Applied Technology Council Hazards by Location Application. Accessed June 3, 2019 (url: https://hazards.atcouncil.org/).

[13] ATC Report dated June 3, 2019, Attachment "A", hereto.

[14] Similarly, 6 C.F.R. Part 27 requires that for certain "high risk" chemical containing facilities, a Department. of Homeland Security ("DHS") security vulnerability assessment may be required. 6 C.F.R. §§ 27.215, 27.230 (performance standards) and 27.240.

[15] Memorandum by B. McIntire to K. Lindquist, Salt Lake City Planning Department dated August 30, 2018, re: Open House Public Comment Responses (hereafter "August 2018 Comments") (url: https://docs.wixstatic.com/ugd/80b28b_0bc4214b1c61450897cfbd5cc5a0e6ee.pdf); Bowen Collins and Associates, circa August 2018, re: Salt Lake City Planning Commission Assessment Memorandum (hereafter the "Bowen First Memorandum") (url: https://docs.wixstatic.com/ugd/80b28b_0e07c5f9e8ff4047a4bd9405ee4d95cf.pdf).

> Typically, culinary well buildings are completely enclosed with fencing to reduce the threat from potential vandalism, theft, and terrorism. The limited space available significantly prevents the ability to properly secure the location (August 2018 Comment Analysis at 4).

The Bowen First Memorandum also recognized the infeasibility of erecting security fencing at the site:

> Fencing to restrict access to the well site is normally recommended to prevent vandalism or other unauthorized access. Due to the location of the well and the minimal existing set-backs, fencing does not appear to be feasible (Bowen Memo. at 3).

To my knowledge and upon information and belief, the DPU has not submitted an application for an exception to this requirement pursuant to UAC R309-105-6(2)(b).

An Economic Hardship Exception is Not Warranted.

Finally, the DPU may in applications for an exception from DDW construction requirements or during the DDW review process may argue economic hardship. Such a claim would be unfounded. Whether a particular public infrastructure improvement is unreasonably expensive depends on its importance to the community and the projected gross and net revenues expected to be received over the lifespan the facility. Net revenues from the current or proposed Well design are not available publically available. But gross revenue data sufficient to make a simple estimate of the economic value of the future value of the Well's gross revenue stream is publicly available.

The June 2018 water rate structure for the DPU[16] recites that residential users are charged at a rate of 748 gallons per "Unit Measure" at a cost of $1.85 per unit. A typical City residential consumers in the Block 2 category are using between 11 and 30 "unit measures" per month. This implies that the mean revenues per gallon of water sold are 0.0025 dollars per gallon[17] or about 400 gallons for one dollar. Assume that the rate of growth in DPU water rates is 2 percent per year and the long-term rate of inflation over 100 years is 3.22%.[18]

The DPU has stated that the 4th Avenue Well Water typically supplies 3 to 7 million gallons of water per day during the summer and dry seasons months.[19] Assume this covers the 5

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[16] DPU. June 2018. Water Rates (url: http://www.slcdocs.com/utilities/PDF%20Files/UtilityRates/WaterrateswebCurrent.pdf).

[17] $1.85 / 748 gallons = 0.0025 dollars per gallon.

[18] 1913-2013 based on CPI (https://inflationdata.com/Inflation/Inflation_Rate/Long_Term_Inflation.asp).

[19] Memorandum by David E. Hansen, Hansen, Allen and Luce, Inc., to B. Stewart, Salt Lake Department of Public Utilities, re: 4th Avenue Well Assessment (hereafter "HAL Report") at 1 (url: https://docs.wixstatic.com/ugd/80b28b_3607f771b2984d63a44ce7a4c3d1c7a9.pdf). (3 to 7 million gallons per day); *see* Semerad, T. April 30, 2019. The fight over pump house pits needs of Salt Lake City's thirsty downtown against a quiet neighborhood in Memory Grove. The Salt Lake Tribune (3 to 7 million gallons per day) (url:

months from June to October (or 150 days) and the mean delivered volume is 5 million gallons per day. Assume the useful life-span of the pump station and chlorination plant is 75 years.

Based on these simplifying assumptions, the present annual estimated revenue stream to the City from the 4th Ave Well has an economic value of $1,875,000 USD per five-month long summer season.[20] (In comparison, the 2017 Annual Report for the DPU recites $72,699,328 in revenues from all of the DPUs water sales.[21]) Over a 75 year life span, the total amount of revenues that the City will collect selling 4th Avenue Well water, not adjusted for 2% compounded growth or discounted for inflation, is $140,625,000.[22] With water rates growing at approximately 2% per year and over 75 years, the total amount collected by the City from the stream of future revenues will be $326,639,265[23] If the $326,639,265 is discounted to present value at a 3.22% long-term annual inflation rate, then the present value of that future income stream is $84,848,491.[24]

The DPU has the revenue stream needed to build a proposed Well and chemical treatment plant that complies with state DDW regulations.

The complex design and engineering challenges presented by the proposed Well have conflicting constraints. If the DPU submits a design that complies with applicable state water quality laws as discussed above, the design will be so massive that it will be plainly incompatible with obtaining a zoning special exception from the City's Historic Landmark Commission. If the applicant proposes a design that is small enough to be compatible with Memory Grove residential pocket historic district, the design will probably not meet state design requirements for public water facilities. Ultimately, these conflicting design objectives are not capable of being resolved and the dilemma weighs in favor of siting the chemical treatment plant elsewhere.

I encourage the Utah DDW to use its administrative powers to direct the DPU to propose and request an exception for a design that consists of a small intermediary transmission pump house at 4th Avenue and North Canyon Road that sends the water for chlorination and fluoridation at a separate chemical treatment plant. City owned land is available within 1,000 feet – not in the direct geologic streambed of City Creek – at which it would be appropriate to locate a separate chemical treatment plant.

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https://www.sltrib.com/news/2019/04/30/residents-mouth-memory/); Stevens, Taylor. June 6, 2019. Pump house fight in Memory Grove neighborhood takes center stage during Salt Lake City budget hearing. The Salt Lake Tribune (url: https://www.sltrib.com/news/politics/2019/06/05/salt-lake-city-budget/).

[20] 5,000,000 gallons per day x 150 days x 0.0025 per gallon. $1.85 per unit / 748 gallons = $0.0025 per gallon in revenues.

[21] DPU. 2018. 2017 DPU Annual Report (url: http://www.slcdocs.com/utilities/PDF%20Files/Annual%20Reports/Annual%20PU%202017.pdf).

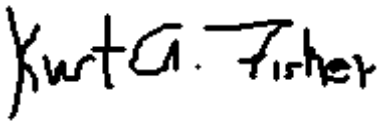
[22] $1,875,000 per year x 75 years.

[23] Excel Formula: -FV(0.02,75,1875000,0,1).

[24] Excel Formula: -PV(0.0322,75,1875000,326639265,1).

Again, I request special notice of any final approvals or orders as outlined above. Please feel free to contact me with any questions that you may have by the means listed above.

Very Truly Yours



Kurt A. Fisher

Addendum

Key Historical Salt Lake City Creek Floods and Northern Utah Cloudburst Flooding Documents, Research and Academic Articles[25]

Excerpts from SLC DPU GRAMA production to K. Fisher, June 13, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190617ExcerptsfromDPUProductionre4thAveWell.pdf).

> As a result of the 1983 state-wide floods, the DPU's predecessor spent about $1,000,000 repairing flood damage to roads from North Temple and State Street north to Memory Grove. The City replaced 1,040 feet of 6" inch pipeline excavated and damaged by flood waters between 4th Avenue and Memory Grove, 18 subsurface sewer and water connections in the area were destroyed, and the foundations of the old Brick Tank house north of Memory Grove were undermined.

Nicoli, K. and Lundeen, Z. J., University of Utah. (2016). A case study: geomorphic effects of the 2009 Big Pole fire, Skull Valley, Utah (Vignettes: Key Concepts in Geomorphology). Northfield, Minnesota. (url: http://serc.carleton.edu/47063).

> Recent example of the effects of cloudburst flooding in northern Utah. In a large Skull Valley canyon fire covering about 41,000 acres. Such fires decrease soil permeability by 9 to 100 times. *See also* Craddock, below. During subsequent heavy rains in Skull Valley, large sheet flows occurred and craved 1 meter deep rills in the alluvium. Historically, a similar incident occurred a Dry Creek Canyon. In 1915, there was a large 4 square mile fire in the Canyon that spread over the Salt Lake City Salient southern city-facing hillside. *See* Salt Lake Telegram and Tribune, 1915, below. Woolley records that on July 25, 1916, a Dry Creek Canyon cloudburst sent a 4 to 10 foot wall of water down City Creek and into city, along with mud, boulders and cattle (below, Salt Lake Tribune July 25, 1916).

Wirth, Craig (KUTV News). May 12, 2014. Remembering the flood of '83. KUTV News. At min. 1:35. (url: https://www.abc4.com/wirth/wirth-watching-remembering-the-salt-lake-city-flood-of-83/204262974)

Salt Lake Tribune, and Smart, C. (2011, Apr 29). River on State Street unlikely in 2011, official says. Salt Lake City Tribune. Salt Lake City, Utah. ProQuest No. 864039697. (Retrospective

[25] In reverse chronological order.

article in which Salt Lake Councilperson describes sandbagging efforts to control 1952 flood; available through Proquest (https://www.proquest.com/) or copy on file with this author).

Honker, A. M. (1999). "Been Grazed Almost to Extinction": The Environment, Human Action, and Utah Flooding, 1900-1940. Utah Historical Quarterly, 76(1), 23–47 (url: http://heritage.utah.gov/history/quarterly) (Includes review and photographs of Salt Lake City Creek flooding, in particular, in 1909. Overviews high-snow melt verses cloudburst flooding in northern Utah).

Salt Lake Tribune, June 3, 1983 and July 22, 1983. Reproduced in Salt Tribune. 1983. *Spirit of Survival: Utah Floods of 1983* (Available at Reference Desk, Main Branch, Salt Lake City Public Library and Special Collections, Marriott Library, University of Utah, Call No. F830 .S657).

Boyce, R. R. (1958). A historical geography of Salt Lake City, Utah. Thesis. Masters. Department of Geography, University of Utah at 41 re 1876). (On file at Special Collections, Marriott Library, University of Utah; copy in author's possession).

Salt Lake Tribune. April 30, 1952 (Available through https://go.newspapers.com/, re: floods of 1952).

Woolley, R. R. (1946). Cloudburst Floods in Utah: 1850-1938. Washington, D.C. at 96-120 (url: http://pubs.er.usgs.gov/publication/wsp994)

> Woolley listed numerous cloudbursts floods that have come across the Avenues District and from City Creek and across the proposed Well site and into the downtown: (Woolley 1946). Summer cloudburst floods included: June 13th, 1854 (city streets flooded), September 11th, 1864 (heavy flooding of North Temple from City Creek), August 25th, 1872 (downtown flooded), July 23rd, 1874 (downtown flooded from City Creek), August 1st, 1874 (Lindsey Gardens areas flooded as in 1945), August 8th, 1884 (North Temple flooded from City Creek), July 26th, 1893 (cloudburst flooded basements in city), July 19th, 1912 (1 inch fell in 1 hour filled South Temple with sand and mud from above), July 25th, 1916 (cloudburst sent a 10 foot wall of water into city along with mud, boulders and cattle), July 30th, 1930 (cloudburst over Emigration, Red Butte, and Parley's Canyons washed out highway north of Salt Lake and washed away three homes with damages of 500,000 USD), and August 13th, 1931 (four to 12 inches of water swept through streets and 12 feet of debris washed over road near Beck Hot Springs).

Craddock, G. W. (1945). The Salt Lake City Flood, 1945. Proceedings of the Utah Academy of Sciences, Arts and Letters, 23, 51–61. (On file with the Special Collections, Marriott Library, University of Utah; copy in author's possession).

Salt Lake Telegram, August 20 and 27, 1945 (Available through https://go.newspapers.com/; copy in author's possession).

Utah Flood Commission. (1931). Torrential floods in Northern Utah, 1930. Logan: Agricultural Experiment Station, Utah State Agricultural College. On file at Special Collections, Marriott Library, University of Utah. (url:.http://www.lib.utah.edu).

Salt Lake Telegram. Sept. 24, 1918. Property Damaged by Big Cloudburst. (A cloudburst flood swept down West Capitol Hill and buried properties at 200 West in up to 1 foot of mud.) (url: https://newspapers.lib.utah.edu/ark:/87278/s6d80jz5).

Salt Lake Tribune. July 25, 1916. Cloudburst Kills Cattle in Canyon. (url: https://newspapers.lib.utah.edu/ark:/87278/s6j10wfd)

> "A cloudburst breaking in Dry canyon during the electrical storm of yesterday emerged from the ravine a solid ten-foot wall of rushing water, carrying with it eight head of cattle and rocks weighing from 1000 to 1500 pounds, swirling them along as lightly as feathers. Following the course of the old waterway, the waters rushed through Popperton place, down Second and Third Avenues, turning on Ninth East to the Second South conduit before the force of the flood was spent. In the residence district of Popperton place and the avenues the telephone poles showed that the water mark to have been four feet."

Salt Lake Tribune. August 6, 1915. City's Watershed Suffers from Fire. (url: https://newspapers.lib.utah.edu/ark:/87278/s6tf17rk/14627562)

Salt Lake Telegram. August 5, 1915. Big Damage Caused by Brush Fire in City Creek. (url: https://newspapers.lib.utah.edu/ark:/87278/s6km0kdd/19586313 , re: 4 square mile brush fire in City Creek Canyon that crossed city-side ridgeline).

Salt Lake Telegram, June 19th, 1903. Salt Lake City in Path of Cloudburst, Should It Break in City Creek. (url: https://newspapers.lib.utah.edu/ar/87278/s6ck2gdq)

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[redacted]

June 19, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com
Historic Landmark Commission
SALT LAKE CITY CORPORATION
451 South State Street, Room 326
Salt Lake City, Utah 84111

cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)

Re: 4th Avenue Well – HLC PLNHLC2018-00557 and PLNHLC2018-00558
Comment: The Commission's Capitol Hill and Commercial Guidelines are Distinguishable and Without Precedential Value; Guidelines for Residential City-Wide Center Greenway Parks are the Controlling Design Guidance.

Ms. Lindquist:

This letter supplements my comment to the Historic Land Commission of June 6 regarding how the applicant's (the DPU's) proposed 4th Avenue Pump fails to comply with Salt Lake ordinance requirements. This supplemental comment concerns the role of the Commission's design guidance in any future hearing.[1] I am aware that the June 6th hearing has been postponed and that further negotiations may result in a revised design being submitted; however, the following authorities and points will be relevant regardless of any pump house design that is considered by this Commission.

[1] Salt Lake City. Salt Lake City Design Guidelines. (Accessed June 19, 2019) (url: https://www.slc.gov/historic-preservation/design-guidelines-and-ordinance-regulations/). Specifically, Design Guidelines for Historic Commercial Properties and Districts in Salt Lake City (accessed June 19, 2019) (url https://www.slc.gov/historic-preservation/design-guidelines-and-ordinance-regulations/) (hereafter "City Historic District Commercial Design Guidelines"); New Construction for Commercial Buildings in Historic Districts, Chapter 13 In City Historic Commercial Design Guidelines (url: http://www.slcdocs.com/historicpreservation/GuideCom/Ch13.pdf) (hereafter "City New Construction Historic District Commercial Design Guidelines"); Design Guidelines for Commercial Buildings in the Capitol Hill Historic District (url: http://www.slcdocs.com/historicpreservation/GuideCom/Ch15.pdf) (hereafter "Capitol Hill New Construction Historic District Commercial Design Guidelines"); Salt Lake City. A Preservation Handbook for Historic Residential Properties and Districts in Salt Lake City (accessed June 19, 2019) (url: http://www.slcdocs.com/historicpreservation/GuideRes/ResidentialGuidelines.pdf) (hereafter "City Residential Design Guidelines in Historic Districts", re: greenbelt parkways).

Design guidance for new construction of commercial buildings in historic districts is distinguishable and does not control in these premises. In summary, the City New Construction Historic District Commercial Design Guidelines and the Capitol Hill New Construction Historic District Commercial Design Guidelines provide examples of existing commercial buildings (e.g. – the) and suggest that any proposed commercial structure with a New Urban Design brick exterior are compatible with the existing historic neighborhood.

All of the examples in the Commercial Historic and Capitol Hill Historic guidelines are either old grocery stores or new multi-family buildings that are oriented as a regular residence facing the street. *None are located in the center of a center-strip greenway park.* All of the examples in the Commercial Historic and Capitol Hill Historic guidelines are either consumer sales establishments or multi-family apartments. *None are chemical treatment facilities or municipal utility buildings.* In its submissions to the Commission, the DPU has provided no counter examples.

In conclusion, the existing guidelines simply do not provide examples or on-point guidance with respect to a chemical treatment plant or a pump house. Existing guidelines are distinguishable.

Analogous examples from nearby pump houses indicate pump houses should be placed at the residential street side like ordinary residences. There are four existing examples in the vicinity of proposed 4th Avenue Well: the existing subsurface 4th Avenue well in a greenway park; the pump house at 521-529 North Cortez Street behind the State Capitol,[2] the pump house at 5th Avenue and "U" Street,[3] a utility building in lower City Creek Canyon north of Memory Grove Park[4], and the historic City Canyon Brick Tanks in lower City Creek Canyon north of Memory Grove Park.[5]

To your commentator's knowledge, there are only three instances in which any non-natural object (other than pedestrian benches) have been placed in any of the City's center-street greenway parks: the existing subsurface 4th Avenue Well; the Crimson historical marker at approximately 150 North Canyon Road, and the "Old Cedar Tree" historical monument at approximately 300 South and 500 East.

The design guidance suggested by existing examples are that above ground pump houses are always located oriented to the street as an ordinary residential home or business would be. Non-natural objects are not placed in a center-street greenway park. *Analogous above-ground facilities are never located in the middle of a center-street greenway park.* In its submissions to the Commission, the DPU has provided no counter examples.

Design guidance for greenway parks should control the Commission's decision making process. Unlike the City's commercial design standards for historic districts, the City Residential

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[2] Map location: url: https://goo.gl/maps/Afbzp9q6NPAhfuay5 .

[3] Map location: url: https://goo.gl/maps/YTDCWRBZztAW4hBCA .

[4] Map location: url: https://goo.gl/maps/pWEKniQdaw1YSSTw8 .

[5] Salt Lake Tribune. August 21, 1898. City's Water System. Utah Digital Newspapers (url: https://newspapers.lib.utah.edu/ark:/87278/s6sj2w7t).

Design Guidelines for Historic Districts provide guidance statements about the City's street-center greenway parks. The City's street-center-greenway parks were developed during the 1910s and 1920s[6] as the City evolved from ten-acre based agriculture blocks into manufacturing and railroad related residential neighborhoods. The wide lanes that supported agriculture were converted into single lane opposing direction streets with a wide street-center greenway belts. The historic district greenway belt streets begin at 600 North and 200 West and continue south through the Memory Grove residential pocket, begin again at 600 East, and then extend east to 1200 East and south to Liberty Park and 800 South.

With respect to these greenway belt parks, City Residential Design Guidelines for Historic Districts provide:

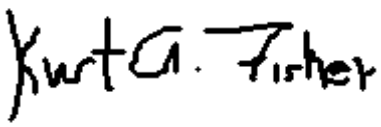
> **Landscaped Medians or Parkways.** Parkway are large grassed or treed medians that line the center of a street, such as along 600 East in Central City, and on 1200 East and 200 South in the University district. They provide a unique historical landscape amenity and are often used as recreational or leisure spaces. They markedly enhance and unify the character of both the street and that part of the district. *Where they are found, parkways add a unique character to the streetscape, and consequently should remain.* Where they have been removed, consider their reinstatement. (*id* at Part II – Design Guidelines, p. 1:10, italic emphasis added).

This guidance should control the instant matter. Non-natural above surface structures should not be built in the street-center parkways. To your commentator's knowledge, there are no current examples of above-ground buildings ever having been allowed anywhere in the City. In its submissions to the Commission, the DPU has provided no counter examples.

Finally, the Commission should consider the precedential effect of allowing an above-ground *chemical treatment plant* to be built in the middle of a historic district street-center parkway. If a chemical treatment plant is permitted, later applicants can argue to allow the conversion of the City's median greenway parks to host latte-coffee huts, freezed soft drink huts, and 7-11 convenience stores.

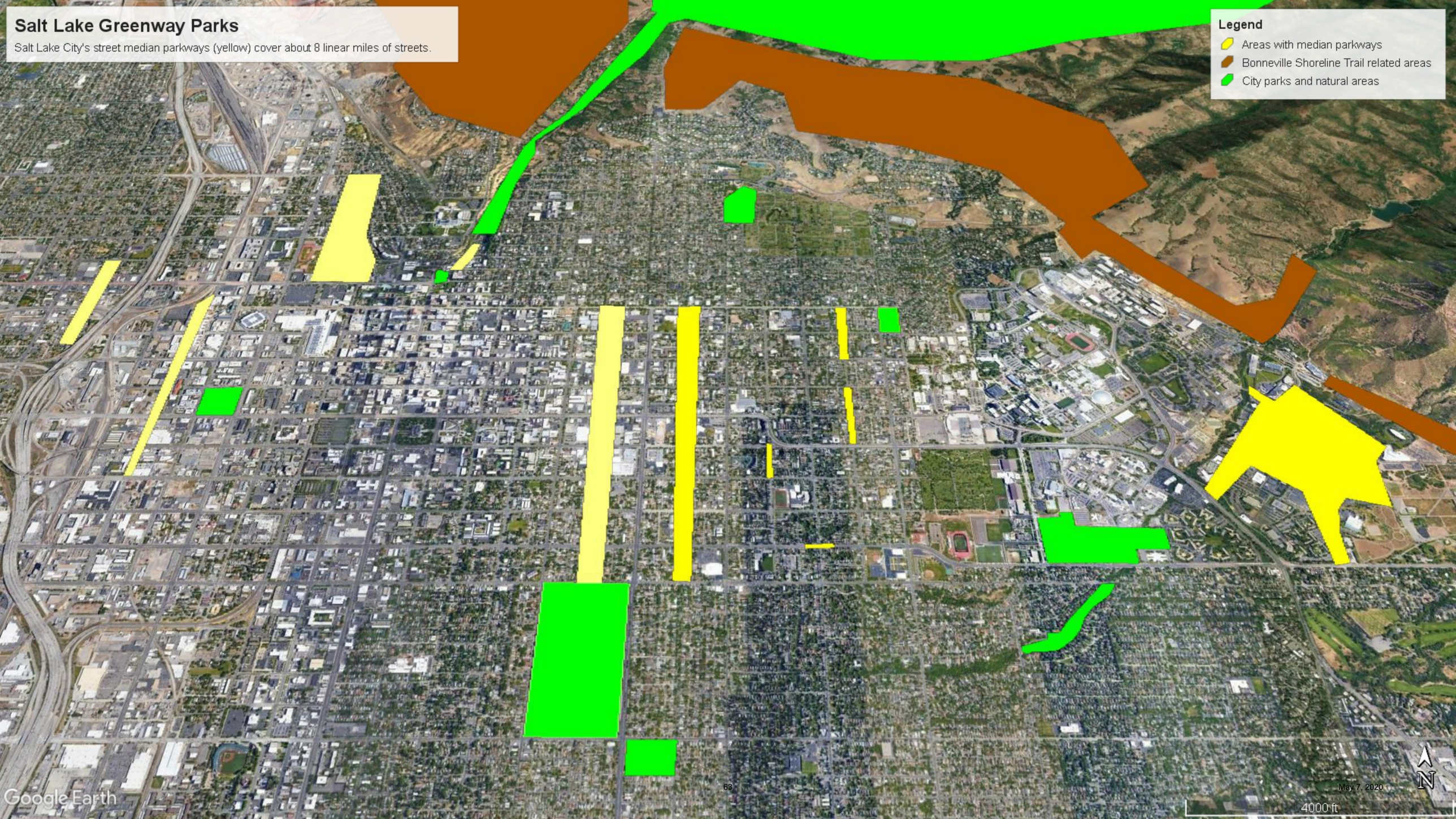
Please feel free to contact me with any questions that you may have by the means listed above.

Very Truly Yours



Kurt A. Fisher

[6] *See* Salt Lake City Municipal Record. July 15, 1917. Cover Art ("A Typical Salt Lake City Residential Street").


Salt Lake Greenway Parks
Salt Lake City's street median parkways (yellow) cover about 8 linear miles of streets.
Legend
Areas with median parkways
Bonneville Shoreline Trail related areas
City parks and natural areas
63
Google Earth
May 7, 2020
4000 ft
N

KURT ALLEN FISHER
POB 11753
Salt Lake City, Utah 84147-0753
[redacted]

June 25, 2019

VIA EMAIL: RThompson@slco.org
Robert Thompson, Section Manager
Watershed Planning and Restoration
COUNTY OF SALT LAKE
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PO Box 144575
Salt Lake City, UT 84114-4575

Re: Cloudburst Flooding Risk and Salt Lake City's Department of Public Utilities Proposed 4th Avenue Well Chemical Treatment Plant at 4th Avenue and North Canyon Road

Director Thompson:

This letter is to request if your agency has done or know of any studies that specifically model potential flow flows during cloudburst flooding events for the City Creek Drainage in Salt Lake County, Utah. The Salt Lake City Department of Public Utilities ("DPU") proposed well at 4th Avenue and Canyon Road (the "Well") [1] This chlorination treatment plant is proposed to be located in the geologic stream bed of City Creek Canyon in the Memory Grove residential pocket just south of the Memory Grove park gate;[2] the chemical treatment plant is proposed to be constructed in one of the City's median greenway parklands. I am participating as a citizen in land use planning hearings seeking a special use exception for the Well.[3] I am seeking this information to determine whether my concern is warranted that the current design of the Well (Figure 1) is insufficiently protected against potential, rare cloud burst flooding.

Although this letter seeks information on and copies of what documents may exist, ideally, I am seeking a data cube that simulates predicted cloud burst stream flows for the following hypothetical.

[1] Salt Lake City Department of Public Utilities. 2019. Information Website on 4th Avenue Well Project (url: https://www.slc.gov/utilities/fourth-avenue-well-project/, accessed May 2019).

[2] Map location: url https://goo.gl/maps/sjukaYA3AKY4uWwn8 .

[3] Salt Lake City Historic Landmark Commission, HLC PLNHLC2018-00557 and PLNHLC2018-00558 (url: https://www.slc.gov/boards/historic-landmark-commission-agendas-minutes/).

1. For two points in the Salt Lake City Creek Drainage at Bonneville Drive and North Canyon Road and at 200 North Canyon Road, Salt Lake City, Utah;
2. For fires in City Creek Canyon beginning at Pleasant Valley covering the interval 1 to 5 square miles in increments of 1 square mile;
3. In such fires soil porosity declines from 10 to 90 percent in increments of 10 percent; and,
4. For rare cloudburst flood events on the interval 1 inch to 8 inches in a 5 to 30 minute duration in increments of 1 inch.

I intend to use such information in support of arguments to DPU and Salt Lake City Historic Landmark Commission that the proposed design insufficiently considers the risk of cloudburst flooding. I acknowledge and understand that it is probably impractical based on the available data to prepare a joint probability distribution for such extreme rainfall and grass and forest fire events. Here, I would like to establish the perimeters of potential flood events.

The DPU's current concept design proposes to build the facility at grade and to omit a floodwater protective barrier required by Utah Admin. Code R309-540-5(1)(a), Facility Design and Operation: Pump Stations - Pumping Facilities (effective April 1, 2019),[4] which states in part, that:

> (ii) the access to the pump station shall be six inches above the surrounding ground and the station located at an elevation which is *a minimum of* three feet above the 100-year flood elevation, or *three feet above the highest recorded flood elevation, which ever is higher*, or protected to such elevations . . . (emphasis added).

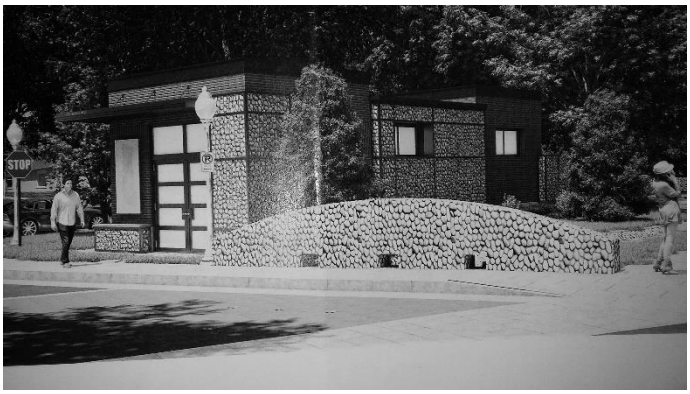

Figure 1 - Excerpt from DPU Architectural Rendering showing daytime view from south east. May 9, 2019.

The Salt Lake County Flood Control Office has prepared duration-based 100 year rainfall prediction maps.[5] Of particular interest is the 30 minute duration map, which predicts a 100 year

[4] url: https://rules.utah.gov/publicat/code/r309/r309-540.htm.

[5] Flood Control Engineering, Salt Lake County. 1999. 100 Year Return Frequency Maps – 15 Minute to 24 Hour Duration. (url: https://www.slco.org/flood-control/rainfall-maps/).

rainfall level of 1.20 inches. The National Weather Service's AHPS service provides flood predictions based on advanced simulation models and such 100 year prediction stream flows

As you are aware, the northern Utah Wasatch Front canyons and valleys are also subject to rare cloudburst flooding events that can greatly exceed the 100 year prediction levels. Craddock (1945) notes previous maximum recorded rainfalls of 4.80 and 5 inches in a five minute period during 1931 and 1936, and he estimated for the 1945 Salt Lake Perry's Hollow cloudburst flood, a maximum rainfall of 5 to 8 inches in a five minute period (with a longer duration average of 1.25 to 1.75 inches).[6] He estimated flows during the resulting cloudburst flood at 2,400 cubic feet per second. A recent example was the July 2019 cloudburst in Salt Lake City's Millcreek neighborhood that resulted in the City's Mayor declaring an emergency.[7] It is also well known for northern Utah that when such random high-rainfall events are coupled with the denuding of ground cover from grazing practices or grass and forest fires that extreme cloudburst floods events – similar to the infamous 1907 Heppner, Oregon cloudburst flood - occur.[8]

Historically, there have been three, possibly four, cloudburst floods from the nearby Salt Lake Salient that has sent waves of water into the city causing severe damage: the 1945 Perry's Hollow flood (2,400 c.f.s. down M and N Streets to South Temple and moving 500 lb. boulders); the 1916 Dry Canyon flood (a 4 to 10 foot wall of water went down Virginia Street and Second and Third Avenue west to 200 South and 900 East moving cattle and 1,000 to 1,500 lb. boulders); and the 1918 West Capitol cloudburst flood (burying properties at 200 West in up to 1 foot of mud).[9] A possible

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[6] Craddock, G. W. (1945). The Salt Lake City Flood, 1945. Proceedings of the Utah Academy of Sciences, Arts and Letters, 23, 51–61 (copy attached, *id* at 58).

[7] Biskupski , J. Mayor. July 28, 2019. Press Conference: Mayor Biskupski Declares Local Emergency in SLC. Video. YouTube.com. (url: https://www.youtube.com/watch?v=aE86VK43tII , DPU Director Laura Briefer appears to the Mayor's left); Fox News (Channel 13, SLC). July 28th, 2019. Mayor Biskupski declares local emergency after SLC flooding. Fox News. (url: https://fox13now.com/2017/07/28/mayor-biskupski-declares-local-emergency-after-slc-flooding/).

[8] Utah Flood Commission. (1931). Torrential floods in Northern Utah, 1930. Logan: Agricultural Experiment Station, Utah State Agricultural College (url:.http://www.lib.utah.edu); Salt Lake Telegram, August 20 and 27, 1945; Salt Lake Tribune, August 19, 1945; Craddock 1945, *supra*; Woolley, R. R. (1946). Cloudburst Floods in Utah: 1850-1938. Washington, D.C. at 96-120 (url: http://pubs.er.usgs.gov/publication/wsp994); Honker, A. M. (1999). "Been Grazed Almost to Extinction": The Environment, Human Action, and Utah Flooding, 1900-1940. Utah Historical Quarterly, 76(1), 23–47 (url: http://heritage.utah.gov/history/quarterly); Boyce, R. R. (1958). A historical geography of Salt Lake City, Utah. Thesis. Masters. Department of Geography, University of Utah at 41 re 1876).

[9] *See* Addendum for historical references. Floods from both of the Perry's Hollow and Dry Fork salient side canyons are now controlled by combined road-flood structures. Perry's Hollow at Chandler Drive (url https://goo.gl/maps/5DU9NJDXphwWWbXUA) and 1691 E. Federal Heights Drive (url https://goo.gl/maps/gYZvJyBUJMmH2Vtn8). Two much smaller flood control structures exist in the City Creek Canyon drainage (n. 16, *infra*).

fourth flood occurred along the highway north of the City and completely buried cars under tons of gravel (*id*).

The proposed 4th Avenue and North Canyon Road site in the geologic stream bed also has been repeatedly flooded by the high-snow pack runoff waters of City Creek Canyon.[10] As a result of the 1983 state-wide floods from high-snowpack melting, the DPU's predecessor spent about $1,000,000 repairing flood damage to roads from North Temple and State Street north to Memory Grove.[11] The City replaced 1,040 feet of 6" inch pipeline excavated and damaged by flood waters between 4th Avenue and Memory Grove, 18 subsurface sewer and water connections in the area were destroyed, and the foundations of the old Brick Tank house north of Memory Grove were undermined (*id*).

Figure 2 – Flood waters passing Ottinger Hall 300 feet north of proposed Well in June 1983. Source: KUTV News. Remembering the Floods of 1983. Web. Accessed May 2019 (url: https://kutv.com/news/local/gallery/photo-gallery-remembering-the-floods-of-1983#photo-28).

In response to the 1983 high-snowpack melt flood, the City has also built two small flood control basins – each about 15 feet deep with a triangular shape of about 100 feet by 200 feet – at the intersection of Bonneville Drive and North Canyon Road.[12] Based on the oblique pyramid formula, I roughly estimate volume of these basins at 100,000 cubic feet each.[13] These basin are principally

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[10] *See discussion* and supporting academic references in Letter by K. Fisher to SLC DPU dated May 25, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190525WellCommentFloodingFinal.pdf). For easy reference, the key documents and academic and research articles regarding historical flooding from high-snow packs and cloudburst floods are listed with retrieval urls where available in the Addendum. Copies of documents not available by internet download are available from this writer on request.

[11] Excerpts from SLC DPU GRAMA production to K. Fisher, June 13, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190617ExcerptsfromDPUProductionre4thAveWell.pdf).

[12] Map location: url https://goo.gl/maps/ez7uk97yt98Jpz6U8 .

[13] V= 1/3Bh = 1/3*200*15 *100.

designed as strainers and not to retain flood waters.[14] An analogous strainer grate also exists at the south end of the dog wading pond at Memory Grove.[15]

Part of the damage in the City's 1983 flood was caused by administrative policies. Since the late 1800s, the City had a program of removing fallen trees from the City Creek Canyon streambed from Pleasant Valley[16] to Memory Grove, but his was discontinued during the 1910s. Currently, the DPU only removes trees that have fallen on or endanger traffic along City Creek Canyon Road; there is no systematic program to remove fallen trees from the stream bed. The 1983 high-snow pack flood waters swept fallen trees that had accumulated in the 12 miles of City Creek stream bed above Memory Grove Park and down into the lower canyon, about 600 feet north of the proposed Well site:

Figure 3 – Tree debris in Memory Grove Park after flood waters receded. Salt Lake City Tribune, July 22, 1983. "Restoration of Memory Grove will be a joint project."

The first nearby ground failure associated with the 1983 flood was at the clogged culvert about 800 feet south of the proposed Well site. The underground culvert carrying City Creek burst, and a city worker had to be lowered into the pipe full of swirling flood waters to set dynamite charges and to free the blockage.[17] Nevertheless, flood waters were so great that the creek also flooded above its entry point into the underground culvert within Memory Grove Park (Figure 2 and Figure 3). In 1983, maximum flows were estimated at about 330 cubic feet per second, far above the 90 foot per second capacity of City Creek's 1908 entombment conduit.

[14] Over the last two spring seasons (2018 and 2019), I have observed that even with moderate snowpack run-off, the north basin fills to about three feet below overtopping.

[15] Map location: https://goo.gl/maps/sLptGo6ezYGptBEq6 .

[16] Map location: url https://goo.gl/maps/CojrGNv2BPiMkev18 .

[17] Salt Lake Tribune, June 3, 1983.

A second ground failure associated with the 1983 flood was a 12 foot deep sinkhole that formed north of the proposed Well site, shown in Figure 4:

Figure 4 – Twelve Foot Deep Surface Failure North of Ottinger Hall and 400 feet north of proposed Well site, looking south, June 9, 1983. Salt Tribune. 1983. Spirit of Survival: Utah Floods of 1983.

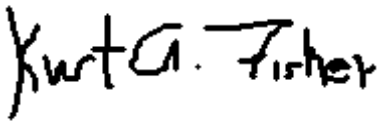
In response to the 1983 floods, the City also increased subsurface conduit carrying capacity from the intersection of North Temple and State Street by adding a second underground conduit west to the Jordan River. The flood carrying capacity of the underground pipe from Memory Grove through North Temple remains at the 90 c.f.s. of the original 1908 subsurface conduit. In conclusion, the 4th Avenue and North Canyon Road site remains vulnerable to both high-snow pack runoff and rare extreme cloudburst events and notwithstanding the two small flood basins at the intersection of Bonneville Drive and North Canyon Road.

My impression from reviewing DPU concept drawings and other available memoranda are that the DPU and the City planning staff either considers the risk of cloudburst flooding at the site to be remote or that such risk would be fully controlled by the two basins at Bonneville Drive and North Canyon Road. My requests stated above[18] are intended to a) locate studies or reports that have already analyzed the perimeters of potential cubic feet per second floodwaters during a cloudburst and/or cloudburst after fire event or b) that your office conduct a floodwater simulation of such an event so the perimeters of the risk can be quantified. Again, the joint probability distribution of such rare events probably cannot be quantified. In the interest of full disclosure, my participation the City land use matter seeks to have the 4th Avenue chemical treatment plant moved to a City owned park about 800 feet to the south and elevated three to six feet above the geological City Creek floodplain.

[18] At page 2.

Please feel free to contact me with any questions that you may have by the means listed above.

Very Truly Yours



Kurt A. Fisher

cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)
Kelsey Lindquist, Senior Planner, Salt Lake City Historic Landmark Commission (Kelsey.lindquist@slcgov.com)
Kirk P. Bagley, P.E., Bowen Collins and Associates, Inc (info@bowencollins.com) (Well consulting designers) .
John Ewanowski, P.E., CRSA (jewanowski@crsa-us.com) (Well consulting designers)

Addendum

Key Historical Salt Lake City Creek Floods and Northern Utah Cloudburst Flooding Documents, Research and Academic Articles[19]

Excerpts from SLC DPU GRAMA production to K. Fisher, June 13, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190617ExcerptsfromDPUProductionre4thAveWell.pdf).

> As a result of the 1983 state-wide floods, the DPU's predecessor spent about $1,000,000 repairing flood damage to roads from North Temple and State Street north to Memory Grove. The City replaced 1,040 feet of 6" inch pipeline excavated and damaged by flood waters between 4th Avenue and Memory Grove, 18 subsurface sewer and water connections in the area were destroyed, and the foundations of the old Brick Tank house north of Memory Grove were undermined.

Nicoli, K. and Lundeen, Z. J., University of Utah. (2016). A case study: geomorphic effects of the 2009 Big Pole fire, Skull Valley, Utah (Vignettes: Key Concepts in Geomorphology). Northfield, Minnesota. (url: http://serc.carleton.edu/47063).

> Recent example of the effects of cloudburst flooding in northern Utah. In a large Skull Valley canyon fire covering about 41,000 acres. Such fires decrease soil permeability by 9 to 100 times. *See also* Craddock, below. During subsequent heavy rains in Skull Valley, large sheet flows occurred and craved 1 meter deep rills in the alluvium. Historically, a similar incident occurred a Dry Creek Canyon. In 1915, there was a large 4 square mile fire in the Canyon that spread over the Salt Lake City Salient southern city-facing hillside. *See* Salt Lake Telegram and Tribune, 1915, below. Woolley records that on July 25, 1916, a Dry Creek Canyon cloudburst sent a 4 to 10 foot wall of water down City Creek and into city, along with mud, boulders and cattle (below, Salt Lake Tribune July 25, 1916).

Wirth, Craig (KUTV News). May 12, 2014. Remembering the flood of '83. KUTV News. At min. 1:35. (url: https://www.abc4.com/wirth/wirth-watching-remembering-the-salt-lake-city-flood-of-83/204262974)

Salt Lake Tribune, and Smart, C. (2011, Apr 29). River on State Street unlikely in 2011, official says. Salt Lake City Tribune. Salt Lake City, Utah. ProQuest No. 864039697. (Retrospective

[19] In reverse chronological order.

article in which Salt Lake Councilperson describes sandbagging efforts to control 1952 flood; available through Proquest (https://www.proquest.com/) or copy on file with this author).

Honker, A. M. (1999). "Been Grazed Almost to Extinction": The Environment, Human Action, and Utah Flooding, 1900-1940. Utah Historical Quarterly, 76(1), 23–47 (url: http://heritage.utah.gov/history/quarterly) (Includes review and photographs of Salt Lake City Creek flooding, in particular, in 1909. Overviews high-snow melt verses cloudburst flooding in northern Utah).

Salt Lake Tribune, June 3, 1983 and July 22, 1983. Reproduced in Salt Tribune. 1983. *Spirit of Survival: Utah Floods of 1983* (Available at Reference Desk, Main Branch, Salt Lake City Public Library and Special Collections, Marriott Library, University of Utah, Call No. F830 .S657).

Boyce, R. R. (1958). A historical geography of Salt Lake City, Utah. Thesis. Masters. Department of Geography, University of Utah at 41 re 1876). (On file at Special Collections, Marriott Library, University of Utah; copy in author's possession).

Salt Lake Tribune. April 30, 1952 (Available through https://go.newspapers.com/, re: floods of 1952).

Woolley, R. R. (1946). Cloudburst Floods in Utah: 1850-1938. Washington, D.C. at 96-120 (url: http://pubs.er.usgs.gov/publication/wsp994)

> Woolley listed numerous cloudbursts floods that have come across the Avenues District and from City Creek and across the proposed Well site and into the downtown: (Woolley 1946). Summer cloudburst floods included: June 13th, 1854 (city streets flooded), September 11th, 1864 (heavy flooding of North Temple from City Creek), August 25th, 1872 (downtown flooded), July 23rd, 1874 (downtown flooded from City Creek), August 1st, 1874 (Lindsey Gardens areas flooded as in 1945), August 8th, 1884 (North Temple flooded from City Creek), July 26th, 1893 (cloudburst flooded basements in city), July 19th, 1912 (1 inch fell in 1 hour filled South Temple with sand and mud from above), July 25th, 1916 (cloudburst sent a 10 foot wall of water into city along with mud, boulders and cattle), July 30th, 1930 (cloudburst over Emigration, Red Butte, and Parley's Canyons washed out highway north of Salt Lake and washed away three homes with damages of 500,000 USD), and August 13th, 1931 (four to 12 inches of water swept through streets and 12 feet of debris washed over road near Beck Hot Springs).

Craddock, G. W. (1945). The Salt Lake City Flood, 1945. Proceedings of the Utah Academy of Sciences, Arts and Letters, 23, 51–61. (On file with the Special Collections, Marriott Library, University of Utah; copy attached).

Salt Lake Telegram, August 20 and 27, 1945 (Available through https://go.newspapers.com/; copy in author's possession).

Utah Flood Commission. (1931). Torrential floods in Northern Utah, 1930. Logan: Agricultural Experiment Station, Utah State Agricultural College. On file at Special Collections, Marriott Library, University of Utah. (url:.http://www.lib.utah.edu).

Salt Lake Telegram. August 14, 1931. Flood Traps Car on Highway. (A cloudburst flood buried cars on highway to the north of Salt Lake City). (url: https://newspapers.lib.utah.edu/ark:/87278/s6cr728k).

Salt Lake Telegram. Sept. 24, 1918. Property Damaged by Big Cloudburst. (A cloudburst flood swept down West Capitol Hill and buried properties at 200 West in up to 1 foot of mud). (url: https://newspapers.lib.utah.edu/ark:/87278/s6d80jz5).

Salt Lake Tribune. July 25, 1916. Cloudburst Kills Cattle in Canyon. (url: https://newspapers.lib.utah.edu/ark:/87278/s6j10wfd)

> "A cloudburst breaking in Dry canyon during the electrical storm of yesterday emerged from the ravine a solid ten-foot wall of rushing water, carrying with it eight head of cattle and rocks weighing from 1000 to 1500 pounds, swirling them along as lightly as feathers. Following the course of the old waterway, the waters rushed through Popperton place, down Second and Third Avenues, turning on Ninth East to the Second South conduit before the force of the flood was spent. In the residence district of Popperton place and the avenues the telephone poles showed that the water mark to have been four feet."

Salt Lake Tribune. August 6, 1915. City's Watershed Suffers from Fire. (url: https://newspapers.lib.utah.edu/ark:/87278/s6tf17rk/14627562)

Salt Lake Telegram. August 5, 1915. Big Damage Caused by Brush Fire in City Creek. (url: https://newspapers.lib.utah.edu/ark:/87278/s6km0kdd/19586313 , re: 4 square mile brush fire in City Creek Canyon that crossed city-side ridgeline).

Salt Lake Telegram, June 19th, 1903. Salt Lake City in Path of Cloudburst, Should It Break in City Creek. (url: https://newspapers.lib.utah.edu/ar/87278/s6ck2gdq)

KURT ALLEN FISHER
POB 11753
Salt Lake City, Utah 84147-0753
[redacted]

July 16, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com

Historic Landmark Commission

SALT LAKE CITY CORPORATION
451 South State Street, Room 326

Salt Lake City, Utah 84111

Re: Is it reasonable to claim that the proposed 4th Avenue water treatment plant could be damaged by a cloudburst flood?

4th Avenue Well – HLC PLNHLC2018-00557 and PLNHLC2018-00558

Utah DDW Matter 4th Avenue Well (WS017); Salt Lake City Water System, System #18026, File #11680

Ms. Lindquist:

This letter supplements my prior comments to the Historic Land Commission (the "Commission") regarding how the applicant's (the DPU's) proposed 4th Avenue pump house and chemical treatment plant fails to comply with Salt Lake ordinance requirements because it is inadequately protected against floods. I am aware that the June 6th hearing has been postponed and that further negotiations may result in a revised design being submitted; however, the following authorities and points will be relevant regardless of any pump house design that is considered by this Commission. This supplemental comment concerns whether it is feasible that a cloudburst flood similar to the 1945 Perry's Hollow flood could damage or destroy the proposed Well-Water Treatment building and how likely such a failure event would be.

The key conclusions of this analysis are: 1) rough, initial modeling indicates that cloudburst-fire floods can reasonably be expected to damage the proposed chemical water treatment plant at 4th Avenue. 2) The risk of a Perry's Hollow type flood should be evaluated as a conditional probability and not by committing the base rate fallacy of estimating fire and flood risks as independent events. If the risk of fire and flood are erroneously estimated as independent, the computed risk such a severe flood is once in 1,250 years. Treating fire and flood frequencies as conditional probabilities, I estimate the lower bound of the 100 year rate for severe cloudburst-fire flood that could damage the proposed chemical plant at 2% per 100 years – or 25 times the risk if fire and flood are treated as independent events. This estimate is are more than the traditional acceptable civil engineering risk criteria of 1% per 100 years. This analysis illustrates how the risk of a cloudburst flood-fire might be assessed when evaluating the proposed chemical treatment plant at 4th Avenue and North Canyon Road.

This 2% point-estimate of risk of cloudburst-fire flooding in the next 100 years is in addition to the empirical rate of City Creek high-snowmelt flooding (post-1909) of about 3 every 100 years. The combined risk is 5 events every 100 years.

Introduction and Summary

Severe cloudburst floods have historically occurred in northern Utah associated with our narrow Wasatch Front Mountain Range canyons or valley floor flatlands. Woolley (1946) abstracts 500 such Utah floods beginning with a June 23, 1852 Salt Lake City cloudburst through 1945.[1] A particularly severe subset of cloudburst floods are cloudburst-fire floods. Such when steep canyon hillsides that are denuded by fire are followed by a cloudburst rain event, then conditions similar to southern Utah soils that are not covered by vegetation are present. A severe cloudburst-fire flood, or what would be called flash flood in desert lands, occurs that can send a wall of water and mud down canyon. Northern Utah canyon related cloudburst floods were so severe during the 1910s to 1920s, that Utah State government commissioned a special study.[2]

Rough, initial modeling indicates that cloudburst floods from many scenarios of reasonably expected combinations of burn-acreage, fire-reduced soil porosity, and, severe rainfall events can send water and mud flows down City Creek Canyon sufficient to overwhelm flood control ponds at North Canyon Road and Bonneville Drive and to damage the proposed chemical water treatment plant (Section IV at 18). The risk of such fire followed by cloudburst rain events is unknown and given currently available severe rain and wildfire historical data can only be roughly estimated.

Cloudburst floods and cloudburst-fire floods are rare events. Since 1900, along the Salt Lake northern salient, there have been two cloudburst floods and two cloudburst-fire floods on salient hillsides between Ensign Peak and Dry Fork Canyon that have deposited torrential floodwaters and large muds flows on the valley floor (Section I at 3). But these rare events cause significant damage (*id*). The likelihood of cloudburst-fire floods are a joint probability distribution of the probability of a moderate and large acre fire occurring and the probability of a severe rainfall event occurring.

Section II reviews what is known about the mean return interval between large, mid-sized, and small acre fires along the Wasatch Front Mountains, generally, and Salt Lake City, specifically. For the Los Angeles basin, Schoenberg, Peng, and Woods (2002) quantified the risk of wildfires by acreage for fires greater than 100 acres along the northern foothills that surround that desert city.[3] As expected, the frequency of wildfires decreases as burn acreage increases.

Based on currently available Utah information, it is not possible to construct a Schoenberg-like probability distribution for wildfires in the Salt Lake City foothills (Section II at 6). An extensive, ongoing research effort by the United States Forest Service ("USFS") and the Utah State Division of Forestry, Fire and State Lands provides on historical Wasatch Front Mountain Range wildfires and the mean-return-time-interval of fires greater than 1,000 acres

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[1] Woolley, R. R. (1946). Cloudburst Floods in Utah: 1850-1938. Washington, D.C. at 96-120 (url: http://pubs.er.usgs.gov/publication/wsp994).

[2] Utah Flood Commission. (1931). Torrential floods in Northern Utah, 1930. Logan: Agricultural Experiment Station, Utah State Agricultural College. On file at Special Collections, Marriott Library, University of Utah. (url:.http://www.lib.utah.edu).

[3] Schoenberg, F.R., Peng, R., and Woods, J. (2002). On the Distribution of Wildfire Sizes. Whitepaper. url: http://www.biostat.jhsph.edu/~rpeng/papers/firesize.pdf . Schoenberg and colleagues found that fire frequency declines as acreage increases by a Pareto distribution.

(Section II.A).[4] New analysis is presented here based on the experience of the Salt Lake City Fire Department fighting small sub-1-acre fires (Section II.C at 9). Missing is historical data on the rate of mid-range fires less than 1,000 acres and more than 1-acre (Section II.B at 9). Without that information, a Schonberg-like estimate of wildfire return times is not possible.

Section III at page 11 reviews what is known about likely frequency of severe cloudburst rainfall events in Salt Lake City. For the valley floor, the baseline risk is a severe 1.5 inch rainfall occurs about every 100 years (Section III.A). New analysis presented here based on two methods (power law and Gumbel distributions) estimates the frequency of such severe rainfall events in City Creek Canyon based on data from automated weather recording stations at Louis Meadows and Lookout Peak which are operated by the United States National Resources Conservation Service ("NRCS") (Section III.B at 12).

Even if fire and cloudburst flood risks could be quantified, it would be improper to reason that they are extremely rare events that occur on the scale of more than once every 500 years. For example, assuming the rate of a 1.5 inch cloudburst rainfall is once every 100 years and the risk of a large acre fire in City Creek is 3 times every 100 years, it would be improper to conclude that the joint risk of these events is 4.5 joint events every 1,000 years (0.015 per 100 years times 0.03 per 100 years = 0.0045 or 4.5 per 1,000 years). A reasonable assumption is that the lower humidities at ground level and the ability of the atmosphere to hold larger amounts of water that causes severe summer thunder storms are both related to the higher summer temperatures during periods of drought. That there have already been two such events within the last 104 years indicates that the risk of wildfire and flood are somehow dependent on each other or third unknown factors and are not independent.

Because the two causes are not independent, deciding, for example, that the risk of a cloudburst flood impacting the proposed treatment plant is less than 1 in 500 years would be a *base rate fallacy* (Section V at 2218). Conditional probability is a better way to quantify the risk, *e.g.-if* the risk of a cloudburst-fire flood is 2 in 100 years, and a 500 acre wildfire occurs, *then* the risk of a subsequent cloudburst and flood is one-half. The overall risk is then 2% x 50% or 1%.

The implication of the risk of cloudburst-fire floods for the Commission's consideration of the 4th Avenue chemical treatment plant is that the Commission will have to engage in fact-finding as to the extent and severity of that risk based on its administrative judgment. Expert opinions – and this writer is not an expert in these matters – will be unable to provide a concise opinion on this risk due to the lack of weather and fire data discussed above. However, the background information provided in this letter can aid the Commission in making that factual determination (Section VI at 24).

I. HOW MANY CLOUDBURST AND CLOUDBURST-FIRE FLOODS HAVE OCCURRED ALONG THE SALT LAKE SALIENT SINCE 1900?

Table 1 and Figure 1 lists and shows the four historical severe cloudburst events that have occurred between the Ensign Peak area and Dry Fork Canyon between 1900 and the present.

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[4] United States Forest Service. 2010. Monitoring-Tends-in-Burn-Severity (MTBS) database. LANDFIRE program. url: https://www.landfire.gov/version_comparison.php ; Utah State Division of Forestry, Fire, and State Lands. (2016). Forest Action Plan 2016 Five-Year Update. url: https://ffsl.utah.gov/forestry/forest-action-plan/ .

Two those events were cloudburst-fire events – one in 1915 and another in 1945. A hypothetical scenario of a 388 acre fire at Pleasant Valley in City Creek, discussed in Section IV, is also illustrated.

Table 1 - Four Cloudburst Floods Along the Salt Lake City Salient Since 1900. Source: Addenda "A" and "B".

Flood Date	Flood Location	Flood Description	Related Fire Date	Related fire location	Description
Sept. 25, 1916	Dry Fork Canyon to 2nd Ave and 9th East	"Solid ten-foot wall of water rushing water . . ."	Aug. and Nov. 1915	Dry Fork to Upper City Creek; Lower City Creek 4 to 7 sq. miles burned	In Aug. "four miles of east side of Canyon burned." In Nov., fire spread from Dry Fork to upper City Creek.
Sept. 24, 1918	West Capitol Hill to 200 West	Up to 1 foot of mud.	Not applicable (NA)	NA	NA
Aug. 31, 1931	West Ensign Peak	Floods mixed with mud completely buried cars on highway	NA	NA	NA
August 20, 1945	Perry's Hollow to M Street and 200 South	Wall of water and mud carried cars and gravestones to North Temple.	Aug. 1, 1944	388 Acres at the top of Perry's Hollow-City Creek ridgeline.	Craddock refers to "Fully 80 percent of the area, including all but patches of the headwater slopes and portions of the lower benchlands, was burned last fall" (at 58).

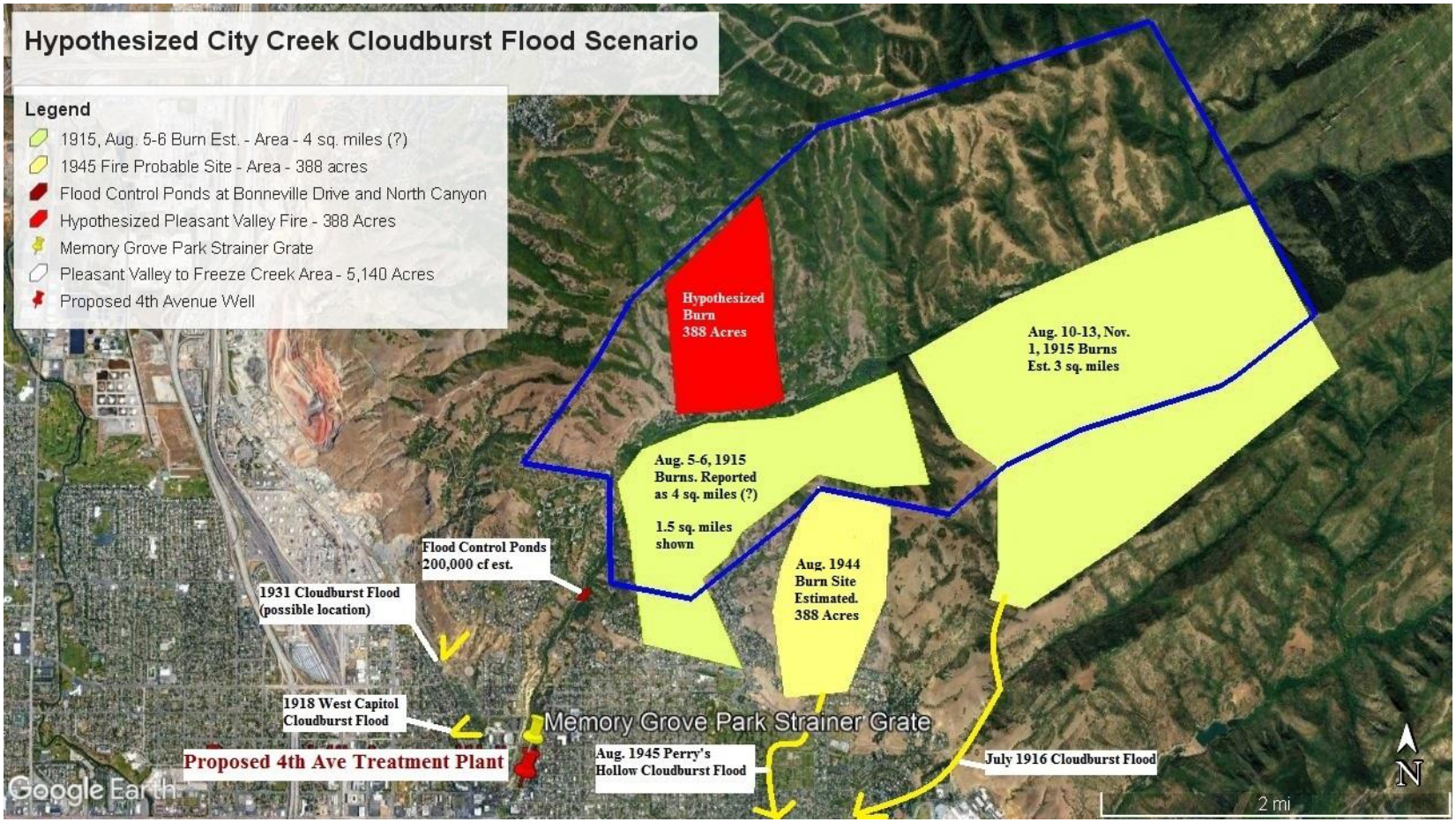

Figure 1 - Two Cloudburst Floods and Two Cloudburst-Fire Floods with Burn Areas (Yellow) with a Hypothesized Burn in City Creek Canyon (Red). Source: Table 1, Addenda "A" and "B".

These events span about 120 years. This implies that cloudburst floods occur in City Creek and on the Salt Lake Salient every 30 years (120 ÷ 4) and that cloudburst-fire floods with high waters and mudflows occur once every 60 years (120 ÷ 2). Cloudburst-fire floods are the result of two rare events: a wildfire followed by a cloudburst rain event during a following season.

II. WHAT HISTORICAL LARGE AND SMALL FIRES HAVE OCCURRED ALONG SALT LAKE FOOTHILL MOUNTAINS?

With respect to the latter fire event, the best estimates for the mean-return-interval for large 1,000+ acre fires on the Salt Lake salient west of Freeze Creek is between 31-35 years for grasslands and 51-60 years for Gamble's oak woodlands (Figure 3). For the montane upper City Creek canyon, the mean-return-interval is about 16-20 years for Aspen community slopes on the north side of Little Black Mountain and 26-30 years for the mountain's north facing Douglas Fir community (*id*).

A. What large acreage fires greater than 1,000 acres have occurred?

Since the 1980s, the USFS has tracked all wildfires in the United States that burned more than 1,000 acres. That fire data is tracked and archived in the agency's "Monitoring Trends in Burn Severity" (MTBS) database.[5] Since 1986, there have been 9 wildfires in the urban Wasatch Front Mountain Range west-facing canyons. That includes the 1988 Affleck Park fire to the south of Lookout Peak that burned approximately 9 square miles. Table 2 and Figure 2 lists and shows the location of those fires. Historical humidity data is shown for four of those fires.

Table 2 – Fire Characteristics and Fire Return Intervals for 9 Wildfires Greater Than 1,000 acres on Wasatch Front West Facing Canyons – Brigham City to Spanish Fork - from 1986 to 2018 shown in Figure 2. USFS MTBS 2019; MesoWest.

Year	Fire	Acres	Date	Return Time (yrs)	Relative Humidity	Temp (F)	Temp and RH from location
2012	Quail	2,041	7/3/2012	9.0	9.6	96.8	SLC AP 2
2003	Farmington	2,070	7/10/2003	1.0	11.7	95.0	Ogden AP
2002	Springville	2,320	6/30/2002	0.9	10.5	98.6	Provo AP
2001	Mollie	7,850	8/18/2001	5.0	11.0	95.0	Mud Springs, Lehi
1996	Vivan Complex	3,084	8/5/1996	1.0			
1995	Perry Canyon	3,123	8/15/1995	0.9			
1994	Trojan 2	3,136	9/10/1994	6.0			
1988	Affleck Park	5,748	9/2/1988	1.1			
1987	Squaw Peak	1,415	8/5/1987	n/a			
	Median	3,084		1.1	10.8	95.9	
	Average	3,421		3.0	10.7	96.4	
	Total Burned	30,787	**Region Total**	422,400	**Burned Percent**	7.3%	**Years** 32

[5] url: https://data.fs.usda.gov/geodata/edw/datasets.php?xmlKeyword=monitoring+trends+in+burn+severity .

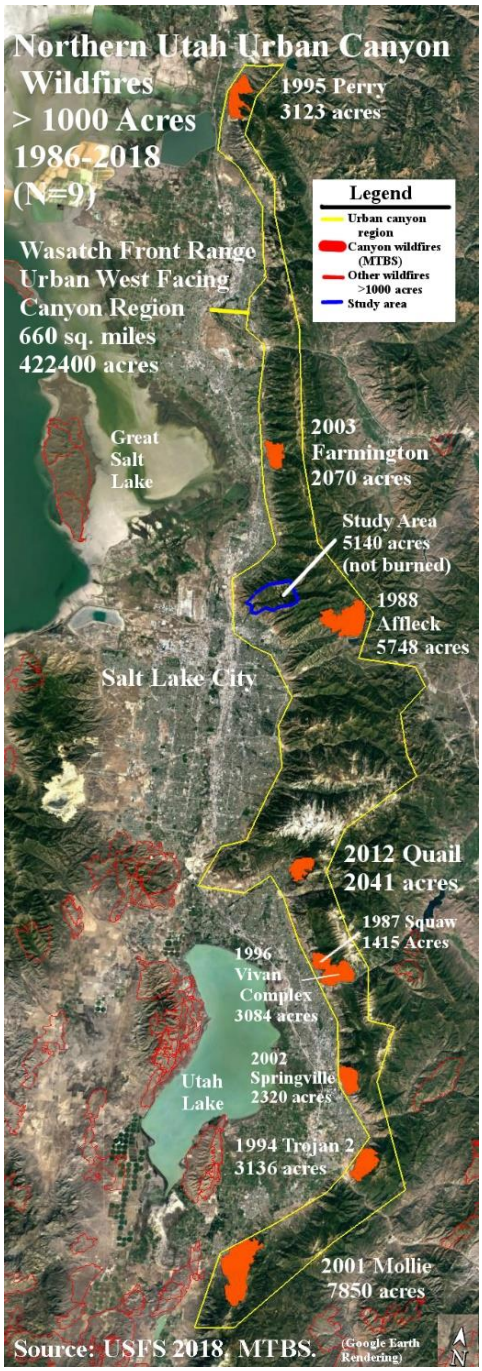

Figure 2 - Northern Utah Wildfires Greater Than 1,000 Acres: 1986 to 2018. Source: USFS 2019. Monitoring Trends in Burn Severity (MTBS) GIS database. Rendering: GoogleEarth.

During the 32 years between 1986 and 2018, 7.3% of the urban west facing canyons of the Wasatch Front Mountain Range burned in fires greater than 1,000 acres (Table 2). That point estimate indicates that the entire area will burn in approximately 32 years.

The west (left) side of Figure 2 shows many more 1,000+ acre fires on the west side of the Great Salt Lake, at Antelope Island, in the Herriman area, and along the Lakeside and NNN mountains. Those fires are outlined in red color without red fill. This is consistent with the biological community of those principally grassland and low-elevation grass-covered mountains. In contrast, there are fewer fires on the eastern high-elevation Wasatch Front canyons. Biology matters.

The USFS and allied agencies perform much more sophisticated analysis of the mean-fire-return-interval in its LANDFIRE program. That program use remote satellite imagery to categorize biological communities in a geographic region. Using its MTSB data, the USFS can then statistically assign wildfire-return intervals for all lands in the United States. Figure 3 is an excerpt from the 2010 national MTSB database for the City Creek and Salt Lake City salient.[6]

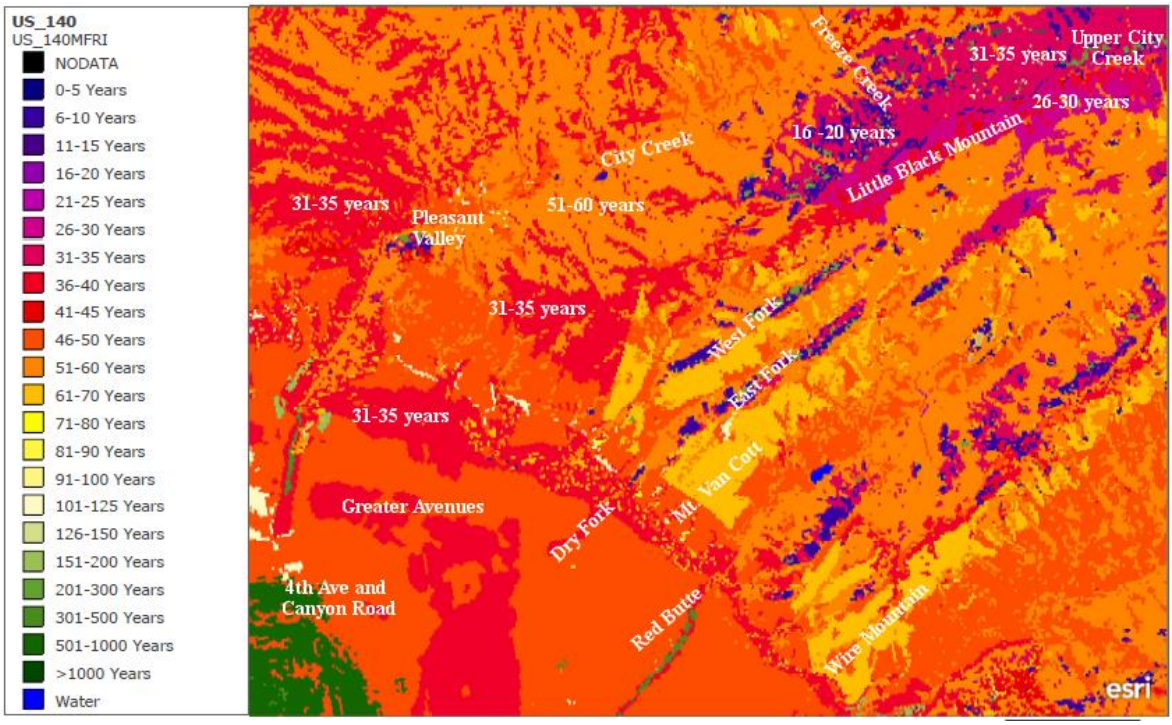

Figure 3 - Mean Fire Return Interval (Years) for City Creek Canyon and the Salt Lake Salient from USDA USFS 2010 LANDFIRE Program, File US_140MFRI.[7] Source: USFS. Rendering: ESRI ArcGIS.

The fire-return-intervals estimates are based on the background occurrence of fires. Departures from larger natural areas can occur from human activity, *e.g.* - an increased incidence from human caused fires and a reduced incidence from better fire-fighting response closer to populated

[6] This 2010 data is the last final MTBS version. Provisional data for 2014 exists that changes Figure 3 estimates. The final approved 2010 data is used here.

[7] url: https://www.landfire.gov/version_comparison.php .

areas.[8] The Utah State Division of Forestry, Fires and State Lands prioritizes fire response strategies based on a nine-point management scale that considers both the propensity for a region to burn and its proximity to large urban populations.[9] The City Creek and Salt Lake County canyons are rated "7" and "8" on the 9-point scale for fire risk and impacts and in the highest three point category for wildfire risk (*id* at 21).

Addendum B at page 29, below, lists historical newspaper accounts for fires reported or estimated at more than 1,000 acres in the Salt Lake City Creek to Emigration area. Fourteen events occurred between 1886 and 1951. After 1951, large fire reports drop off due to a gap in the newspaper review scope during 1980 to 1991 and due to modern improvements in fire-fighting techniques.

B. What medium acreage fires between 1,000 acres and 100 acre have occurred?

I was unable to obtain a catalogue of northern Utah fires less than 1,000 acres but more than 100 acres in a timely manner. The Utah State Division of Forestry and-or the Utah Interagency Fire Center is believed to have such a database that is comparable to the UFSF MTBS database. The absence of a fire catalogue prevents preparing a mean-fire-return-interval study similar to the 2002 Schoenberg, Peng, and Woods study for Los Angeles.

Addendum C, at page 33 below, abstracts 12 historical newspaper reports of such mid-sized Salt Lake City fires between 500 and 100 acres that occurred between Ensign Peak and Dry Fork.

As discussed in Section IV, fires that burn acreages between 250, 400, and 1,000 acres as a matter of mechanics can generate cloudburst-fire floods capable of reaching the 4th Avenue chemical treatment plant. That table includes the July 2008 175 acre fire behind Ensign Peak near the radio towers and the July 2018 100 acre fire that raced up Columbus Avenue below Ensign Downs.

C. How often does the Salt Lake City Fire Department fight small fires along the foothill benches?

In November 2017, I obtained a fire response database from the Salt Lake City Fire Department for the period 2012 through October 2017. The data was in the form of an Excel spreadsheet. By geo-plotting those fires, 39 foothill bench fires shown in Figure 4 were located between Beck Street and Emigration Canyon. This indicates that the Salt Lake City Fire Department responds to about 8-9 foothill bench fires of less than 10 acres per year.

Addendum D, at page 35 below, abstracts 30 historical newspaper reports of small-sized Salt Lake City fires between of less than 100 acres that occurred between Ensign Peak and Dry

[8] *See* Safford, H. D., Van de Water, K. M. (January 2014). Using Fire Return Interval Departure (FRID) Analysis to Map Spatial and Temporal Changes in Fire Frequency on National Forest Lands in California. U.S.F.S. Pacific Southwest Research Station. Research Paper PSW-RP-266.

[9] Utah State Division of Forestry, 2016 Forest Action Plan, n. 4, above.

Fork. That abstract includes an August 6, 2016 10 acre fire observed by this writer, and the August 30, 2017 seventy-five acre fire on the Bountiful side of the City Creek ridgeline.

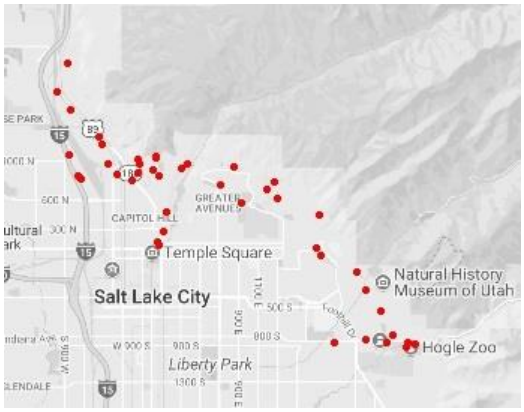

Figure 4 – Location of Thirty-nine Small Foothill Bench Fires less than 1-acre in size fought by the Salt Lake City Fire Department 2012-2017. Source: SLC Fire Dept. GRAMA Production to K. Fisher, Nov. 2017.

The 2017 Bountiful "Summerwood" fire prompted Mayor Biskupski to close entry to City Creek Canyon.

D. Can wildfire-fighting technology abate Salt Lake City wildfires greater than 1,000 acres?

Table 2 at page 6 above is instructive as to what causes wildfires and large wildfires in particular. Average daily summer humidity in Salt Lake City is 22% during the daytime. As seen in the table, large fires occur when summer daytime humidity drops to below 11%. This is the lesson of California's July 2018 Carr Fire near Redding, the Paradise, California November 2018 Fire, and the San Fernando Valley November 2017Fire that destroyed hundreds of homes. In the Carr Fire, humidity dropped to 10% over several hot summer afternoons. When humidity dropped to 9%, the forest ignited in fire that could not be controlled by modern fire-fighting techniques.

Although the City Fire Department and the Utah Interagency Fire Center have done an amazing and admirable job of controlling fires at Salt Lake City's urban interface, at some point, the large variations in northern Utah's weather will cause humidity to drop. Then a large, difficult to control fire, like Salt Lake's 1988 Affleck Park fire, can occur in City Creek. Fire-fighting technology cannot completely control nature; it should not be assumed that the fire return times shown in Figure 3, above, can be completely abated.

The next part of the joint probability that can create cloudburst-fire events is extreme rainfall.

III. WHAT IS THE RATE OF CLOUDBURST RAINSTORMS AROUND SALT LAKE CITY?

A. What is the severe rainstorm rate on the valley floor?

A recent local example of a cloudburst flood was the July 2017 event in which 2.5 inches of rain fell within one hour was Salt Lake City's eastside neighborhood and that resulted in the City's Mayor declaring an emergency[10]

Figure 5 – Mayor Biskupski and DPU Director Briefer at July 28, 2017 declaration of cloudburst flood emergency. YouTube.com. (url: https://www.youtube.com/watch?v=aE86VK43tII

The Mayor characterized the cloudburst flood as "unprecedented". It was. But cloudburst floods are also a well-known environmental hazard in northern Utah. The Salt Lake County Flood Control Office has prepared duration-based 100 year rainfall prediction maps.[11] For the east bench neighborhoods, the 30 minute duration map predicts a 100 year rainfall level of 1.20 inches and the one-hour duration predicted rainfall is about 1.5 inches. The Watershed Planning and Restoration Office extreme rain chart provides a point-estimate for a one-hundredth year 1-hour rainfall event of between 1.5 and 1.65 inches for a City Creek Canyon cloudburst:

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[10] Biskupski , J. Mayor. July 28, 2017. Press Conference: Mayor Biskupski Declares Local Emergency in SLC. Video. YouTube.com. (url: https://www.youtube.com/watch?v=aE86VK43tII , DPU Director Laura Briefer appears to the Mayor's left); Fox News (Channel 13, SLC). July 28th, 2017. Mayor Biskupski declares local emergency after SLC flooding. Fox News. (url: https://fox13now.com/2017/07/28/mayor-biskupski-declares-local-emergency-after-slc-flooding/).

[11] TRC North American Weather Consultants Meteorological Solutions, Inc. and Flood Control Engineering, Salt Lake County. (August 1999). 100 Year Return Frequency Maps – 15 Minute to 24 Hour Duration. (url: https://www.slco.org/flood-control/rainfall-maps/). *See* Excerpt, Figure 6, *infra*, at page 9.

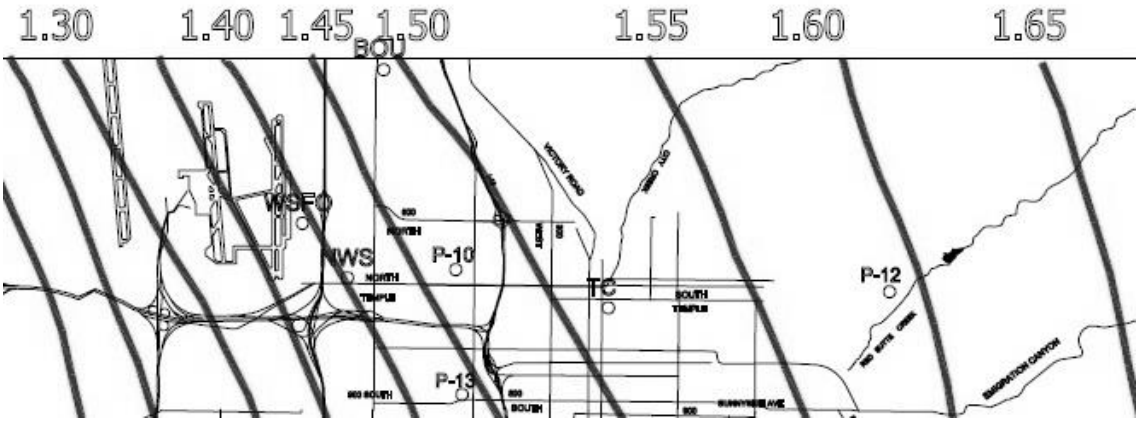

Figure 6 - Excerpt from Salt Lake County Rainfall Map –Inches of Rain, Duration 1 Hour, 100-Year Event (August 1999). n. 11.

Empirical cloudburst flood events shown in Figure 1 and Addenda A suggest this 100-year frequency estimate may be too low. During the 100 years between 1916 and 2016, there were three possible events of that magnitude in the 1.50-1.55 band – the 1918 West Capitol and the 1931 Beck Street cloudburst floods. In the 1.55-1.65 band, there were also three possible events between 1916 and 2016 – the 1916 Dry Fork flood, the 1945 Perry's Hollow flood, and the July 28, 2017 City eastside flood.

While the spatial location of cloudburst floods in each band are random, Figure 6 shows that there is a progression of intensity from the valley floor to the Wasatch Front Mountains. Mountains make weather. Other metrological data from the National Oceanographic and Atmospheric Administration (NOAA) indicates that the return times for severe storms in the mountains are higher than those of the valley floor.

B. Is the cloudburst rainfall event rate higher in City Creek Canyon?

It is often said that "mountains make weather." Higher elevations force clouds to rise and as a result, they release rain. It is reasonable to expect more cloudburst events at higher elevations such as the mid-City Creek Canyon's Pleasant Valley or in the upper canyon between Grandeur Peak and Lookout Peak. To test this commonplace, I obtained data for April 2003 to the present from SNOTEL automated weather recording stations at Louis Meadows and Lookout Peak in City Creek Canyon which have been operated by the United States NRCS.[12] Automated readings are taken every hour, the including temperature and one-hour duration accumulated rain and snowfall.

The elevation of the valley floor at 300 West and North Temple which appears in the Salt Lake County 100-year rainfall contour line of 1.5 inches is 4,280 feet. The Louis Meadows SNOTEL station is at an elevation of 6,700 feet; the Lookout Peak SNOTEL station is at an

[12] NRCS. 2019. Lewis Meadows (SNOTEL Station 972) Site Information and Reports. url: https://wcc.sc.egov.usda.gov/nwcc/site?sitenum=972&state=ut; NRCS. 2019. Lookout Peak (Station 596) Site Information and Reports. url: https://wcc.sc.egov.usda.gov/nwcc/site?sitenum=596&state=ut ; NRCS. 2019. NRCS Report Generator 2.0. url: https://wcc.sc.egov.usda.gov/reportGenerator/ .

elevation of 8,161 feet. Are there more 1.5 inch rainfall events than once every hundred-years at the higher stations?

The 288,413 raw hourly observations for these stations for the period April 1, 2003 to July 4 2019 were cleaned for instrumentation errors and station downtime.[13] The stations recorded accumulated rainfall and snow since the instrument last reset in minimum increments of 0.1 inches. Hourly incremental values had to be derived by taking the difference of the current and preceding observation. Temperature was also reported hourly. For the Louis Meadows station, 6.5% of raw observations were excluded as instrumentation errors, and, for the Lookout Peak station, 13.5% of raw observations were coded as instrumentation errors.[14] Next, data was recoded to change snow, snow-sleet, sleet, and evaporative events as "not a rainfall" event. After cleaning and recoding, 15.4 years of valid hourly observations for the Louis Meadows station and 14.24 years of valid hourly observation data for the Lookout Peak station remained in 259,584 hourly observations as summarized in Table 3.

Table 3 - Characteristics of Data Cleaning and Recoding

	Louis Meadows		Lookout Peak		Both	
	Count	**Percent**	**Count**	**Percent**	**Totals**	**Percent**
Total Observations	144,237	100.0%	144,176	100.0%	288,413	100.0%
Instrument & Other Errors	9,372	6.5%	19,457	13.5%	28,829	10.0%
Subtotal Cleaned and Recoded Observations	134,865	93.5%	124,719	86.5%	259,584	90.0%
Zero rainfall events	120,909	89.7%	113,063	90.7%	233,972	90.1%
Rainfall events => 0.1	13,956	10.3%	11,656	9.3%	25,612	9.9%
Checksum	134,865	100.0%	124,719	100.0%	259,584	100.0%

For those cleaned and recoded observations and the Louis Meadows station, 13,596 observations involved hourly rainfall precipitation in the range of 0.1 inches to 1.2 inches. For cleaned and recoded observations and the Lookout Peak station, 11,656 observations involved hourly rainfall precipitation in the range of 0.1 inches to 3.0 inches. With respect to the low percentage of total rainfall events (N=25,612, 9.9%) with precipitation greater than or equal to 0.1, recall that most of the annual precipitation at these mountain sites is in the form of snow. Snow-only events were recoded as "not rainfall" events with a rainfall precipitation equal to zero. Rainfall events involve summer season hourly changes of 0.1 inches and only rarely does more than that amount of rain fall in an hour. In contrast, winter snow can fall in feet over a few hours.

For Louis Meadows, Station 972, the observed frequencies of precipitation over 15.4 years are tabulated in Table 4 in Columns B and C. A fitted power law distribution model (R^2=0.99) appears in Column D. The expected 100-year counts are shown in Column E based on

[13] SNOTEL Station Analysis Report by K. Fisher, in process.

[14] Typically, both stations' recording devices marked a quality assurance error for either an automatically recorded precipitation or snowfall reading. Each such error event invalidated the current reading and the next subsequent reading that established a new accumulation baseline. At the beginning of each month, both stations reset their sensors, again generating a discontinuity in the incremental hourly reading.

the observational frequencies in Column B. The sum of power law distributed random variables is the sum of the variables with the same power α parameter and a scaled C_0 parameter ($y= C_0x^{-\alpha}$).[15] This means that the 100-year expected observations are the same as the original observations during a shorter interval scaled by 100 years divided by the initial observation duration, *e.g.* – 100 ÷ 15.39 = 6.5). For example, the observed 1.2 inch single event in Column B translates into 6 expected events over 100 years in Column E. The expected and predicted 100-year counts are shown in Figure 7 for a 100-year model (Columns E to F in Table 4).

Table 4 – Louis Meadows SNOTEL Station – Frequency of Observed Hourly Rainfall Events and 100-Year Hourly Predicted Counts (N=134,865 observed Hours)

A	B	C	D	E	F
	Over 15.39 observed years			Over 100 predicted years	
Precipitation (in)	**Count (observed)**	**Percent**	**Count (predicted)**	**Count 100-years (expected)**	**Count 100-years (predicted)**
0.0	120,909	89.652%	120,952	785,350	785,633
0.1	12,793	9.486%	11,690	83,095	75,931
0.2	913	0.677%	2,980	5,930	19,355
0.3	155	0.115%	1,130	1,007	7,339
0.4	57	0.042%	532	370	3,459
0.5	19	0.014%	288	123	1,871
0.6	8	0.006%	171	52	1,113
0.7	3	0.002%	109	19	709
0.8	4	0.003%	73	26	477
0.9	2	0.001%	51	13	334
1.1	1	0.001%	28	6	181
1.2	1	0.001%	21	6	138
1.3			*17*		*108*
1.5			*11*		*69*

[15] This was verified by simulation in the instant matter.

Source: Author and NRCS SNOTEL Reporter 2.0. Notes: Italicized values are extrapolated beyond the range of the observations. Station 972; elevation - 6,700 ft.

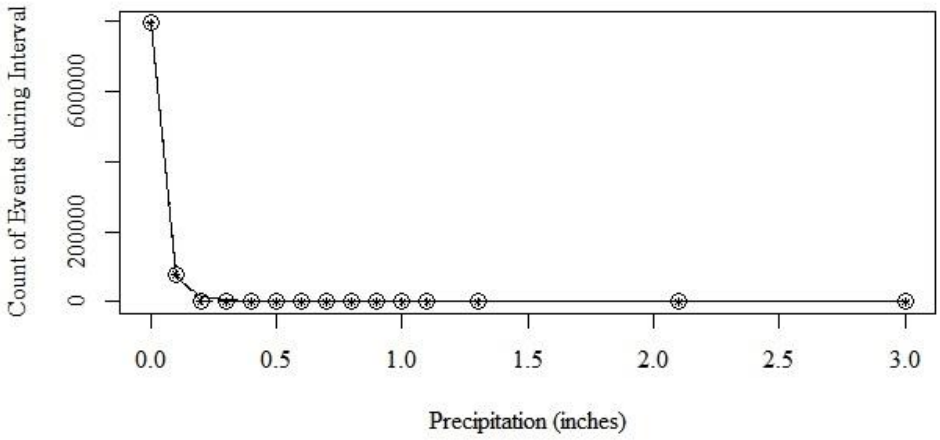

Figure 7 - Louis Meadows SNOTEL Station – Power Law Model of Predicated 100-Year Hourly Rainfall Events. * - Observed; Circles - Predicted. Source: Columns D and E, Table 4.

For Lookout Peak, Station 596, the observed frequencies of precipitation over 14.2 years are tabulated in Columns B and C of Table 5. The observed 1.3 inch single event in Column B translates into 7 expected events over 100 years in Column E (100 ÷14.24 = 7.0). A predicted power law distribution model (R^2=0.99) over 100-years appears in Columns E and F. The 100-year power law model is shown in Figure 8.

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Table 5 – Lookout Peak SNOTEL Station – Frequency of Observed Hourly Rainfall Events and 100-Year Hourly Predicted Counts (N= 124,719 Observed hours)

A	B	C	D	E	F
	Over 14.24 observed years			Over 100 predicted years	
Precipitation (in)	**Count (observed)**	**Percent**	**Count (predicted)**	**Count 100-years (expected)**	**Count 100-years (predicted)**
0.0	113,063	90.654%	113,099	794,131	794,385
0.1	11,130	8.924%	10,120	78,175	71,080
0.2	379	0.304%	2,466	2,662	17,320
0.3	76	0.061%	906	534	6,360
0.4	38	0.030%	416	267	2,924
0.5	18	0.014%	221	126	1,550
0.6	5	0.004%	129	35	906
0.7	1	0.001%	81	7	569
0.8	1	0.001%	54	7	378
0.9	2	0.002%	37	14	262
1.1	1	0.001%	27	7	188
1.2	2	0.002%	20	14	139
1.3	1	0.001%	12	7	81
1.5		0.000%	*7*	*7(?)*	*51*
2.1	1	0.001%	2	7	17
3.0	1	0.001%	1	7	5

Source: Author and NRCS SNOTEL Reporter 2.0. Notes: Italicized values are predicted within the range of the observations. Station 596; elevation – 8,161 ft.

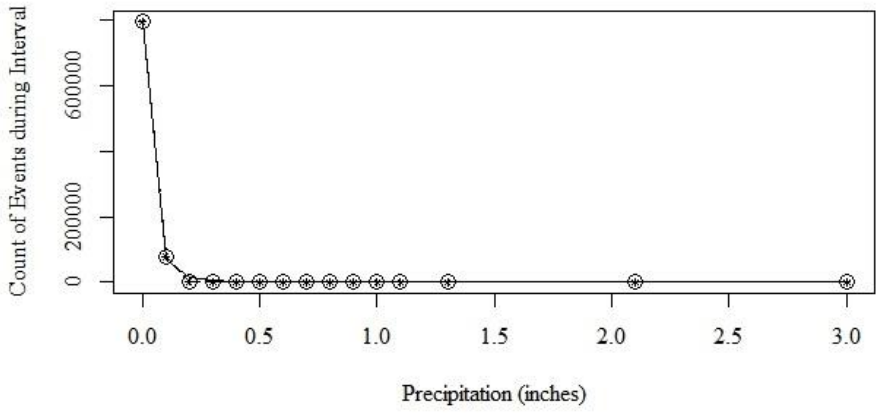

Figure 8 – Lookout Peak SNOTEL Station – Power Law Model of Predicated 100-Year Rainfall Events. * - Observed; Circles - Predicted. Source: Columns D and E, Table 5.

The overall result of this gathering of SNOTEL data and analysis is:

Table 6 - Expected Count of 1.5 inches Rainfall Events every 100 Years by Altitude

Station	Elevation (feet)	Expected Number of 1.5 inch rainfall events per 100-years
Louis Meadows	6,100	6
Lookout Peak	8,161	7

This power-law methodology is not a generally accepted method used by hydrologists for predicting the extreme rainfall frequency. The generally accepted method is to analyze rainfall using the Gumbel distribution method for extreme value events.[16] That method of analysis also indicates that for heavy and extreme rainfalls between 1.0 and 1.5 inches, that are shown in Section IV to be capable of producing cloudburst-fire floods, such events occur on the order of 20 times per 100 years.

The Gumbel distribution method involves determining the maximum rainfall event each year for a number of years. That data is used to estimate the parameters for the Gumbel cumulative distribution that predicts the likely interval of time in which a specified amount of rainfall will be exceeded. Table 7 summarizes the Gumbel distribution computation for the Louis Meadows and Lookout Peak SNOTEL stations.

Table 7 - Max. Exceedance Rainfall (inches) by 4 to 100 Year Intervals and Excepted 100 Year Events Counts for SNOTEL Stations at Louis Meadows and Lookout Peak

		Maximum exceedance rainfall inches (X*)		
Elevation (feet)		**6,100**	**8,161**	
Return time years	**Expected Count per 100 years**	**Louis Meadows**	**Lookout Peak**	**300 W. N. Temple**
4	25	0.9	1.6	
5	20	1.0	1.7	
7.5	13	1.0	1.9	
10	10	1.1	2.1	
25	4	1.3	2.6	
50	2	1.4	3.0	
75	1	1.5	3.3	
100	1	1.5	3.4	1.5

Source: Author and NRCS SNOTEL Reporter 2.0.

Table 6 indicates that as altitude increases, the number of extreme rainfall events increases. Table 7 indicates the frequency (the Expected Count column) of events that are capable of generating cloudburst-fire floods for larger burned acreages can occur quite frequently – as many as 20 to 25 years out of 100 years.

[16] Hornberger, G.M., Wiberg, P.L., Raffensperger, J.P. and D'Odorico, P. (2012 2nd). *Elements of Physical Hydrology*. Baltimore, M.D.: Johns Hopkins University Press at 36.

If an unfortunate congruence of a wildfire in a burned area of City Creek Canyon and a cloudburst rainfall event occurred, would the surface runoff be sufficient to generate a flood that could reach the proposed 4th Avenue chemical treatment plant?

IV. WHAT ARE THE PARAMETERS OF CLOUDBURST-FIRE FLOODS THAT COULD BE REASONABLY EXPECTED TO DAMAGE THE 4TH AVENUE CHEMICAL TREATMENT PLANT?

A simple model that explores the cloudburst flood event space shows that mechanically, a large cloudburst flood in City Creek could reach 4th Avenue and North Canyon Road. One lay technique for assessing whether cloudburst flooding risk is speculative is simulation. First order simulation is the art of making a first rough approximation for which no better information is currently available or might become available in the future.[17] Such rough simulations are a more rationale decision-making method than relying on simple intuition or by ignoring a material factor.

One approach to evaluating whether physically a cloudburst flood in City Creek Canyon could reach 4th Avenue is to pose the question: "What if a 1945 Perry's Hollow cloudburst flood[18] on the south face of the ridgeline separating the City and City Creek Canyon occurred on near Pleasant Valley below the south facing ridge between City Creek Canyon and Bountiful?" This question defines the perimeters of what flood scenarios might have adverse impacts on the 4th Avenue chemical treatment plant, *assuming that, after a wildfire, a cloudburst flood occurs.*

In the Perry's Hollow 1945 event, 388 acres burned in a 1944 grass fire. This resulted in the soil losing its porosity and ability to hold rain water. After a burn, soil porosity can change from 100% retention or decline to about 10% retention. In the fall of 1945, a cloudburst storm deposited between 1.25 and 1.75 inches (or an average of 1.5 inches) in one hour with possible intermittent bursts of between 5 and 8 inches of rain per hour.[19] The resulting cloudburst flood sent a 2,400 c.f.s. wall of water and mud down Perry's Hollow, breached the city cemetery wall, and then carried gravestones and 500 lb. boulders down M and N Streets to South Temple. In response to this flood during the 1980s, the City constructed a combined-road flood control structure on Chandler Drive.[20]

What would happen if a 1.5 inch per hour cloudburst storm of 1 hour duration occurred over a 388 burned acres on the north slope above Pleasant Valley in City Creek Canyon? This hypothesized scenario is illustrated in Figure 1 at page 5, above.[21]

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[17] Weinstein, L. and Adam, J. A. (2009). Guesstimation: Solving the World's Problems on the Back of a Cocktail Napkin. Princeton University Press; Harte, J. (1988, 1st Ed). Consider a Spherical Cow: A course in environmental problem solving. Univ. Science Books.

[18] Craddock (1946). Salt Lake Telegram, August 20 and 27, 1945 (Available through https://go.newspapers.com/; copy in author's possession).

[19] n. 18, above.

[20] Map location – url: https://goo.gl/maps/m4QNHVuoqUxNsJjE7 .

[21] *See* Addenda "A" and "B" for supporting references to historical cloudburst floods shown in Figure 2.

The resulting volume of cloudburst flood water would be about 2,112,660 cubic feet.[22] If soil porosity is 100%, the ground would absorb all the water. But if as occurred in Perry's Hollow, soil porosity is 10%, then 90% of the rainfall, or 1,901,394 cubic feet would then proceed to flow downhill and out the City Creek stream bed (2,112,660 times 0.90). This complementary 90% is the "solidity" of the soil.[23] The 2,112,660 cubic feet of rain water is falling through an imaginary horizontal plane above a slope. The slope beneath that horizontal plane has more area and would absorb more water proportional to its area. The typical slope on the north half of City Creek Canyon is 20%. Thus, 1,901,394 cubic feet of water is adjusted downwards to 1,786,726 cubic feet.[24]

By comparison, an Olympic-sized swimming pool contains about 88,000 cubic feet of water. The outdoor 50 meter pool at the Steiner Aquatic Center is an Olympic pool.[25]

The slope above the north face of Pleasant Valley is similar to the Perry's Hollow headwaters. Initially, the flow of the hypothesized cloudburst flood would be similar – about 2,400 cubic feet per second. The flow would slow as it approached the more flat terrain at North Canyon Road and Bonneville Drive.

At North Canyon Road and Bonneville Drive, there are two small flood control basins constructed in response to the 1983 floods – each about 15 feet deep with a triangular shape of about 100 feet by 200 feet – at the intersection of Bonneville Drive and North Canyon Road.[26] Based on the oblique pyramid formula, I roughly estimate volume of these basins at 100,000 cubic feet each.[27] These basin are principally designed as strainers and not to retain flood waters.[28]

When the hypothesized floodwaters of a 1.5 inch per hour cloudburst storm that sends 1,786,726 cubic feet of water down canyon reaches these structures, their 200,000 cubic feet capacity would be quickly overwhelmed, leaving 1.6M cubic feet of water to travel down canyon. Even if one-half of 1,786,726 cubic feet of water was absorbed prior to reaching these

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[22] 388 acres * 43560 sq-ft per acre * 1.5 inches * 1 foot per 12 inches per hour = 2,112,660 cubic feet.

[23] "Solidity" is the complement of "Porosity". Porosity refers to the percentage of water that is retained by the ground,*.e.g.* a surface with 40% porosity retains 40% of water that falls on it in a given duration. This implies that the surface has 100%-40%=60% solidity.

[24] "Adjusted Volume CF" means the net volume of water is reduced proportional to the degrees of slope. 20% is the working slope angle of the south-facing, northern half of City Creek drainage. 2,111,660*cosine(slope in radians)=2,111,660-0.94=1,985,251 cubic feet.

[25] Map location: url: https://goo.gl/maps/YbFQBsVM8rea7WSG9 .

[26] Map location: url https://goo.gl/maps/ez7uk97yt98Jpz6U8 .

[27] V= 1/3Bh = 1/3*200*15 *100.

[28] Over the last two spring seasons (2018 and 2019), I have observed that even with moderate snowpack run-off, the north basin fills to about three feet below overtopping.

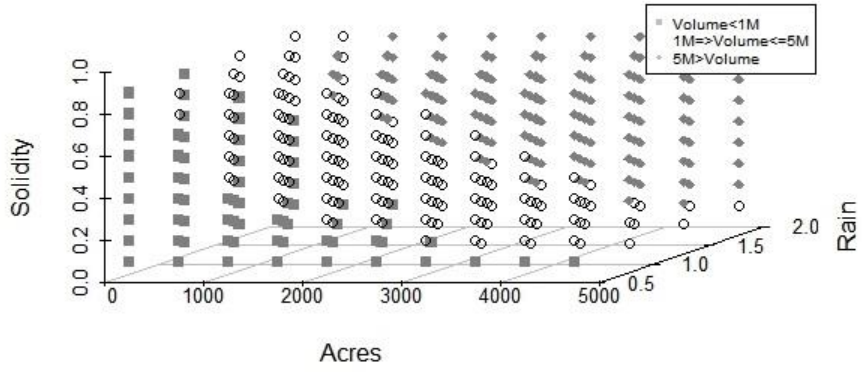

Figure 9 – Cloudburst Event Subspaces. 1M-5M flood water volumes (open circles), low-volume floods unlikely to cause damage (grey squares), and >5M floods with less-likely high burned acreages (grey diamonds). Source: Table 8.

ponds, about 700,000 cubic feet of water would still travel downstream to the next flood control feature – a strainer grate at the south end of the dog wading pond at Memory Grove.[29]

This grate accesses the 1908 City Creek entombment conduit that post-1983 still has an approximate capacity of 100 cubic feet per second. This structure would also be easily overwhelmed by the remaining 1.7M cubic feet of flood water.

Figure 1 (at page 5, above) illustrates only one of many permutations of possible combined wildfires followed by a cloudburst scenario that might occur in the lower Pleasant Valley-to-Freeze Creek City area of the City Creek drainage. A full permutation of all possible scenarios might involve a) 0.5 to 2.0 inches of rain fall in one-half inch increments; b) soil porosity between 10% and 90% in 10% increments; and burned acres from 250 to 4,750 acres in increments of 500 acres each. In those intervals, there are 360 permutated scenarios that are summarized in Table 8 and visualized in Figure 9.

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[29] Map location: https://goo.gl/maps/sLptGo6ezYGptBEq6 .

Table 8 – Characteristics of Possible Cloudburst Flood Scenarios Ordered by Floodwater Volumes - Selected by Minimum Acres or Less than Maximum Solidity† (N=17 of 360)

Volume CF	Slope	Adjusted Volume CF[30]	Olympic Pools	Acres[31]	Rain Inch	Solidity[32]
317,625	20	298,470	3	250	0.5	0.7
544,500	20	511,663	6	250	1.0	0.6
1,089,000†	20	1,023,325	12	250	2.0	0.6
1,089,000†	20	1,023,325	12	750	0.5	0.8
1,089,000†	20	1,023,325	12	750	1.0	0.4
1,089,000	20	1,023,325	12	250	1.5	0.8
1,633,500	20	1,534,988	17	250	2.0	0.9
1,815,000	20	1,705,542	19	1250	0.5	0.8
2,722,500	20	2,558,313	29	750	2.0	0.5
3,675,375	20	3,453,723	39	750	1.5	0.9
4,900,500	20	4,604,964	52	750	2.0	0.9
6,897,000	20	6,481,060	74	4750	0.5	0.8
9,438,000	20	8,868,819	101	3250	1.0	0.8
13,884,750	20	13,047,397	148	4250	1.0	0.9
18,104,625	20	17,012,783	193	4750	1.5	0.7
31,036,500	20	29,164,770	331	4750	2.0	0.9

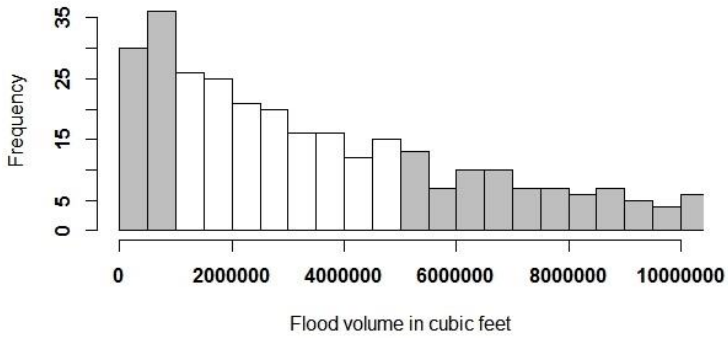

Figure 10 - Frequency of Possible Cloudburst Flood Scenarios (N=360, truncated at 10M cubic feet, max 31.2M cf.; each bar represents 500,000 c.f.; grey bars correspond to shading in Error! Reference source not found.**.)**

Table 8 describes 17 representative scenarios out of the possible 360. Several scenarios can result in the same flood water flow. Where ties existed, the minimum acre entry was chosen

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[30] n.23, above.

[31] "Acres" means the area of an imaginary horizontal surface above a slope. Because rain falls through this imaginary plane on to a sloped surface, the volume of absorbed water is increased, and the net volume of water traveling downhill is reduced, *e.g.* – the "Adjusted Volume CF".

[32] n.24, above.

for inclusion in the table and are marked with †. This procedure resulted in also biasing the representative scenarios with those that had the highest soil solidity. Further acreage ties where the top two entries had the same acreage were resolved by using the entry that had less than the maximum solidity, and those entries are (also marked with †. A potential flow of 1M or 1.5M cubic feet of flood water is abstract to most readers. To provide a more human-based measurand, the "Olympic Pool" column was added, and it expresses the equivalent volume of water stored in a number of Olympic regulation-sized swimming pools.

The event-space visualization in Figure 9 is graphically misleading in that it assumes that the density on each scale is uniform. As noted above, this is not the case. Higher acreage wildfires are less likely than small fires, probably by a Pareto distribution.[33] Higher acreage-high rainfall events are less likely than small acreage-moderate rainfall events. How then can the risk of a Perry's Hollow type cloudburst-fire flood be characterized?

V. THE BASE RATE FALLACY CAN LEAD TO UNDERESTIMATING THE PROBABILITY OF WILDFIRES FOLLOWED BY CLOUDBURST-FIRE FLOODS.

Based on the foregoing analyses of wildfire and severe rainfall events, a commonplace assessment of the joint probability of a wildfire event and a cloudburst flood event would be to multiply the two probabilities. For example, if the risk of a wildfire greater than 1,000 acres is 4 in 100 years (0.01 or 4%, *see* Table 2) and the risk of a cloudburst flood of 1.5 inches is 1.5 inches (Figure 6), then their joint probability is 0.04 times 0.01, or 0.0004, or 4 in 10,000 years or once every 2,500 years. *This reasoning only applies to events that are independent.*

Where two events are *not* independent, applying this reasoning is called the *base rate fallacy*. The base rate fallacy is the failure to consider that the probability of the occurrence of events may be conditioned on the characteristics of some narrower subgroup. The base rate applied to a larger group is erroneously generalized to the subgroup. Rules of probability can clarify such cases by applying Bayes' rules for conditional probability.

In the instant matter, the empirical probability of joint cloudburst fires is about 2 every 100 years (Figure 1 at 5). The empirical rate of extreme rainfall events is about 6 every 100 years (Table 4 at 14).

The rate of wildfires in and near is City Creek greater than 388 acres is unknown, but from the USFS, the probability of wildfires greater than 1,000 acres is about 3 every one-hundred years (1 ÷ mean fire return time of 33 years, Table 2 at 6, Figure 3). During the 20th century, City Creek fires - where newspaper accounts confirm fires with published estimates greater than 1,000 acres - number 8 or about once every 12 years. (1900, 1902, 1905, 1915 Aug (twice), 1916, 1932 in Addendum B). A ninth large acre fire occurred in 1898. The lower USFS frequency of about 3 wildfires per 100 years is used here.

Using rules of probability and knowing that the two rates are dependent, the probability of a wildfire over 388 acres in or near City Creek Canyon can be estimated. First, tests for independence can be applied to verify that the rates of fire and flood are dependent. Two random variables are *independent* if,

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[33] n. 3, above at page 2.

$$P(fire) \times P(flood) = P(fire \cap flood).$$
$$\frac{3}{100} \times \frac{6}{100} = \frac{1.8}{1000} \neq \frac{2}{100}.$$

Another probability rule that tests for independence is,

$$P(fire|flood) = P(flood).$$
$$\frac{2}{100} \neq \frac{4}{100},$$

per Figure 1, where "|" means "given that". These two tests confirm our hypothesis that the two events – wildfires and floods are dependent either on each other or on some other unknown factor.

Another relevant probability rule involves the intersection of two events. The intersection rule states that the intersection or joint probability of two events must be less than the sum of probabilities of each event separately:[34]

$$P(flood\ and\ fire) \leq P(flood) + P(fire).$$

This probability rule can be used to estimate the upper bound of the joint probability of fires greater than 388 acres occurring in or near City Creek Canyon (Figure 1 at 5 and Table 4 at 14),

$$\frac{2}{100} \leq \frac{6}{100} + P(fire \geq 388\ acres).$$
$$P(fire \geq 388\ acres) \geq \frac{4}{100}.$$

From this, the probability of a wildfire over 388 acres in or near City Creek Canyon should be at most approximately 4 wildfires per 100 years. Figure 1 at 5 page, above, shows the location of the four fires greater than 388 acres that occurred in or near City Creek during the 100 years of the 20th century: the August 5-6, 1915 fire, the August 10-11, 1915 fire, the November 1915 fire, and the August 1944 Perry's Hollow fire (*see* Addenda A and B).

The simple form of Bayes Rule regarding conditional probability can also be used to estimate the conditional probability of a flood happening after a fire greater than 388 acres occurs in or near City Creek Canyon,

$$P(flood|fire) = \frac{P(flood \cap fire)}{P(fire)}$$

$$\frac{1}{2} = \frac{\frac{2}{100}\ (fires\ and\ floods)\ per\ 100\ years}{\frac{4}{100}\ fires\ per\ 100\ years} = \frac{1}{2}(floods \mid fires) = 50\%\ per\ 100\ years.$$

This conditional probability means that if a wildfire burns more than 388 acres in or near City Creek Canyon over 100 years, there is a 50% chance that cloudburst flood will follow. The 100 year rate of 4 fires times the conditional probability of 50% equals a 2% probability over the next 100 years for another cloudburst-fire flood event.

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[34] This is sometimes also called the "conjunction fallacy" or "the Linda problem". It is a form of the triangle inequality in probability metric spaces.

It is sometimes useful to visualize these two-category conditional probability problems as a two-way table in order to better understand the impact of a large number of non-event (no rainfall) on the probability of rare events (fire and flood). Once a fire occurs, the "F" column becomes applicable and the probability of a fire and flood becomes one-half of that column:

Table 9 - Two-Way Probability Table for Fire and Floods

		Fire		
		F	$\overline{\text{F}}$	$\boldsymbol{R} \cup \boldsymbol{R}$
Rain-Flood	R	$\frac{2}{100}$	$\frac{4}{100}$	$\frac{6}{100}$
	$\overline{\text{R}}$	$\frac{2}{100}$	$\frac{92}{100}$	$\frac{94}{100}$
	$\boldsymbol{F} \cup \boldsymbol{F}$	$\frac{4}{100}$	$\frac{96}{100}$	$\frac{100}{100}$

If the higher worst case frequency of fires greater than 1,000 acres – 8 fires in 100 years – is used instead, the conditional probability estimate is,

$$\frac{\frac{2}{100}\ (fires\ and\ floods)\ per\ 100\ years}{\frac{8}{100}\ fires\ per\ 100\ years} = \frac{1}{4}(floods \mid fires) = 25\%\ per\ 100\ years.$$

The expected risk *is not* 0.04 times 0.02, or 8 in ten-thousand, or once in 1,250 years.

Using the higher 100 year rate of 8 fires times the conditional probability of 25% also equals a 2% probability for another cloudburst-fire flood event in the next 100 years.

These estimates are more than the traditional civil engineering risk criteria of 1% per 100 years. This is how the risk of a cloudburst flood-fire might be assessed when evaluating the proposed chemical treatment plant at 4th Avenue and North Canyon Road.

VI. HOW CAN THE COMMISSION INCORPORATE THIS INFORMATION IN ITS DECISION-MAKING PROCESS?

Ideally, such an analysis would be done by a hydrologist or requested by one of the many registered professional engineers ("P.E.s") involved in this matter. There is no evidence in the Commission's record regarding flood risk provided by the proponent DPU. The March 2019 staff analysis does not mentioning flooding. Your commentator has provided several letters documenting the risk of high-snow melt flooding, and in this letter and estimate of the risk of cloudburst-fire flooding is provided.

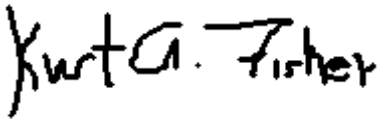
Given that there is no DPU or other expert opinion in the record, the Commission should, based on the preponderance of evidence, conclude that there is a reasonable potential for a cloudburst-fire flood to damage the proposed Well chemical treatment plant. Absent experts, the Commission is left to its own lay devices to decide if the risk is serious and poses a threat to the proposed design. To resolve such factual questions with finality, lay administrative law judges, such as the Commission's members, are retained as quasi-judicial decision makers.

Given the absence of any responsible estimates of flood and fire risk by the DPU, the Commission is within its administrative powers to adopt the cloudburst-fire and snow-melt risks as outlined by your commentator. If these 100 year risk estimates are adopted by the

Commission, the Commission can reasonably conclude that the DPU's failure to submit a safe design as required by Utah Administrative Code R309-540-5, Facility Design and Operation: Pump Stations - Pumping Facilities (effective April 1, 2019)[35] - by including either flood protection walls, by elevating the entire structure at least 3 feet above the last known historic flood levels, or by moving the proposed treatment plant out of the geologic streambed of City Creek - is fatal to the DPU's proposal.

Please feel free to contact me with any questions that you may have by the means listed above.

Very Truly Yours



Kurt A. Fisher

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[35] url: https://rules.utah.gov/publicat/code/r309/r309-540.htm.

Addendum A

Key Historical Salt Lake City Creek Floods and Northern Utah Cloudburst Flooding Documents, Research and Academic Articles[36]

Excerpts from SLC DPU GRAMA production to K. Fisher, June 13, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190617ExcerptsfromDPUProductionre4thAveWell.pdf).

> As a result of the 1983 state-wide floods, the DPU's predecessor spent about $1,000,000 repairing flood damage to roads from North Temple and State Street north to Memory Grove. The City replaced 1,040 feet of 6" inch pipeline excavated and damaged by flood waters between 4th Avenue and Memory Grove, 18 subsurface sewer and water connections in the area were destroyed, and the foundations of the old Brick Tank house north of Memory Grove were undermined.

Nicoli, K. and Lundeen, Z. J., University of Utah. (2016). A case study: geomorphic effects of the 2009 Big Pole fire, Skull Valley, Utah (Vignettes: Key Concepts in Geomorphology). Northfield, Minnesota. (url: http://serc.carleton.edu/47063).

> Recent example of the effects of cloudburst flooding in northern Utah. In a large Skull Valley canyon fire covering about 41,000 acres. Such fires decrease soil permeability by 9 to 100 times. *See also* Craddock, below. During subsequent heavy rains in Skull Valley, large sheet flows occurred and craved 1 meter deep rills in the alluvium. Historically, a similar incident occurred a Dry Creek Canyon. In 1915, there was a large 4 square mile fire in the Canyon that spread over the Salt Lake City Salient southern city-facing hillside. *See* Salt Lake Telegram and Tribune, 1915, below. Woolley records that on July 25, 1916, a Dry Creek Canyon cloudburst sent a 4 to 10 foot wall of water down City Creek and into city, along with mud, boulders and cattle (below, Salt Lake Tribune July 25, 1916).

Wirth, Craig (KUTV News). May 12, 2014. Remembering the flood of '83. KUTV News. At min. 1:35. (url: https://www.abc4.com/wirth/wirth-watching-remembering-the-salt-lake-city-flood-of-83/204262974)

Salt Lake Tribune, and Smart, C. (2011, Apr 29). River on State Street unlikely in 2011, official says. Salt Lake City Tribune. Salt Lake City, Utah. ProQuest No. 864039697. (Retrospective article in which Salt Lake Councilperson describes sandbagging efforts to control 1952 flood; available through Proquest (https://www.proquest.com/) or copy on file with this author).

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[36] In reverse chronological order.

Honker, A. M. (1999). “Been Grazed Almost to Extinction”: The Environment, Human Action, and Utah Flooding, 1900-1940. Utah Historical Quarterly, 76(1), 23–47 (url: http://heritage.utah.gov/history/quarterly) (Includes review and photographs of Salt Lake City Creek flooding, in particular, in 1909. Overviews high-snow melt verses cloudburst flooding in northern Utah).

Salt Lake Tribune, June 3, 1983 and July 22, 1983. Reproduced in Salt Tribune. 1983. *Spirit of Survival: Utah Floods of 1983* (Available at Reference Desk, Main Branch, Salt Lake City Public Library and Special Collections, Marriott Library, University of Utah, Call No. F830 .S657).

Boyce, R. R. (1958). A historical geography of Salt Lake City, Utah. Thesis. Masters. Department of Geography, University of Utah at 41 re 1876). (On file at Special Collections, Marriott Library, University of Utah; copy in author’s possession).

Salt Lake Tribune. April 30, 1952 (Available through https://go.newspapers.com/, re: floods of 1952).

Woolley, R. R. (1946). Cloudburst Floods in Utah: 1850-1938. Washington, D.C. at 96-120 (url: http://pubs.er.usgs.gov/publication/wsp994)

> Woolley listed numerous cloudbursts floods that have come across the Avenues District and from City Creek and across the proposed Well site and into the downtown: (Woolley 1946). Summer cloudburst floods included: June 13th, 1854 (city streets flooded), September 11th, 1864 (heavy flooding of North Temple from City Creek), August 25th, 1872 (downtown flooded), July 23rd, 1874 (downtown flooded from City Creek), August 1st, 1874 (Lindsey Gardens areas flooded as in 1945), August 8th, 1884 (North Temple flooded from City Creek), July 26th, 1893 (cloudburst flooded basements in city), July 19th, 1912 (1 inch fell in 1 hour filled South Temple with sand and mud from above), July 25th, 1916 (cloudburst sent a 10 foot wall of water into city along with mud, boulders and cattle), July 30th, 1930 (cloudburst over Emigration, Red Butte, and Parley's Canyons washed out highway north of Salt Lake and washed away three homes with damages of 500,000 USD), and August 13th, 1931 (four to 12 inches of water swept through streets and 12 feet of debris washed over road near Beck Hot Springs).

Craddock, G. W. (1946). The Salt Lake City Flood, 1945. Proceedings of the Utah Academy of Sciences, Arts and Letters, 23, 51–61. (On file with the Special Collections, Marriott Library, University of Utah; copy attached).

Salt Lake Telegram, August 20 and 27, 1945 (Available through https://go.newspapers.com/; copy in author's possession).

Salt Lake Telegram, August 1, 1944. "S.L. Fire Burns Grass, Brush." This fire potentially led to the Aug. 1945 Perry's Hollow flood per Craddock (1946) (url: https://newspapers.lib.utah.edu/ark:/87278/s6j97frg/17144631).

Utah Flood Commission. (1931). Torrential floods in Northern Utah, 1930. Logan: Agricultural Experiment Station, Utah State Agricultural College. On file at Special Collections, Marriott Library, University of Utah. (url:.http://www.lib.utah.edu).

Salt Lake Telegram. August 14, 1931. Flood Traps Car on Highway. (A cloudburst flood buried cars on highway to the north of Salt Lake City). (url: https://newspapers.lib.utah.edu/ark:/87278/s6cr728k).

Salt Lake Telegram. Sept. 24, 1918. Property Damaged by Big Cloudburst. (A cloudburst flood swept down West Capitol Hill and buried properties at 200 West in up to 1 foot of mud). (url: https://newspapers.lib.utah.edu/ark:/87278/s6d80jz5).

Salt Lake Tribune. July 25, 1916. Cloudburst Kills Cattle in Canyon. (url: https://newspapers.lib.utah.edu/ark:/87278/s6j10wfd)

> "A cloudburst breaking in Dry canyon during the electrical storm of yesterday emerged from the ravine a solid ten-foot wall of rushing water, carrying with it eight head of cattle and rocks weighing from 1000 to 1500 pounds, swirling them along as lightly as feathers. Following the course of the old waterway, the waters rushed through Popperton place, down Second and Third Avenues, turning on Ninth East to the Second South conduit before the force of the flood was spent. In the residence district of Popperton place and the avenues the telephone poles showed that the water mark to have been four feet."

Salt Lake Tribune. August 6, 1915. City's Watershed Suffers from Fire. (url: https://newspapers.lib.utah.edu/ark:/87278/s6tf17rk/14627562)

Salt Lake Telegram. August 5, 1915. Big Damage Caused by Brush Fire in City Creek. (url: https://newspapers.lib.utah.edu/ark:/87278/s6km0kdd/19586313 , re: 4 square mile brush fire in City Creek Canyon that crossed city-side ridgeline).

Salt Lake Telegram, June 19th, 1903. Salt Lake City in Path of Cloudburst, Should It Break in City Creek. (url: https://newspapers.lib.utah.edu/ar/87278/s6ck2gdq)

Addendum B

Table 10 -Fires Greater than 500 Acres on the Salt Lake Salient and in City Creek Canyon – Historical Newspaper Accounts (N=14)[37]

Year	Month	Size	Article Date	Newspaper	Description/Title/Url
1886	Aug	Large, size unknown; Est. > 640 acres	1886-08-08	Salt Lake Herald	"Fire in City Creek" "Fire been burning for there for the last few days." https://newspapers.lib.utah.edu/ark:/87278/s6vm5jtr/10670880 .
1898	Aug	Est. 6 to 15 sq. miles	1898-08-20	Salt Lake Tribune	"Fire along City Creek". From City Creek sweeping north to Bountiful. "At midnight, the flames extended along the hills for a distance of 6 miles. . . . . At midnight, tankman Brown estimated that the fire would exceed fifteen miles." https://newspapers.lib.utah.edu/ark:/87278/s6x93mw7/12792082 (Note: There is no corresponding Fall 1898-Summer 1899 Salt Lake City cloudburst flood reported by Woolley (1945).)
1900	Aug	Est. 1,000 acres	1900-08-12	Salt Lake Herald Salt Lake Tribune	"Big Fire in the Foothills . . ." Northwest of Fort Douglas travelling into Red Butte Canyon. "When the fire had spent its fury, an area of probably 1,000 acres was left black . . ." https://newspapers.lib.utah.edu/ark:/87278/s6ms4z4x/11117735 "Big Blaze in Hills." "[I]t had spread to Red Butte Canyon on the east and into Dry Fork Canyon a short distance, besides reaching nearly halfway up rugged Black Mountain . . ." https://newspapers.lib.utah.edu/ark:/87278/s69k5n2t/13406975
1902	Aug	4 sq. miles	1902-08-25	Salt Lake Tribune Salt Lake Telegram	"Forest Fire Threatens City." "A forest fire raged in City Creek Canyon north of the city . . . stripping four miles of territory of its vegetation . . ." City Creek Canyon, caused by campers. https://newspapers.lib.utah.edu/ark:/87278/s6st90nv/13469547

[37] Based on author's newspaper review from 1870 to 2018, excluding 1980 to 1991.

Year	Month	Size	Article Date	Newspaper	Description/Title/Url
					"Forest Fire Sweeps 4 Miles of Prairie." "The fire burned fire miles up and down the canyon before it was controlled." https://newspapers.lib.utah.edu/ark:/87278/s6446tnv/16716797
1905	Jul	800 acres (1.25 sq. miles)	1905-07-25	Salt Lake Herald	"Fire in City Creek Canyon." "The blaze . . . began at a point about three miles up the creek from the city and burned over an area about two and one-half miles in length and one-half-mile in width." Started by a camper. https://newspapers.lib.utah.edu/ark:/87278/s6446rxm/11900137
1905	Aug	Large, size unknown	1905-08-3	Salt Lake Telegram	"Brush fire in canyon." "A brush fire originating near Twelfth Street . . . swept northward over the ridge toward City Creek Canyon." https://newspapers.lib.utah.edu/ark:/87278/s6vm8f37/18225319
1912	Jul	Large, size unknown	1912-07-11 1912-07-12	Salt Lake Telegram Salt Lake Tribune	"First Forest Fire of the Summer Starts . . . " Fire on Salt Lake salient between City Creek and Dry Fork Canyons. https://newspapers.lib.utah.edu/ark:/87278/s6v13c5j/18092417 "Fire patrol will protect canyons." "A party of men was successful in conquering a brush fire that raged all yesterday between City Creek and Dry Fork Canyons." https://newspapers.lib.utah.edu/ark:/87278/s6q82mft/18092670
1915	Aug	At least 4 square miles	1915-08-05 1915-08-05 1915-08-06	Salt Lake Herald Salt Lake Telegram Salt Lake Herald	"City Creek Canyon Ablaze." "A grass fire started yesterday on the north bench and crept over the hill into City Creek, where the flames cut into the brush. The flames were about a mile below the high line station . . ." https://newspapers.lib.utah.edu/ark:/87278/s6qr6304/10126956 "Big Damage Caused by Brush Fire in City Creek". "[A] four mile stretch of the canyon on the east side had been burned clean . . . . Destruction of the brush . . . is considered very serious because of the importance of this undergrowth in holding and protecting the winter snows and checking its melting in the spring." https://newspapers.lib.utah.edu/ark:/87278/s6km0kdd/19586313 "Fire sweeps large area." https://newspapers.lib.utah.edu/ark:/87278/s6m341kp

Year	Month	Size	Article Date	Newspaper	Description/Title/Url
1915	Aug	3 sq. miles	1915-08-10 to 1915-08-13	Salt Lake Telegram Salt Lake Tribune Salt Lake Herald	"Forest Fires Rage; Salt Lake's Water Supply Periled." Began in west fork of Dry Fork and spread over Black Mountain and down into City Creek. Fire burned through August 13th, 1915. SLTe. 8-10. https://newspapers.lib.utah.edu/ark:/87278/s6t451n5/19587977 "Large Grass Fire Occurs in Canyon." SLTr. 8-10. https://newspapers.lib.utah.edu/ark:/87278/s6z04khg/14636781 "Flames Menace Water Sources." "About three square miles of timbered land was burned, and the fire is still burning . . ." SLH.8-11. https://newspapers.lib.utah.edu/ark:/87278/s6th9sj7/10128812 "Watershed Saved from Fire." SLTr. 8-11. https://newspapers.lib.utah.edu/ark:/87278/s6f490h2/14628711 "City Creek is in Flames." SLTe. 8-12. https://newspapers.lib.utah.edu/ark:/87278/s6jm3j64/19588334 "Fire Fighters Make Headway in Canyon." SLH. 8-12. "[]one and one-half miles north of High Line station . . ." https://newspapers.lib.utah.edu/ark:/87278/s6pv7r6s/10129011 "Relentless Work Halts Timber Fire" SLTr. 8-12. https://newspapers.lib.utah.edu/ark:/87278/s6rf75dx/14632812 "Flames Driven by Wind May Destroy Zion's Watershed." SLTe. 8-13. "Brought to life by a sudden mountain wind . . ., the forest fire on Black mountain and City Creek Canyon is raging anew." https://newspapers.lib.utah.edu/ark:/87278/s6pc48zw/19588159 "Brush Fire Extinguished". SLH. 8-13. ". . . the brush fire, which has been sweeping a portion of the canyon above the High Line, is practically extinguished." https://newspapers.lib.utah.edu/ark:/87278/s6k370h6/10129223 "Fire in City Creek is Conquered." SLTr. 8-13. https://newspapers.lib.utah.edu/ark:/87278/s6vh706s/14616003

Year	Month	Size	Article Date	Newspaper	Description/Title/Url
1915	Nov	Large, size unknown	1915-11-01	Salt Lake Tribune Salt Lake Telegram	“Fierce Fire Rages in near-by Canyon”. SLTr. Black Mountain spreading into upper City Creek Canyon. https://newspapers.lib.utah.edu/ark:/87278/s64x6k62/14554664 “City Creek Canyon Blaze Extinguished”. SLTe. https://newspapers.lib.utah.edu/ark:/87278/s6pp0d5t/19343612
1916	Sep	Two sq. miles	1916-09-07	Salt Lake Telegram	“Citizen Soldiers Fight Canyon Fire.” Started by soldiers using blank cartridges during combat exercises. https://newspapers.lib.utah.edu/ark:/87278/s6f77m3d/19391742
1928	Sep	Several sq. miles	1928-09-26 to 1928-09-30	Salt Lake Telegram	“Salt Lake Brush Flames Checked at Rotary Park.“. Spreading from Dry Fork Canyon to Red Butte Canyon then over Black Mountain and upper City Creek Canyon. Fire was extinguished by a rain storm. https://newspapers.lib.utah.edu/ark:/87278/s6xh10vn/17900812 “Rainfall Puts End to Danger of Brush Fire.” SLTe. 9-27. Fire was extinguished by a rain storm. 600 soldiers fought fire. https://newspapers.lib.utah.edu/ark:/87278/s6sr084b/17901120 “Citizen Soldiers Fight Canyon Fire.” SLTe. 9-30. Started by soldiers using blank cartridges during combat exercises. https://newspapers.lib.utah.edu/ark:/87278/s6f77m3d/19391742
1936	Aug	More than 1 sq. mile	1932-08-22	Salt Lake Telegram	“2-mile grass fire is fought.” “West of City Creek Canyon” toward Ensign Peak. https://newspapers.lib.utah.edu/ark:/87278/s62v3q9m/16543702
1951	Jul	Large, size unknown	1951-07-02	Salt Lake Telegram	“Forest Fire Rages in S.L. Canyon" Covering a wide area" north of Pleasant Valley. https://newspapers.lib.utah.edu/ark:/87278/s6sb5f9d/17631073

Addendum C

Table 11 - Fires between 500 acres and 100 acres on the Salt Lake Salient and in City Creek Canyon – Historical Newspaper Accounts (N=12)[38]

Year	Month	Size	Article Date	Newspaper	Description/Title/Url
1905	Sep	Large acreage, unknown size	1905-09-14	Salt Lake Tribune	"Big Brush Fire Rages." "The burned area is extensive and the entire canyon became filled with smoke." https://newspapers.lib.utah.edu/ark:/87278/s6252v8j/13792648
1911	Aug	Large acreage, unknown size	1911-08-21	Salt Lake Tribune	"Big Fire is Raging Near Black Mountain." "A timber fire of big dimensions . . . about one mile north of Fort Douglas between Black Mountain and Dry Fork." https://newspapers.lib.utah.edu/ark:/87278/s60v9q24/14266092
1919	Jun	Large acreage, unknown size	1919-06-16	Salt Lake Herald	"Grass Fires Unchecked." Large blaze reported in City Creek Canyon. https://newspapers.lib.utah.edu/ark:/87278/s6h71mqt/10279971
1933	Sep	100 acres	1933-09-05	Salt Lake Telegram	"Black Mountain Fire is Checked." "[A]t the face of Black Mountain at the head of City creek canyon . . ." https://newspapers.lib.utah.edu/ark:/87278/s67w7m7w/16234153
1936	Aug	500 acres	1936-08-24	Salt Lake Telegram	"Forest Fires laid to Matches, Cigarettes." "[O]ver nearly 500 acres in City Creek Canyon …" https://newspapers.lib.utah.edu/ark:/87278/s6z61x6h/16544106
1938	Jul	100 acres 50 acres	1938-07-23	Salt Lake Telegram	"Fire Officials Sound Warning." 100 acre fire at Fort Douglas; 50 acre fire on Ensign Peak.

[38] Based on author's newspaper review from 1870 to 2018, excluding 1980 to 1991.

Year	Month	Size	Article Date	Newspaper	Description/Title/Url
1941	Sep	More than 500 acres	1941-09-01	Salt Lake Telegram	"City Creek Fire Rakes Big Area." SLTe. 9-1. Salt Lake salient at near 13th Avenue and E Street and sweeping over ridgeline into City Creek Canyon. https://newspapers.lib.utah.edu/ark:/87278/s6z90mn8/16941270 "Big Canyon Fire Laid to Youths Trying to Halt Toy 'Sabotage'" SLTe 9-4. https://newspapers.lib.utah.edu/ark:/87278/s6cc27zx/16947504
1944	Aug	388 Acres	1944-08-01	Salt Lake Telegram	"S.L. Fire Burns Grass, Brush." This fire potentially led to the Aug. 1945 Perry's Hollow flood per Craddock (1946) Craddock refers to "Fully 80 percent of the area, including all but patches of the headwater slopes and portions of the lower benchlands, was burned last fall" (at 58). Although the 1944 article does not state the number of acres burned, Craddock estimated the burn size at 388 acres. https://newspapers.lib.utah.edu/ark:/87278/s6j97frg/17144631
1958	Oct	100 acres	1958-10-18	Salt Lake Tribune	"Fire hits [Water]'Shed at City Creek." At Ensign Peak; started by a hunter at the police firing range. Rec'vd from www.newspapers.com. In author's possession.
1992	Jul	150 acres	1992-07-23	Salt Lake Tribune	"Residents Rush to Safety as Brush Fire Sweeps Foothills . . ." 150 acre fire near the Lime Kiln on Tomahawk Drive. ProQuest document ID: 288484519.
2008	Jul	175 acres	2008-07-30	Deseret News	"Crews fighting wildfires in City Creek." Burning close to radio towers behind Ensign Peak. ProQuest document ID: 351641173.
2018	Jul	100 acres	2018-07-24	Salt Lake Tribune	"Grass fire near Salt Lake City's Ensign Peak damages one home. Three firefighters and two residents were injured." https://www.sltrib.com/news/2018/07/24/fire-reported-salt-lake/

Addendum D

List of Small Acreage Fires Less than 100 Acres on the Salt Lake Salient and in City Creek Canyon – Historical Newspaper Accounts (N=30) [39]

• July 24th, 1894, unknown size, City Creek Canyon, Salt Lake Tribune, boys camping.

• May 2nd, 1899, small acreage, City Creek Canyon, Salt Lake Tribune, Abandoned camp fire.

• September 2nd, 1905, size unknown, City Creek Canyon near the Brick Reservoir, Salt Lake Herald.

• April 15th, 1909, unknown size, City Creek Canyons - four miles from downtown, Deseret Evening News.

• On April 29th, 1910, small acreage, City Creek Canyon near Memory Grove, Salt Lake Tribune.

• June 28th, 1918, size unknown, City Creek Canyon, Salt Lake Telegram, Canyon closure ordered.

• August 7th, 1922, size unknown, City Creek Canyon near mile 0.9, Ogden Standard Examiner.

• August 27th, 1926, unknown size, City Creek Canyon at old Brick Reservoir Tanks, Salt Lake Telegram, Destroyed reservoir tanks.

• June 18th, 1930, size unknown, small acreage, Salt Lake Telegram.

• April 25th, 1934, small acreage, City Creek Canyon, Salt Lake Tribune, woman fined for starting a fire.

• July 18th, 1934, Two acres, City Creek Canyon in upper north fork, Salt Lake Tribune.

• July 23rd, 1938, 50 acres, Ensign Peak, "Fire Officials Sound Warning." Salt Lake Telegram. https://newspapers.lib.utah.edu/ark:/87278/s6zw2v3m/16622337

• July 3rd, 1951, 80 acres, "Blaze Blamed on S.L. Boys." Salt Lake Tribune. https://newspapers.lib.utah.edu/ark:/87278/s6c2651d/17633875 and "Fire Blackens 80 Acres." https://newspapers.lib.utah.edu/ark:/87278/s6c2651d/17633883 .

• August 8th, 1940, 20 acres, Salt Lake salient at north of 12th Avenue between H and K Streets, Salt Lake City Tribune.

• July 5th, 1951, unknown size, Ensign Peak - below, Salt Lake Tribune, Started by rifle fire at police gun range.

• July 7th, 1953, 50 acres, Ensign Peak, Porschatis Photographs, Marrriot Library Digital Archive.

• June 24th, 1957, small acreage, City Creek Canyon on east slope below homes near A Street and Ninth Avenue, Salt Lake Tribune.

• June 22nd, 1960, 50 acres, City Creek Canyon, Salt Lake Tribune.

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[39] Based on author's newspaper review from 1870 to 2018, excluding 1980 to 1991. Unlike the two earlier lists, url references are not provided for these small acreage fires.

• July 24th, 1960, small acreage, Ensign Peak, Salt Lake Tribune July 25th, 1960, Started at police range on July 24th day.

• July 14th, 1971, Four acres, City Creek Canyon at western side of Bonneville Drive, Salt Lake Tribune.

• August 4th, 1973, small acreage, City Creek Canyon, Salt Lake Tribune.

• August 27th, 1973, 2 acres, Salt Lake salient north of 18th Avenue, Salt Lake Tribune).

• July 1st, 1997, small acreage, City Creek Canyon at Memory Grove, Salt Lake Tribune.

• September 6th, 2002, 60 acres, City Creek-Bountiful ridge, Salt Lake Tribune.

• On August 25th, 2006, unknown size, City Creek Canyon headwaters, Deseret News and Salt Lake Tribune, Caused by lightning strike.

• August 31st, 2006, 4 acres, City Creek Canyon at Memory Grove sweeping up-canyon to Bonneville Drive and 11th Avenue, Deseret News.

• July 23rd, 2010, 2 acres, City Creek Canyon, Salt Lake Tribune.

• July 23rd, 2011, small acreage, City Creek Canyon at Bonneville Drive and Memory Grove, Salt Lake Tribune, Mentally ill person admitted to starting three fires.

• August 6th, 2016, 10 acres, Ensign Peak, Personal observation.

• August 30th, 2017, 75 acres, Bountiful side of Salt Lake salient, Salt Lake Tribune, Short-term closure of City Creek Canyon ordered. https://www.ksl.com/article/45612452/summerwood-fire-25-contained-city-creek-canyon-remains-closed

Exploratory Statistical Analysis of Extreme Rainfall Events Recorded by SNOTEL Stations 972 and 596 – City Creek Canyon, Utah

Kurt A. Fisher[1]

July 23, 2019

Abstract: The maximum annual rainfall data at two Salt Lake City higher-altitude SNOTEL stations was used in support of making provisional estimates of 100-year rainfall exceedance levels. Two sets of 16 years of maximum annual rainfall data were fitted to the Gumbel distribution. The Louis Meadows SNOTEL Station (972) computed 100-year extreme rainfall exceedance level is 1.44 inches; the Lookout Peak SNOTEL Station (596) computed 100-year extreme rainfall exceedance level is 3.18 inches. These are provisional estimates because the 100-year level is extrapolated far outside the regression domain of 16 years. Two anomalous high readings in the Lookout Peak data are investigated as Gumbel regression influencers.

Gumbel method exceedance levels do not reveal how often exceedance rainfall will be nearly met within a 100-hundred year period. This question is investigated with a supplemental power law regression between precipitation and counts of hourly rainfall events (R^2=0.99). In particular, the counts of 71 rare rainfall events ≥ 0.5 inches per hour over 16 years at two the SNOTEL sites are perfectly correlated (R^2=1.0), even though the sites are separated by 3.25 miles and on only two dates do these high rainfalls occur at both sites on the same calendar day. This demonstrates two independent stochastic processes being driven by a third, hidden, deterministic causal model. Over 16 years, on only one date are their two consecutive hours of precipitation ≥ 0.5 inches per hour. For a range of high annual hourly precipitation events, e.g. 0.5 to 1.5, many more events occur than suggested by a once in 100-year maximum annual exceedance point estimate. We report a negative result: the maximum annual rainfall exceedance level does not appear to increase with altitude. Another 15 years of data collection will increase confidence in these provisional estimates and may reverse the conclusion that maximum exceedance rainfall does not increase with altitude.

Introduction

With respect to a personal project on the probability of cloudburst-fire floods in City Creek Canyon, quantification of extreme rainfall events at various altitudes using SNOTEL data from the Louis Meadows (972) and Lookout Peak (596) stations was undertaken.

The Salt Lake County Flood Control Office has prepared duration-based 100 year rainfall prediction maps.[2] For the east bench neighborhoods, the 30 minute duration map predicts a 100

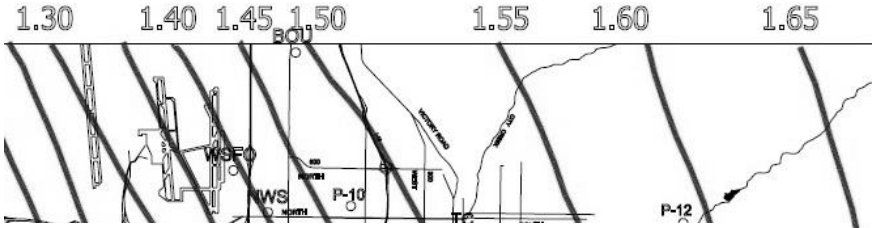

Figure 1 - Salt Lake County. (August 1999). 100 Year Return Rainfall Map for 1 Hour Duration.

[1] Former mathematics undergraduate; not a hydrologist.

[2] TRC North American Weather Consultants Meteorological Solutions, Inc. and Flood Control Engineering, Salt Lake County. (August 1999). 100 Year Return Frequency Maps – 15 Minute

year rainfall level of 1.20 inches and the one-hour duration predicted 100-year rainfall is about 1.5 inches. The Watershed Planning and Restoration Office extreme rain chart provides a point-estimate for a one-hundredth year 1-hour rainfall event of between 1.5 and 1.65 inches for a City Creek Canyon cloudburst: Empirical cloudburst flood events listed in Addenda A suggest this 100-year frequency estimate may be too low. During the 100 years between 1916 and 2016, there were three possible events of that magnitude in the 1.50-1.55 band – the 1918 West Capitol and the 1931 Beck Street cloudburst floods. In the 1.55-1.65 band, there were also three possible events between 1916 and 2016 – the 1916 Dry Fork flood, the 1945 Perry's Hollow flood, and the July 28, 2017 City eastside flood.

While the spatial location of cloudburst floods along the valley floor are random, Figure 1 shows that there is a progression of intensity from the valley floor to the Wasatch Front Mountains. Mountains make weather. Other metrological data from the National Oceanographic and Atmospheric Administration (NOAA) indicates that average annual precipitation in the Wasatch Front Mountains are higher than those on lower valley floors. That is why Salt Lake City can exist. We capture average high levels of snow and water during the winter season and store it to bridge water needs during hot, dry summers.

It is often said that "mountains make weather." Higher elevations force clouds to rise and as a result, they release rain. It is reasonable to expect more cloudburst events of maximum annual rainfall at higher elevations such as the mid-City Creek Canyon's Pleasant Valley or in the upper canyon between Grandeur Peak and Lookout Peak. The following hypothesis was formed: "Is the cloudburst rainfall event rate higher in City Creek Canyon at higher altitudes?

Methods

To test this commonplace, I obtained data for April 2003 to June 2019 from SNOTEL automated weather recording stations at Louis Meadows and Lookout Peak in City Creek Canyon which have been operated by the United States NRCS.[3] Automated readings are taken every hour, the including temperature and one-hour duration accumulated rain and snowfall.

The elevation of the valley floor at 300 West and North Temple which appears at the Salt Lake County 100-year rainfall contour line of 1.5 inches is 4,280 feet. The Louis Meadows SNOTEL station about 8.25 northeast of this first valley floor station at an elevation of 6,700 feet; and the Lookout Peak SNOTEL station is about 3.25 miles up canyon from Louis Meadows at an elevation of 8,161 feet. Are there more 1.5 inch rainfall events than once every hundred-years at the higher stations?

The 288,413 raw hourly observations for these stations for the period April 1, 2003 to July 4 2019 were cleaned for instrumentation errors and station downtime. The stations recorded accumulated rainfall and snow since the instrument last reset in minimum increments of 0.1

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to 24 Hour Duration. (url: https://www.slco.org/flood-control/rainfall-maps/). *See* Excerpt, **Error! Reference source not found.**, *infra*, at page 9.

[3] NRCS. 2019. Lewis Meadows (SNOTEL Station 972) Site Information and Reports. url: https://wcc.sc.egov.usda.gov/nwcc/site?sitenum=972&state=ut; NRCS. 2019. Lookout Peak (Sttion 596) Site Information and Reports. url: https://wcc.sc.egov.usda.gov/nwcc/site?sitenum=596&state=ut ; NRCS. 2019. NRCS Report Generator 2.0. url: https://wcc.sc.egov.usda.gov/reportGenerator/ .

inches. Hourly incremental values had to be derived by taking the difference of the current and preceding observation. Temperature was also reported hourly. Data was cleaned and recoded using attribute tags listed in Table 13 in Addendum "C". Results are listed in Table 1. Exclusionary attribute tags were applied progressively. This means that if an hourly reading was excluded based on an earlier tag, *e.g.* "3", that row would not be coded for exclusion based on a later attribute.

For the Louis Meadows station, 6.5% of raw observations were excluded as instrumentation errors, and, for the Lookout Peak station, 13.5% of raw observations were coded as instrumentation errors.[4] After cleaning, data was recoded to change snow, snow-sleet, sleet, and evaporative events as "not a rainfall" event.

After cleaning and recoding, 15.4 years of valid hourly observations for the Louis Meadows station and 14.24 years of valid hourly observation data for the Lookout Peak station remained in 259,584 hourly observations (Table 1).

For those cleaned and recoded observations and the Louis Meadows station, 13,596 observations involved hourly rainfall precipitation in the range of 0.1 inches to 1.2 inches. For cleaned and recoded observations and the Lookout Peak station, 11,656 observations involved hourly rainfall precipitation in the range of 0.1 inches to 3.0 inches. With respect to the low percentage of total rainfall events (N=25,612, 9.9%) with precipitation greater than or equal to 0.1, recall that most of the annual precipitation at these mountain sites is in the form of snow. Snow-only events were recoded as "not rainfall" events with a rainfall precipitation equal to zero. Rainfall events involve summer season hourly changes of 0.1 inches and only rarely does more than 0.1 inches of rain fall in an hour. In contrast, winter snow can fall in feet over a few hours.

Table 1 - Characteristics of Data Cleaning and Recoding

	Louis Meadows		Lookout Peak		Both	
	Count	**Percent**	**Count**	**Percent**	**Totals**	**Percent**
Total Observations	144,237	100.0%	144,176	100.0%	288,413	100.0%
Instrument & Other Errors	9,372	6.5%	19,457	13.5%	28,829	10.0%
Subtotal Cleaned and Recoded Observations	134,865	93.5%	124,719	86.5%	259,584	90.0%
Zero rainfall events	120,909	89.7%	113,063	90.7%	233,972	90.1%
Rainfall events => 0.1	13,956	10.3%	11,656	9.3%	25,612	9.9%
Checksum	134,865	100.0%	124,719	100.0%	259,584	100.0%

[4] Typically, both stations' recording devices marked a quality assurance error for either an automatically recorded precipitation or snowfall reading. Each such error event invalidated the current reading and, for our purposes concerning hourly change in rainfall, the next subsequent hourly reading that established a new accumulation baseline that is also an error reading. For NRCS purposes the first following total accumulation reading in not an error reading. At the beginning of each month, both stations reset their sensors, again generating two hours of discontinuity in the incremental hourly readings.

Table 2 lists the observed annual maximum rainfall (X`) over 16 water seasons from 2003 to 2019. The observed cumulative distributions of the maximum rainfall for each year at the two stations are tabulated in Table 3 and are shown for each station in Figure 4 and in Figure 5. By inverting those figures, the cumulative annual maximum rainfall by increasing year of observation is shown in Figure 2 and Figure 3. Figure 2 and Figure 3 show the observed distribution for which modeling is sought.

Table 2 - Annual Maximum Rainfall (X`) for Louis Meadows and Lookout Peak SNOTEL Stations (2003-2019). Source: NRCS Report Generator 2.0.

Water Year		Louis Meadows	Lookout Peak
Start	End	X`	X`
2003	2004	0.4	0.3
2004	2005	0.9	0.5
2005	2006	1.1	2.1
2006	2007	0.5	3
2007	2008	0.9	1.3
2008	2009	0.4	0.5
2009	2010	0.7	0.4
2010	2011	0.5	0.9
2011	2012	0.6	1.1
2012	2013	0.8	0.5
2013	2014	0.6	0.6
2014	2015	0.6	1.1
2015	2016	0.8	0.5
2016	2017	0.6	0.5
2017	2018	0.7	0.6
2018	2019	1.2	0.5

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Table 3 - Cumulative Frequency of Annual Maximum Rainfall (X`) for Louis Meadows and Lookout Peak SNOTEL Stations (2003-2019). Source: Table 2

Louis Meadows		Lookout Peak	
Years	Max Annual Rainfall	Years	Max Annual Rainfall
2	0.4	1	0.3
4	0.5	2	0.4
8	0.6	8	0.5
10	0.7	10	0.6
12	0.8	11	0.9
14	0.9	13	1.1
15	1.1	14	1.3
16	1.2	15	2.1
-	-	16	3

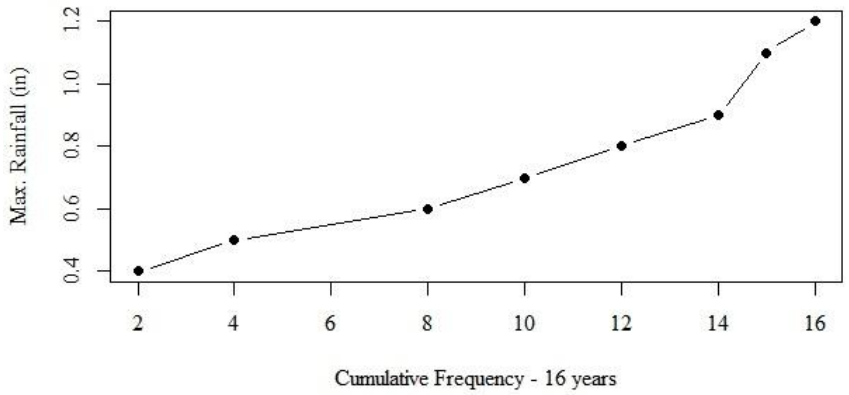

Figure 2 - Cumulative Maximum Rainfall (X`) by Observing Years for the Louis Meadows SNOTEL Station (2003-2019). Source: Inverted From of Figure 4.

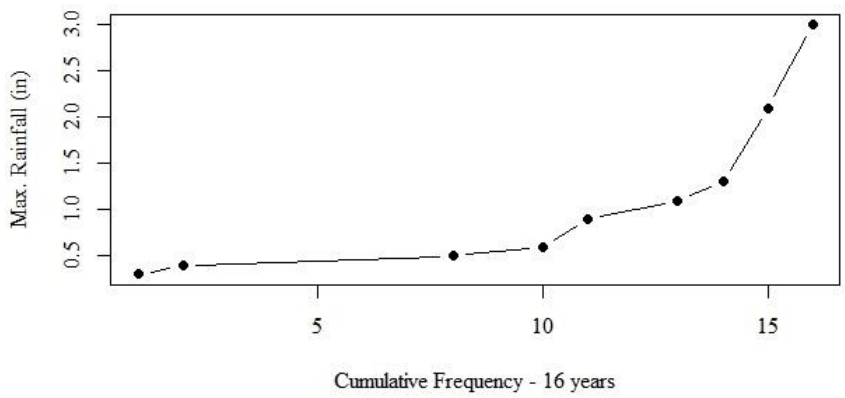

Figure 3 - Cumulative Maximum Rainfall (X`) by Observing Years for the Lookout Peak SNOTEL Station (2003-2019). Source: Inverted From of Figure 5.

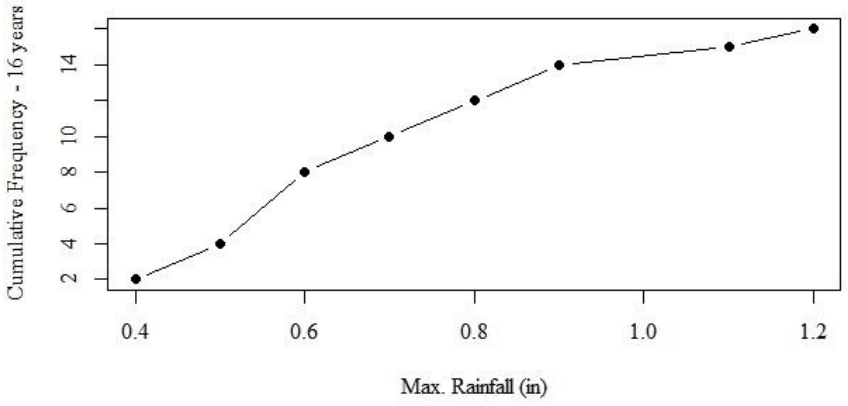

Figure 4 - Cumulative Frequency of Annual Maximum Rainfall (X`) for the Louis Meadows SNOTEL Station (2003-2019). Source:

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Table 3.

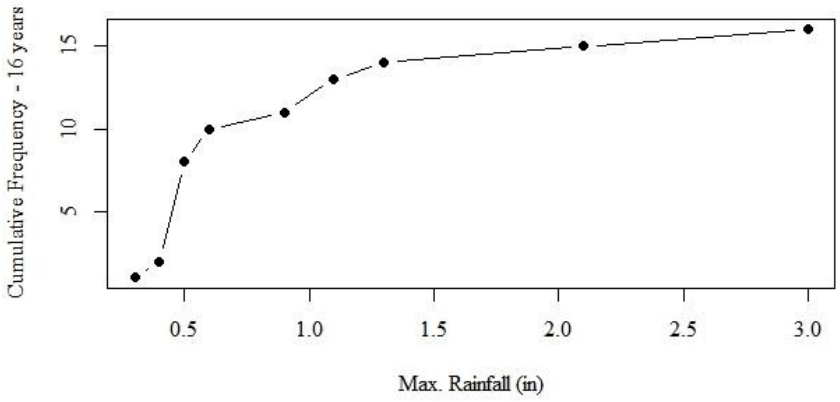

Figure 5 - Cumulative Frequency of Annual Maximum Rainfall (X`) for Lookout Peak SNOTEL Station (2003-2019). Source: Table 3.

The top two precipitation entries at the Lookout Peak station that do not data clean, re-code, or statistically test as outliers, are listed in Table 4. Much of the following analysis and discussion center around the inability to properly fit models to the Lookout Peak data. These two entries were initially suspected of causing poor model fits. Later analysis examines these readings as influencers during regression and concludes that they are not influencers.

Table 4 - Two Readings from the Lookout Peak Station that may be Potential Influencers

Date-Time	4/2/2005 10:00	4/7/2006 12:00
Δ Precip (in)	2.1	3
Air Temp (F)	47	39
QC-Flag Air	V	V
Acc. Precipitation	37	48.5
QC_Flag Precip.	V	V
Acc. Snow Depth	104	117
QC_Flay Snow Depth	V	V
Snow Water Equivalent	36.7	45.7
QC_Flag Water Equiv.	V	V

The hydrologist's maximum exceedance rainfall over 100-years estimates a one-shot maximum level of rainfall; it does not inform as to how often high levels of rainfall may be approached or how often near-maximums occur. For example at Louis Meadows although the 100-year maximum event is 1.2 inches of rain, in one-half of 16 years, the maximum rainfall is 0.8 inches or higher This suggests that annually, there is high risk of some high rainfall events that may impact human safety or structures.

For Louis Meadows, Station 972, the observed frequencies of precipitation over 15.4 years are tabulated in Table 5 in Columns B and C. For Lookout Peak, Station 596, the observed frequencies of precipitation over 14.2 years are tabulated in Columns B and C of Table 6.

Table 5 – Louis Meadows SNOTEL Station – Frequency of Observed Hourly Rainfall Events and 16-Year Predicted Counts (N=134,865 observed Hours)

A	B	C	D
	Over 15.39 observed years		
Precipitation (in)	**Count (observed)**	**Percent**	**Count (predicted)**
0.0	120,909	89.652%	120,952
0.1	12,793	9.486%	11,690
0.2	913	0.677%	2,980
0.3	155	0.115%	1,130
0.4	57	0.042%	532
0.5	19	0.014%	288
0.6	8	0.006%	171
0.7	3	0.002%	109
0.8	4	0.003%	73
0.9	2	0.001%	51
1.1	1	0.001%	28
1.2	1	0.001%	21
1.3			*17*
1.5			*11*
Rare Event Counts			
≥ 0.5	38		
≥ 0.2	1163		

Source: Author and NRCS SNOTEL Reporter 2.0. Notes: Italicized values are extrapolated beyond the range of the observations. Station 972 elevation - 6,700 ft. Notes: "Predicted Counts" from a power law model are discussed in the "Analysis" section, below.

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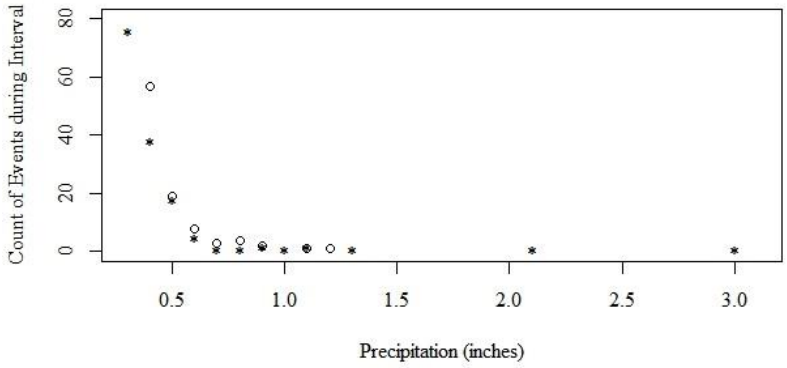
Table 6 – Lookout Peak SNOTEL Station – Frequency of Observed Hourly Rainfall Events and 16-Year Hourly Predicted Counts (N= 124,719 Observed hours)

A	B	C	D
Over 14.24 observed years			
Precipitation (in)	**Count (observed)**	**Percent**	**Count (predicted)**
0.0	113,063	90.654%	113,099
0.1	11,130	8.924%	10,120
0.2	379	0.304%	2,466
0.3	76	0.061%	906
0.4	38	0.030%	416
0.5	18	0.014%	221
0.6	5	0.004%	129
0.7	1	0.001%	81
0.8	1	0.001%	54
0.9	2	0.002%	37
1.1	1	0.001%	27
1.2	2	0.002%	20
1.3	1	0.001%	12
1.5		0.000%	*7*
2.1	1	0.001%	2
3.0	1	0.001%	1
Rare Even Counts			
≥ 0.5	33		
≥ 0.2	526		

Source: Author and NRCS SNOTEL Reporter 2.0. Notes: Italicized values are predicted within the range of the observations. Station 596; elevation – 8,161 ft. Notes: "Predicted Counts" from a power law model are discussed in the "Analysis" section, below.

Figure 6 - Frequency of Counts of Hourly Rainfall ≥ 0.3 for SNOTEL Louis Meadows and Lookout Peak. (N=397). Source: Table 5 and Table 6. Circle - Louis Meadows, * = Lookout Peak.



The top 71 rare events for both stations are shown in Figure 6 and are listed in Table 7 where rainfall is ≥ 0.5 inches. Although the two sites are separated by 3.25 miles and 1,461 feet in elevation, they have nearly identical extreme rainfall count profiles. On only two of 36 event dates – June 8, 2006 and July 27, 2017 – does precipitation occur on the same calendar day. Only on July 8, 2015 does precipitation persist for two sequential hours at the same station. A third deterministic process is causing the same random effects at two different spatial locations.

Table 7 - The Top 72 Top Precipitation Events – Hourly Rainfall ≥ 0.5 inches at Louis Meadows and Lookout Peak by Date

Date	Station	Precip. (in)	Air Temp. (F)	Date	Station	Precip. (in)	Air Temp. (F)
7/17/2004 19:00	972	0.9		12/2/2012 20:00	972	0.8	35
8/18/2004 17:00	596	0.5	49	5/30/2013 9:00	596	0.5	42
4/2/2005 10:00	596	2.1	47	9/7/2013 16:00	972	0.5	55
8/2/2005 18:00	972	0.5		2/15/2014 10:00	596	0.6	44
10/3/2005 11:00	972	1.1		3/1/2014 14:00	972	0.6	39
2/27/2006 12:00	596	0.6	45	7/12/2014 8:00	596	0.8	66
3/21/2006 12:00	972	0.5		9/5/2014 1:00	596	1.1	47
4/7/2006 12:00	596	3	39	9/8/2014 16:00	596	0.7	50
6/8/2006 20:00	972	0.5		9/9/2014 6:00	596	0.5	47
6/8/2006 20:00	596	0.5	47	2/3/2015 15:00	972	0.6	45
11/21/2006 13:00	596	0.6	45	2/6/2015 19:00	596	0.6	46
4/8/2007 2:00	972	0.5	40	6/11/2015 13:00	596	0.5	48
5/4/2007 14:00	596	1.3	33	7/8/2015 21:00	972	0.8	51
7/25/2007 17:00	972	0.8	60	7/8/2015 22:00	972	0.5	51
2/27/2008 14:00	972	0.9	41	8/7/2015 18:00	596	0.5	50
7/15/2008 2:00	596	0.5	52	12/2/2015 14:00	596	0.5	33
6/2/2009 18:00	972	0.5	48	10/3/2016 12:00	972	0.5	37
6/7/2009 1:00	972	0.5	38	10/15/2016 22:00	972	0.6	60
7/2/2009 14:00	972	0.7	57	11/20/2016 7:00	596	0.5	43
2/25/2010 12:00	972	0.5	35	12/16/2016 9:00	972	0.5	39
5/29/2010 16:00	972	0.5	50	1/8/2017 18:00	596	0.5	38
6/12/2010 4:00	596	0.5	37	7/14/2017 17:00	596	0.5	56
12/2/2010 13:00	596	0.5	40	7/26/2017 2:00	972	0.5	55
12/8/2010 20:00	596	0.9	36	7/26/2017 3:00	596	0.6	52
4/5/2011 10:00	596	1.1	45	11/2/2017 5:00	972	0.7	35
4/11/2011 12:00	596	0.9	42	11/2/2017 18:00	972	0.6	51
6/19/2011 10:00	972	0.5	45	11/4/2017 9:00	972	0.5	43
7/24/2011 21:00	596	1	59	1/12/2018 10:00	972	0.5	36
8/1/2011 10:00	972	0.6	62	2/3/2018 6:00	972	0.5	39
8/20/2011 18:00	972	0.6	59	4/8/2018 1:00	596	0.5	34
10/16/2011 23:00	972	0.5	45	10/2/2018 20:00	596	0.5	48
11/12/2011 12:00	972	0.5	34	10/4/2018 23:00	972	0.8	42
4/26/2012 20:00	972	0.6		3/7/2019 13:00	972	1.2	42
5/10/2012 9:00	972	0.6		3/16/2019 14:00	596	0.5	39
12/1/2012 16:00	596	0.5	39	4/27/2019 14:00	596	0.5	49
				5/23/2019 1:00	972	0.7	38

Analysis and Results

Gumbel Extreme 100-Year Event Characterization after Hornberger

$$X^* = \beta - (\alpha) ln \left[-\ln(1 - \frac{1}{T_{return}} \right]$$

Equation 1 - Gumbel extreme value distribution

The generally accepted method by hydrologists to analyze extreme rainfall on 100-year intervals is by the Gumbel distribution method.[5] The Gumbel distribution method involves determining the maximum rainfall event each year for a number of years. That data is used to estimate the parameters for the Gumbel cumulative distribution that predicts the likely interval of time in which a specified amount of rainfall will be exceeded. Gumbel distribution likelihood estimators for rainfall maximums per 100 years from Hornberger and NIST were used.[6] The estimators for the maximum exceedance value X^* from the maximum annual of each sampled year (X') are α and β. Those parameters consist of:

$\alpha = \frac{\sqrt{6}}{\pi}\sigma_{x'}$; σ_{Gumbel} - the Gumbel standard deviation – estimated from the standard deviation of X`.

$\beta = \overline{X'}$ - 0.5572α; μ_{Gumbel} – estimated from the arithmetic mean of maximums.

And where the maximum rainfall exceedance value from the average return time is:

$$X^* = \beta - (\alpha) ln \left[-\ln(1 - \frac{1}{T_{return}}) \right].$$

Parameters α and β were estimated (Table 8) and a fitted Gumbel distribution extrapolating the expected cumulative maximum rainfall events through 100 years was computed (Table 10) using R software code.[7] The expected cumulative maximum rainfall events for the both stations are shown in Figure 9.

[5] Hornberger, G.M., Wiberg, P.L., Raffensperger, J.P. and D'Odorico, P. (2012 2nd). *Elements of Physical Hydrology*. Baltimore, M.D.: Johns Hopkins University Press at 36.

[6] NIST. 2019. Extreme Value Type I Distribution.§ 1.3.6.16. In *Engineering Statistics Handbook*. url: https://itl.nist.gov/div898/handbook/eda/section3/eda366g.htm

[7] "R" software and the non-linear squares (nls) function in the base package.

Table 8 - Estimated Parameters for Gumbel maximum event distribution

	Louis Meadows	Lookout Peak
n	16	16
μ	0.71	0.9
σ	0.232	0.723
μ Gumbel - β	0.6053	0.5637
σ Gumbel - α	0.1811	0.5859
$X'_{100\ yr}$ rain (in)	1.44	3.18

Table 9 compares the observed and corresponding predicted cumulative annual precipitation levels for the two stations within the 16 year observing frame. In the context of a non-linear least square regression, these tests due not have the same weight and validity as in the linear and generalized multiple linear regression contexts. R^2 is only indicative for non-linear squares curve fitted. The χ**2** value shows whether the observed and predicted curves are from the same statistical families, but for Lookout Peak, that 0.22 acceptance of the null hypothesis that the observed and predicted Gumbel distribution curves are from the same family may be a data artifact from the low fit evidenced by the low R^2. For Louis Meadows, the Kolmogorov-Smirnov test indicates that the observed and predicted curves are from the same Gumbel family of distributions. The KS test for Louis Meadows fails at 0.09.

Table 9 - Good-of-Fit Tests - Observed to Predicted - 16 Years of Observations

	Cumulative max rain (in) over 16 years			
	972		596	
Years	**Observed**	**Predicted**	**Observed**	**Predicted**
1	-	-	0.3	-
2	0.4	0.67	0.4	0.79
4	0.5	0.83	-	-
8	0.6	0.98	0.5	1.72
10	0.7	1.01	0.6	1.85
11	-	-	0.9	1.91
12	0.8	1.04	-	
13	-	-	1.1	2.01
14	0.9	1.07	1.3	2.05
15	1.1	1.08	2.1	2.10
16	1.2	1.10	3	2.13
R^2	0.75	-	0.36	-
χ^2	0.23	-	0.23	-
KS test	0.28	-	0.09	-

This lack of goodness-of-fit for the Lookout Peak Station calls into question, on statistical grounds, extrapolating this fitted Gumbel distribution to out to 100-years. For the

Lookout Station another 16 years of data will have to recorded in order to increase the confidence of that station's forecasted 100-year maximum exceedance rainfall.

Table 10 – Maximum Predicted Exceedance Rainfall (inches) by 4 to 100 Year Intervals and Expected 100 Year Events Counts for Stations at Louis Meadows and Lookout Peak

		Predicted Maximum exceedance rainfall inches (X*)		
Elevation (feet)		**6,100**	**8,161**	**4,280**
Return time years	**Expected Count per 100 years**	**Louis Meadows**	**Lookout Peak**	**300 W. N. Temple**
4	25	0.83	1.29	
5	20	0.88	1.43	
7.5	13	0.96	1.68	
10	10	1.01	1.85	
25	4	1.18	2.39	
50	2	1.31	2.79	
75	1	1.39	3.02	
100	1	1.44	3.18	1.5

Source: Author and NRCS SNOTEL Reporter 2.0.

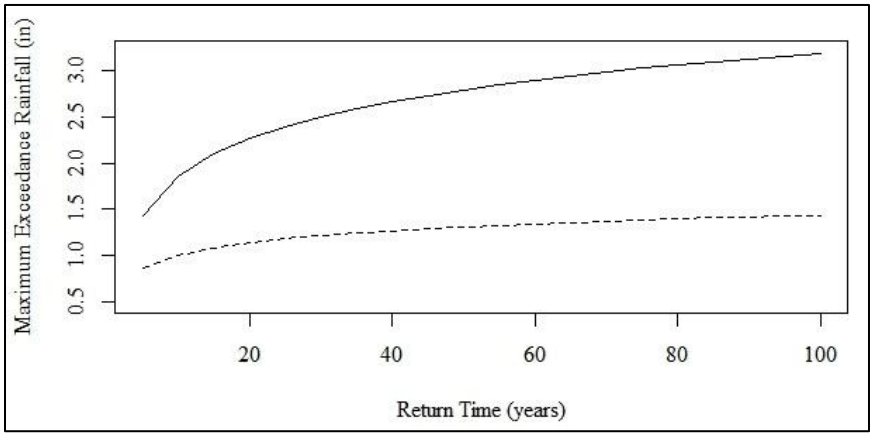


Figure 7 – Comparision of Predicted 100-year Maximum Exceedance Levels for Louis Meadows and Lookout Peak SNOTEL Stations, Years 0 to 100. Source: Table 8. Solid=Lookout Peak; Dashed = Louis Meadows.

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In conclusion, the Louis Meadows SNOTEL Station (972) computed 100-year extreme rainfall level is 1.44 inches. For the Lookout Peak Station (596) , the 100-year maximum exceedance rainfall was computed at 3.18 inches. Since both of these 100-year estimate values are far outside the domain of the 16 years of observations, they have low-confidence.

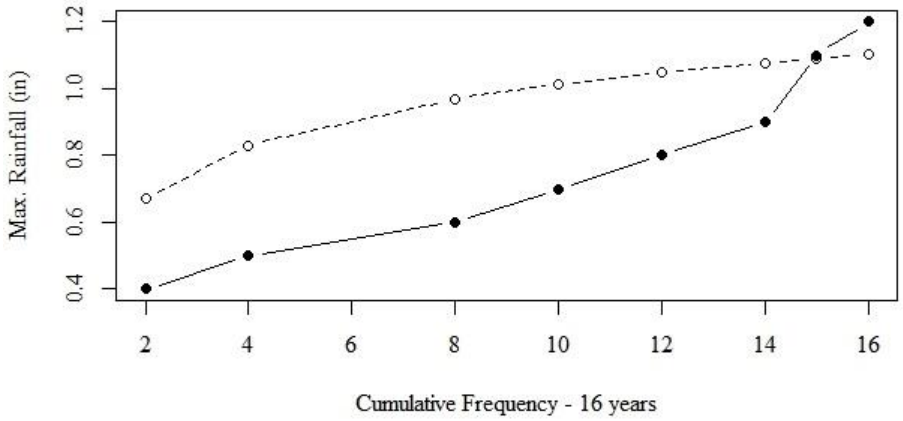

Figure 8 – Comparison of Gumbel Distribution Predicted to Observed Cumulative Annual Maximum Rainfall (in) for Louis Meadows for 16 years. Source: Table 9 and Table 10. Solid = Observed. Dashed = Predicted.

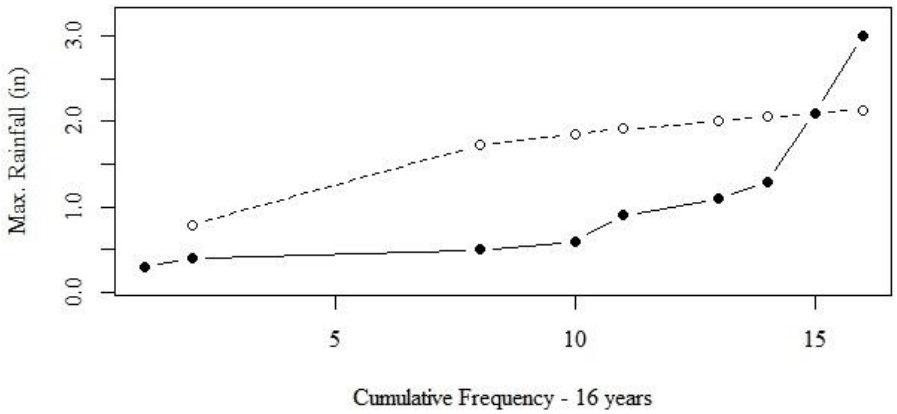

Figure 9 - Comparison of Gumbel Distribution Predicted to Observed Cumulative Annual Maximum Rainfall (in) for Lookout Peak for 16 years. Source: Table 9 and Table 10. Solid = Observed. Dashed = Predicted.

Influencer Analysis of Two Highest Lookout Peak Readings

Two potential outliers (2.1 and 3.0) at Lookout Peak might influence the 100-year Gumbel exceedance rainfall prediction. One statistical influence test to regress a model with and then without the potential influencer points. In order to investigate this possibility, the Gumbel distribution model was re-run for the Lookout Peak data, but with the 2.1 and 3.0 values censored out. The 100-year predicated rainfall remained declined to 3.0 inches with censoring. There were identical parameters and significance results for the Lookout Peak data.

The shape of the Lookout Peak maximum annual rainfall curve explains why the two points have relatively little influence on the model's outcome. Figure 3 at page 6 above shows that most of the rise in Lookout Peak's cumulative maximum annual rainfall occurs towards the end of 16 year period. This yields a steeper curve between years 10 to 16. Censoring the last two rainfall values of 2.1 and 3.0 does not change the observed slope between years 10 to 14. As a result, censoring the two top values did not change the parameters of the fitted curve for Lookout Peak. The 100-year maximum exceedance value decreased from 3.2 to 3.0. Compare Figure 3 for Lookout Peak with Figure 2 for Louis Meadows. The rise in the Louis Meadows cumulative maximum annual rainfall is slight and consistent over the observed interval. The result is that the 100-year maximum exceedance value remains near the maximum of the 16 year observed interval – at about 1.4 inches per hour. The two values of 2.1 and 3.0 should not be censored on the grounds of influence with respect to the Gumbel distribution.

The Likelihood of a Range of Precipitation Maximum Annual Events Over 100-years

Another measure of the magnitude-intensity characteristics of severe rainfall events is how often a range of severe rainfall events occur at various levels of precipitation. The 100-year exceedance level concerns magnitude, but a 100-year maximum exceedance point estimate tells us nothing about how many times over 100 years that lesser precipitation might occur that nearly equal the maximum. For example, it might be useful to know for Louis Meadows the number of times it would be expected that between one inch per hour and the exceedance level of 1.44 niches will be occur within a 100-year time frame. As seen in Table 5 and Table 6 when rainfall events are combined with site specific safety risk and structure engineering concerns on a less than 100-year time frame, safety risk events can frequently occur at less than the 100-year maximum. Evaluating this range of risks with a Gaussian distribution cannot be used because only average annual rainfall has a normal distribution; annual maximum levels do not.[8]

It is mathematically possible to infer expected counts from the Gumbel-fitted maximum exceedance distribution (Table 8 and Table 9). The domain of Gumbel-fitted exceedance is the return time of a level of rainfall (T). The inverse of the return time implies an expected count (1/T) of the number of years over the 100 years that annual maximum rainfall will occur. Since the fitted distribution is continuous, Equation 1 at page 11 can be inverted.

$$\frac{1}{T_{return}} = 1 - e^{-e^{-(\frac{x-\beta}{\alpha})}} = F(a,b).$$

Equation 2 - Image-inverted form of Equation 1 - Gumbel maximum value survival function.

[8] Hornberger et al., above, at 31,34.

The right-hand side of Equation 2 is a Gumbel *survival function* for maximum annual rainfall across an interval (NIST, n. 6.). The Gumbel survival curve in Figure 10 shows how as the maximum annual rainfall increases, the probability of seeing that event within a 100-year time frame decreases.

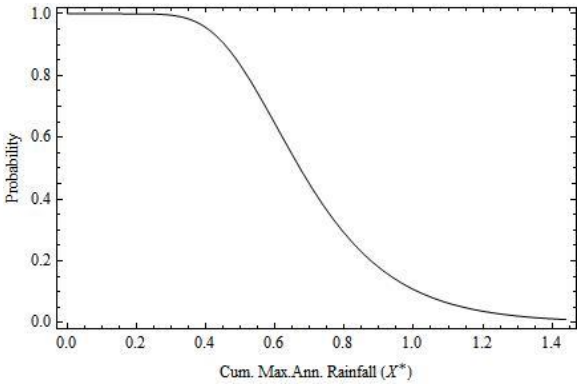

Figure 10 - Survival Curve of Maximum Annual Precipitation over 100-years for Louis Meadows.

Applying the calculus anti-derivate interval rule that $\int_a^b f = F(b) - F(a)$, the probability that the number of years that a range of maximum annual precipitations will occur can be predicted. For example for Louis Meadows 100-year model (Table 1), for the maximum annual precipitation ranges between 1.0 inches and 1.44 inches,

$$F(1.0) - F(1.44) \simeq 0.10,$$

or in 10 out of every 100 years, the maximum annual rainfall is expected to fall between 1.0 and 1.44 inches. For between 0.5 and 1.44 inches,

$$F(0.5) - F(1.44) \simeq 0.82,$$

or in 82 out of 100 years, the maximum annual rainfall is fall expected to be between 0.5 and 1.44 inches.

However, this inverse function inherits the moderate-to-poor goodness-of-fit for original 100-year models (Table 9). The variation in the results of this method of predicting the likelihood of a range of precipitation events make it less useful as a predictive tool. In the next section, an alternative method – power law fitting - is used to address this question.

Power Law Fit of Count of Hourly Rainfall Events

$$y = Cx^{-\alpha}$$

Equation 3 - Power law model

Another statistical approach to model the intensity of maximum events is to directly examine the total count of expected high, rare rainfall events over a defined interval. For Louis Meadows, a fitted power law density model (R^2=0.99) appears in Column D of Table 5 on page 8, above. For the Lookout Peak Station, the same data and power law model are listed in Table 6 on page 9. The fitted parameters of each 16-year power law model are listed as follows. The fits have such high R^2 and low p-values because there are over 130,000 hourly observations for each station. Having a continuous distribution of counts implies that integration techniques can be used to answer "in-between" questions, such as "What is expected count of rain events between 1.0 and 1.4 inches?" over 16 years? The 16-year model regressions for each station are shown in Figure 11 and Figure 12.

Table 11 - Estimated Parameters and Goodness-of-fit for the Power Model of Hourly Rainfall (in).

Station	α	α se	*p*-value	C	C se	*p*-value	R^2	N
972	3.371	0.093	<000001	51.466	10.935	<0.001	0.999	134,865
596	3.482	0.091	<0.00001	37.252	7.784	<0.0004	0.999	124,719

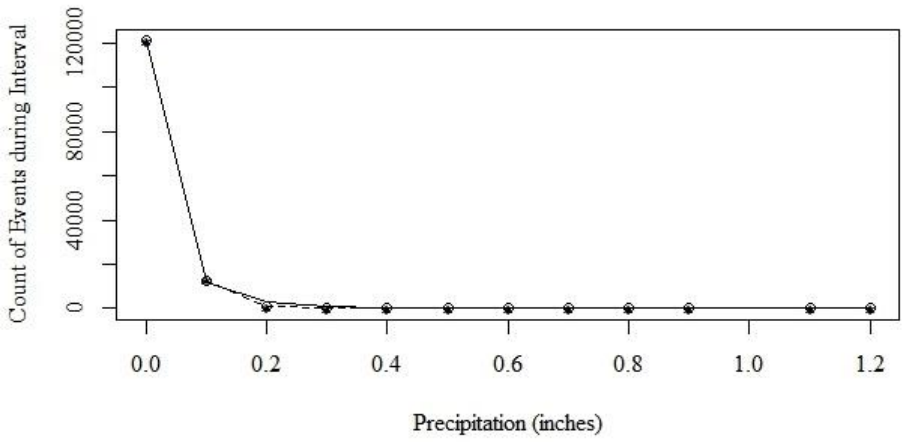

Figure 11- Counts of rainfall events from power law model for Louis Meadows over 16 years. * - Observed; Circles - Predicted. Source: Table 11.

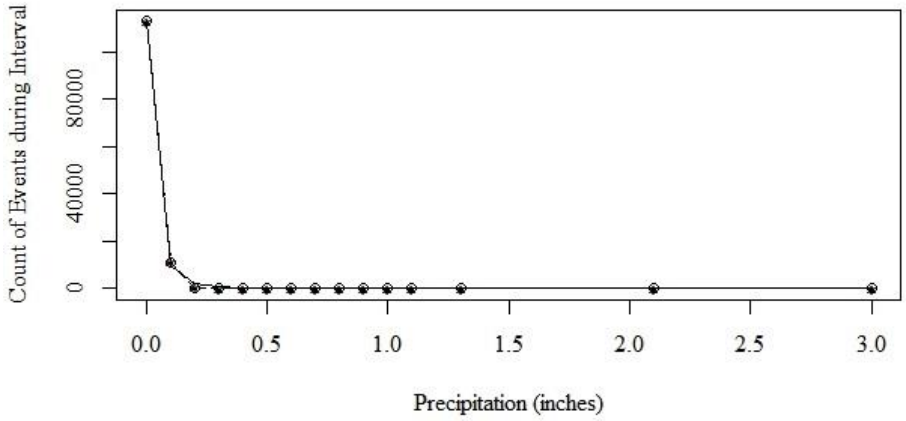

Figure 12 - Counts of rainfall events from power law model for Lookout Peak over 16 years. * - Observed; Circles - Predicted. Source: Table 11.

Calculus can again be used to predict the expected count of rainfall events over 16 years and for a range of precipitation events at the Louis Meadows station, *e.g.* – for the ranges 0.8 to 1.2 and 0.5 to 1.2 inches,

$$\int_{0.8}^{1.2} 51.444\, x^{-3.371} \simeq 23.$$

$$\int_{0.5}^{1.2} 51.444\, x^{-3.371} \simeq 98.$$

Similar predictions can be made for the Lookout Peak station,

$$\int_{0.5}^{1.2} 37.252\, x^{-3.482} \simeq 74.$$

These predicted point estimates are much higher than the corresponding rainfall ranges are higher than the observed 16 year amounts (Table 5 and Table 6 at pages 8-9). This is attributable to the standard errors of the coefficients (Table 11), and that as the "tail" of rare events in a power law distribution is approached, the variance increases dramatically.

Advanced statistical techniques can be used to extrapolate these levels from 16 years to 100 years, by summing 6.25 (100/16) sets of power law random variables, but that is beyond the scope of this inquiry. [9]

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[9] *See* Newman, M.J.E. (2005). Power laws, Pareto distributions and Zipf's law. Contemporary Physics. 46(5):323-351. DOI: 10.1080/00107510500052444. Ordinarily, power law functions can be integrated, because they do not converge as they approach zero. The solution is to integrate only part of the interval where integration is first possible. Using this partial integration, usual techniques for finding the expected value of the sums of several random variables can be applied.

The main conclusion from power law analysis is considering a range of precipitation, there are many more occurrences of potential damage producing rainfall in City Creek Canyon than suggested by a point estimate of a 100-year Gumbel 100-year maximum exceedance rainfall of 1.5 inches from either the Salt Lake County 1-hour 100-year maximum exceedance rainfall map or from analysis of City Creek SNOTEL station data.

Discussion

Data cleaning and coding

There were two lessons-learned during this cleaning and recoding process. First, in order to preserve the integrity of the statistical process, raw– not NRCS cleaned – datasets should be used. Agency data error corrections do not fully code for all invalid data that should be excluded from a maximum rainfall exceedance analysis. Second, Excel was used for the cleaning and coding process. Stata should have been used because it better maintains a permanent traceable record of the data cleaning and recoding process.[10] The final cleaned and recoded dataset is not attached due to size, but is available on request.[11]

Does the Rate of Maximum Annual Rainfall Increase with Altitude?

A complete Gumbel distribution for valley floor extreme rainfall exceedance levels prepared by Salt Lake County is not available. Single point estimates of the maximum annual rainfall over a 1 hour period per 100 years suggests that $X^*_{100\text{-years}}$ increases with altitude.

		Sign Magnitude	Intensity
Station	**Elevation (ft)**	**Gumbel (in-$_{100yrs}$)**	**Observed Events ≥ 0.5 in for 16 years**
300 West N. Temple	4,280	1.50	Unknown
Louis Meadows	6,700	1.44	38
Lookout Peak	8,160	3.18	33

Louis Meadows has a lower predicted 100-year exceedance rainfall than the lower 300 West N. Temple station, but the Lookout Peak 100-year exceedance rainfall is higher than either Louis Meadows or North Temple. This is attributed to the physical setting. The Louis Meadows station is set in a deep canyon between Grandeur Peak to the north and Little Black Mountain to the south. The topography may be altering weather patterns. Conversely, the Lookout Peak station is located on an unobscured mountain ridgeline.

The difference between the observed count of rainfall events greater than or equal to 0.5 inches over 16 years was not significant between at the Louis Peak station as compared to the higher Lookout Peak station (38-33=3).

As discussed above, these estimates are based on extrapolating 16 years of observations outside the observed interval to 100-years. That process inherently reduces confidence in these predicted values, and these results should be considered provisional.

[10] The cleaning and recoding file, not attached, is 20190705NRCSSnotelSt972_576RawWorkingD.xlsm (117mb).

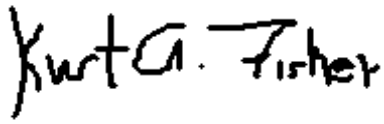
[11] File: 20190711SnotelGTE0_1PrecipEvents.csv (27Mb).

Overall the weight of signs, given the low confidence in extrapolating 16 years of data to 100 years, does not support the hypotheses that severe rainfall event increase with elevation.

Conclusion

In conclusion, based on 14 to 15 years of available cleaned SNOTEL data, severe rainfall events at these three stations most probably do not increase with elevation. Low-confidence point estimates for maximum annual rainfall 100-year exceedance ($X^*_{100\text{-years}}$) are reported. Based on power law analysis considering a range of precipitation, considering a range of precipitation, there are many more occurrences of potential damage producing rainfall than suggested by a point estimate of the corresponding 100-year Gumbel 100-year maximum exceedance rainfall.

Suggested future work would be to expand data analysis of rare rainfall events at mountainous SNOTEL stations in an increasing radius around City Creek in order to determine if the high correlation of precipitation to counts in the rare event tail of power law distributions is a general result. An analysis of 1-hour precipitation events during the same 16 year time interval might be performed using University of Utah or Salt Lake International Airport station data on MesoWest in order to further investigate whether there is in fact a relationship between altitude maximum rainfall exceedance levels over 100-years and altitude.



Kurt A. Fisher

Addendum A

Key Historical Salt Lake City Creek Floods and Northern Utah Cloudburst Flooding Documents, Research and Academic Articles[12]

Excerpts from SLC DPU GRAMA production to K. Fisher, June 13, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190617ExcerptsfromDPUProductionre4thAveWell.pdf).

> As a result of the 1983 state-wide floods, the DPU's predecessor spent about $1,000,000 repairing flood damage to roads from North Temple and State Street north to Memory Grove. The City replaced 1,040 feet of 6" inch pipeline excavated and damaged by flood waters between 4th Avenue and Memory Grove, 18 subsurface sewer and water connections in the area were destroyed, and the foundations of the old Brick Tank house north of Memory Grove were undermined.

Nicoli, K. and Lundeen, Z. J., University of Utah. (2016). A case study: geomorphic effects of the 2009 Big Pole fire, Skull Valley, Utah (Vignettes: Key Concepts in Geomorphology). Northfield, Minnesota. (url: http://serc.carleton.edu/47063).

> A recent example of the effects of cloudburst flooding in northern Utah. In a large Skull Valley canyon fire covering about 41,000 acres. Such fires decrease soil permeability by 9 to 100 times. *See also* Craddock, below. During subsequent heavy rains in Skull Valley, large sheet flows occurred and craved 1 meter deep rills in the alluvium. Historically, a similar incident occurred a Dry Creek Canyon. In 1915, there was a large 4 square mile fire in the Canyon that spread over the Salt Lake City Salient southern city-facing hillside. *See* Salt Lake Telegram and Tribune, 1915, below. Woolley records that on July 25, 1916, a Dry Creek Canyon cloudburst sent a 4 to 10 foot wall of water down City Creek and into city, along with mud, boulders and cattle (below, Salt Lake Tribune July 25, 1916).

Wirth, Craig (KUTV News). May 12, 2014. Remembering the flood of '83. KUTV News. At min. 1:35. (url: https://www.abc4.com/wirth/wirth-watching-remembering-the-salt-lake-city-flood-of-83/204262974)

Salt Lake Tribune, and Smart, C. (2011, Apr 29). River on State Street unlikely in 2011, official says. Salt Lake City Tribune. Salt Lake City, Utah. ProQuest No. 864039697. (Retrospective article in which Salt Lake Councilperson describes sandbagging efforts to control 1952 flood; available through Proquest (https://www.proquest.com/) or copy on file with this author).

Honker, A. M. (1999). "Been Grazed Almost to Extinction": The Environment, Human Action, and Utah Flooding, 1900-1940. Utah Historical Quarterly, 76(1), 23–47 (url: http://heritage.utah.gov/history/quarterly) (Includes review and photographs of Salt Lake City Creek

[12] In reverse chronological order.

flooding, in particular, in 1909. Overviews high-snow melt verses cloudburst flooding in northern Utah).

Salt Lake Tribune, June 3, 1983 and July 22, 1983. Reproduced in Salt Tribune. 1983. *Spirit of Survival: Utah Floods of 1983* (Available at Reference Desk, Main Branch, Salt Lake City Public Library and Special Collections, Marriott Library, University of Utah, Call No. F830 .S657).

Boyce, R. R. (1958). A historical geography of Salt Lake City, Utah. Thesis. Masters. Department of Geography, University of Utah at 41 re 1876). (On file at Special Collections, Marriott Library, University of Utah; copy in author's possession).

Salt Lake Tribune. April 30, 1952 (Available through https://go.newspapers.com/, re: floods of 1952).

Woolley, R. R. (1946). Cloudburst Floods in Utah: 1850-1938. Washington, D.C. at 96-120 (url: http://pubs.er.usgs.gov/publication/wsp994)

> Woolley listed numerous cloudbursts floods that have come across the Avenues District and from City Creek and across the proposed Well site and into the downtown: (Woolley 1946). Summer cloudburst floods included: June 13th, 1854 (city streets flooded), September 11th, 1864 (heavy flooding of North Temple from City Creek), August 25th, 1872 (downtown flooded), July 23rd, 1874 (downtown flooded from City Creek), August 1st, 1874 (Lindsey Gardens areas flooded as in 1945), August 8th, 1884 (North Temple flooded from City Creek), July 26th, 1893 (cloudburst flooded basements in city), July 19th, 1912 (1 inch fell in 1 hour filled South Temple with sand and mud from above), July 25th, 1916 (cloudburst sent a 10 foot wall of water into city along with mud, boulders and cattle), July 30th, 1930 (cloudburst over Emigration, Red Butte, and Parley's Canyons washed out highway north of Salt Lake and washed away three homes with damages of 500,000 USD), and August 13th, 1931 (four to 12 inches of water swept through streets and 12 feet of debris washed over road near Beck Hot Springs).

Craddock, G. W. (1946). The Salt Lake City Flood, 1945. Proceedings of the Utah Academy of Sciences, Arts and Letters, 23, 51–61. (On file with the Special Collections, Marriott Library, University of Utah; copy attached).

Salt Lake Telegram, August 20 and 27, 1945 (Available through https://go.newspapers.com/; copy in author's possession).

Salt Lake Telegram, August 1, 1944. "S.L. Fire Burns Grass, Brush." This fire potentially led to the Aug. 1945 Perry's Hollow flood per Craddock (1946) (url: https://newspapers.lib.utah.edu/ark:/87278/s6j97frg/17144631).

Utah Flood Commission. (1931). Torrential floods in Northern Utah, 1930. Logan: Agricultural Experiment Station, Utah State Agricultural College. On file at Special Collections, Marriott Library, University of Utah. (url:.http://www.lib.utah.edu).

Salt Lake Telegram. August 14, 1931. Flood Traps Car on Highway. (A cloudburst flood buried cars on highway to the north of Salt Lake City).(url: https://newspapers.lib.utah.edu/ark:/87278/s6cr728k).

Salt Lake Telegram. Sept. 24, 1918. Property Damaged by Big Cloudburst. (A cloudburst flood swept down West Capitol Hill and buried properties at 200 West in up to 1 foot of mud). (url: https://newspapers.lib.utah.edu/ark:/87278/s6d80jz5).

Salt Lake Tribune. July 25, 1916. Cloudburst Kills Cattle in Canyon. (url: https://newspapers.lib.utah.edu/ark:/87278/s6j10wfd)

> "A cloudburst breaking in Dry canyon during the electrical storm of yesterday emerged from the ravine a solid ten-foot wall of rushing water, carrying with it eight head of cattle and rocks weighing from 1000 to 1500 pounds, swirling them along as lightly as feathers. Following the course of the old waterway, the waters rushed through Popperton place, down Second and Third Avenues, turning on Ninth East to the Second South conduit before the force of the flood was spent. In the residence district of Popperton place and the avenues the telephone poles showed that the water mark to have been four feet."

Salt Lake Tribune. August 6, 1915. City's Watershed Suffers from Fire. (url: https://newspapers.lib.utah.edu/ark:/87278/s6tf17rk/14627562)

Salt Lake Telegram. August 5, 1915. Big Damage Caused by Brush Fire in City Creek. (url: https://newspapers.lib.utah.edu/ark:/87278/s6km0kdd/19586313 , re: 4 square mile brush fire in City Creek Canyon that crossed city-side ridgeline).

Salt Lake Telegram, June 19th, 1903. Salt Lake City in Path of Cloudburst, Should It Break in City Creek. (url: https://newspapers.lib.utah.edu/ar/87278/s6ck2gdq)

Addendum B

Table 12 - Four Cloudburst Floods Along the Salt Lake City Salient Since 1900. Source: Addenda "A"

Flood Date	Flood Location	Flood Description	Related Fire Date	Related fire location	Description
Sept. 25, 1916	Dry Fork Canyon to 2nd Ave and 9th East	"Solid ten-foot wall of water rushing water . . ."	Aug. and Nov. 1915	Dry Fork to Upper City Creek; Lower City Creek 4 to 7 sq. miles burned	In Aug. "four miles of east side of Canyon burned." In Nov., fire spread from Dry Fork to upper City Creek.
Sept. 24, 1918	West Capitol Hill to 200 West	Up to 1 foot of mud.	Not applicable (NA)	NA	NA
Aug. 31, 1931	West Ensign Peak	Floods mixed with mud completely buried cars on highway	NA	NA	NA
August 20, 1945	Perry's Hollow to M Street and 200 South	Wall of water and mud carried cars and gravestones to North Temple.	Aug. 1, 1944	388 Acres at the top of Perry's Hollow-City Creek ridgeline.	Craddock refers to "Fully 80 percent of the area, including all but patches of the headwater slopes and portions of the lower benchlands, was burned last fall" (at 58).

Addendum "C"

Table 13 - Data Cleaning and Coding Flags

Code	Column	Count	Type	Meaning
0	adjMan	Not stated		The most common entry. NOT excluded row. Valid data.
1	adjMan	Ns	Invalid data	Mostly at water year breaks on Oct 1, 2019 where the accumulation is reset to zero.
0	exclFlag	Ns		The most common entry. NOT excluded row. Valid data.
1	exclFlag	2,262	Invalid data	PrecipQC has E flag N=2744 or Precip is "blank".
2	exclFlag	5,160	Invalid data	SnowDepthQC has E flag, excluding those items not already excluded on adjMan Flag=1.
3	exclFlag	13,484	Invalid data	This flag presents the greatest challenge for quality assurance evaluation. The pattern indicates that the field is empty for those summer months are the snowpack reaches its seasonable evaporation, but those hours are not coded as such. The implied summer value is "0". During the winter this represents an instrumentation failure. However, between November and March, where SnowDepth and SnowDepthQC are "blank", those entries are coded for exclusion on the grounds it represents an instrumentation error. Note for many of these hours, a Snow Water equivalency is recorded. This represents a substantial data loss. N=13,484, exclusive of any prior exclusion of a value on other grounds. Many summer entries contain anomalous codes that are less than zero, e.g. -6854 and -182. These are ignored as instrument messages. Many summer entries for snow depth fluctuate between 0, 1, and -1. They reserve and sum to zero on consecutive days. These are ignored as random instrument fluctuations. This excludes almost all of the Lookout Peak records during January to March 2003 when that station was first starting up. Kept SnowDepth and SnowDepthQC is "blank" - 50,414.
4	exclFlag	3,139	Invalid data	Snow WaterQc has E flag and not already excluded on other grounds. SnowWaterQc and SnowtWater are "blank" are retained. These entries generally occur during the summer months and indicate a non-functioning instrument.
5	exclFlag	3	Invalid data	AirTempQC = E. AirTemp and AirTemp QC are blank is retained. For the first three years, air temperatures were not recorded and are blank. This information is used to verify high rainfall events; it is expected that temperatures should drop before an event.
6	exclFlag		Invalid data	Misc.manual review exclusions. delta Precip are large negative values =< -2.0

Code	Column	Count	Type	Meaning
				Instrument reset error codes. After the first 47 entries through Neg Delta LT-2.0 to Louis Meadows 6-18-2011, I felt that is was appropriate to automark all entries with delta <-10.0 and delta>10.0 as code 6 - instrument reset. N=56 reset. That left 51 to review for the negative values LT -2.0 Reviewed -1.5 to -0.3 and 0.3 to 2.0 for pairs of E and instrument reset on next reading not flagged. Did recoding to 6 for all matched pairs in "E" and "E"+1 rows using R code program. N=2077 Coded -0.3 to 0 and 0 to -0.3 where both snowdepth delta and precip are positive during months Oct to February .
7	exclFlag	4,009	Event space filtering	Mixed snow/sleet event - Event space filtering - of not otherwise excluded. Precip >= 2.0 inches with substantial fraction of snow. The precip amount quickly reverses in the next hour's entry due to melting or freezing.
8	exclFlag	<10	Invalid data	Other miscellaneous anomalous reading. Decided to keep two Lookout Peak events (2.1 and 3.0 inches). Later power law analysis indicates the readings were not outliers.
9	exclFlag	147	Event space filtering	Air temps less than 32 degs F and precip positive and not otherwise excluded. Excludes winter cases with water precipitation while temps are -10 deg. F. but there is no snow water equivalent change reported or a snow water equivalent change is reported. Event space filtering.
10	exclFlag	Ns	Event space filtering	Negative delta precips. Evaporative event. Event space filtering.
11	exclFlag	Ns	Event space filtering	-0.3 to 0 and 0 to -0.3 where both snowdepth delta and precip are positive during months Oct to February .
12	exclFlag	Ns	Event space filtering	12 - Oct through Apr month by month review. Not previously excluded. Includes 0.1, 0.2 and 0.3 in. precips. Temps are all less than 32. Precips with no or ambiguous snowfall are presumed snow.
13	exclFlag	Ns	Event space filtering	Nov through Feb month by month review. Not previously excluded. Includes 0.1, 0.2 and 0.3 in. precips. Temps are blanks.
14	exclFlag	Ns	Event space filtering	All months. Evaporative events not previously excluded. Generally, -0.1 to -0.3.
15	exclFlag	Ns	Event space filtering	Nov, Dec, Jan, Feb. Temp blank and precip = 0.
0	eventClass	Ns	Final inclusion	All valid preceip events. Precip = 0.0.

Code	Column	Count	Type	Meaning
1	eventClass	Ns	Final inclusion	All valid preceip events with Precip => 0.01
2	eventClass		Final exclusion	All invalid and non-precip events..

90°

WEATHER ALERTS /Flood Advisory: **Franklin, Oneida**

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LOCAL NEWS

US-89 between Thistle and Birdseye opened earlier than expected

Posted: Jul 27, 2019 / 04:52 AM UTC / Updated: Jul 29, 2019 / 04:32 AM UTC

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UDOT Traffic
@UDOTTRAFFIC

May 7, 2020

90°

Co.
Est. Clearance Time: 8:58 PM

2 8:02 PM - Jul 28, 2019

See UDOT Traffic's other Tweets

UPDATE: Utah Department of Transportation indicated the road will be closed until at least Monday at 6 a.m.

John Gleason
@johnegleason

Damage on U.S. 89 captured the morning after flooding forced the closure of the highway. UDOT crews are working to re-open the road by Monday morning.

87 11:13 AM - Jul 27, 2019

40 people are talking about this

BIRDSEYE, Utah (ABC4 News) – US-89 is closed in southeastern Utah County due to flooding Friday evening.

Utah Department of Transportation said the roadway is closed in both directions due to debris and flooding one mile north of Birdseye.

MUD, DEBRIS COVER US-89 IN UTAH COUNTY

Heavy equipment plowed through underwater debris with dozens of vehicles stranded along the highway.

90°

Courtesy: Richard Scutt - US-89 closed due to flooding

The roadway is surrounded by burn scar from last year's Pole Creek fire.

"With that, of course, that debris is more easily picked up, mudflows off the mountainside a little easier, and this is the result," said Sgt. Street.

Troopers said some drivers fled their vehicle to get to higher ground.

"It sounds like there were a few people that had to sprint to safety – and fortunately they were able to," said Sgt. Street.

90°

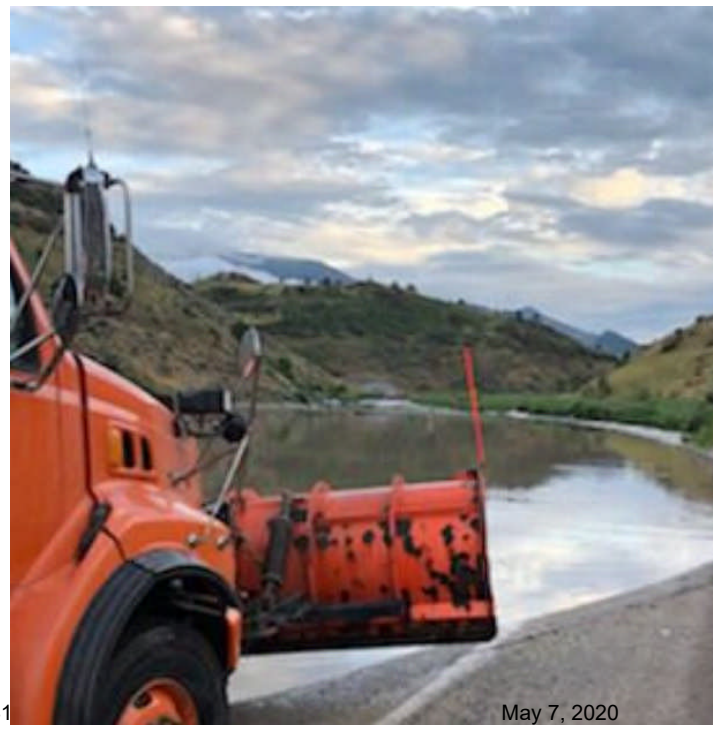
Courtesy: Lynn and Angie Daley - US-89 flooding

US-89 TO BE CLOSED FOR 'UNDERTMINED' AMOUNT OF TIME

Highway 89 between mile markers 6 and 11 will be closed indefinitely until crews can assess the situation.

Flash flooding and mudslides caused water, mud and other debris to cover the highway.

Three different tractors and plows are being used to clear the debris, so the Utah Department of Transportation can determine how much damage has been done to the roadway.

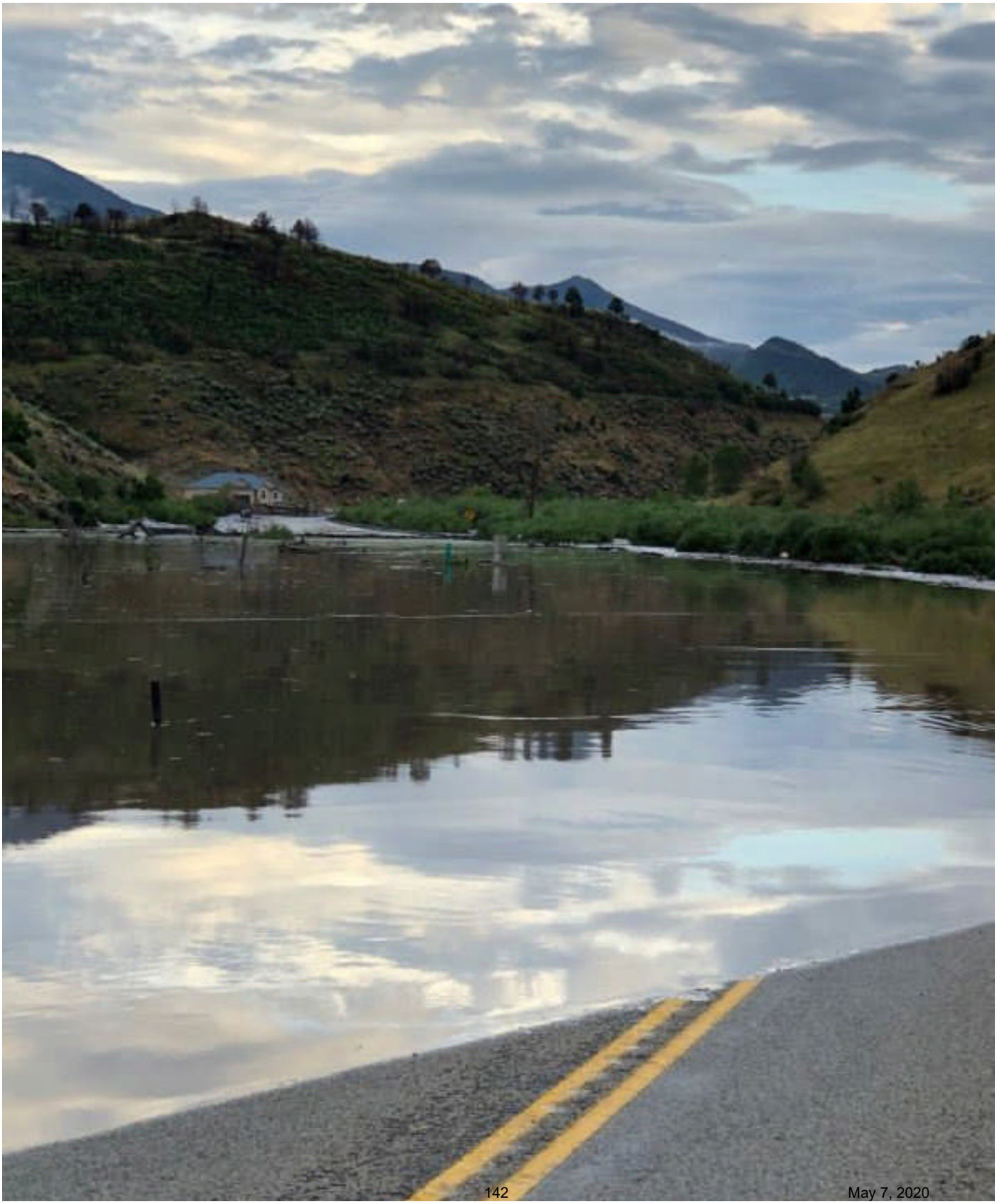


141 May 7, 2020

90°

Photo: UDOT

Photo: UDOT



90°

Photo: UDOT

This amount of water can erode the shoulders of the road, so the pavement and substructure underneath can become unstable which creates unsafe conditions for drivers.

Utah Department of Transportation says this same area flooded back in 1983 but the damage wasn't anything of this magnitude.

"This hasn't happened to this level in several years, so this is a big event for us in trying to clean things up and get the roadway reopen," said Geoff Dupaix, UDOT Region 3 Communication Manager.

If the weather cooperates, UDOT hopes to get everything cleared up in these overnight hours.

WHAT OTHERS ARE CLICKING ON:

- EXCLUSIVE: Friends and family remember West Valley City man who drowned in Provo River
- Trump signs bill extending 9/11 Victims Compensation Fund into law
- US rejection disappoints states eyeing Utah Medicaid plan
- Elementary school choir gets surprise performance from Carrie Underwood
- Capital One target of massive data breach

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KURT ALLEN FISHER
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[redacted]

August 27, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com
Historic Landmark Commission
SALT LAKE CITY CORPORATION
451 South State Street, Room 326
Salt Lake City, Utah 84111

cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)

Re: 4th Avenue Well – HLC PLNHLC2018-00557 and PLNHLC2018-00558
Comment: Alleged "Critical Need" for the 4th Avenue Well

Ms. Lindquist:

This letter supplements my prior comments to the Historic Land Commission. I am aware that the June 6th hearing has been postponed and that the matter may not return to the Commission until the end of year. I am sending this comment to you for filing in the Commission's records now, should I forget the issue between now and the future reactivation of this matter four to six months from now.

Many have described the 4th Avenue Well as "critical" infrastructure. In April 2019, DUP Director Briefer implied that if the well is turned off in the summer, then downtown water users will not get water (Fox News). In its recap of its June 4, 2019 budget hearing, the Salt Lake City Council described the 4th Avenue Well as, "The well serves as a critical water supply for downtown." In a June 21, 2019 statement by Mayor Biskupski, she commented that, "The criticality of this well cannot be overstated", and Mayor went on to imply that if not approved, insufficient water might be available to fight fires in the Avenue's foothills or in downtown hotels. These statements made external to the Historical Landmark Commission administrative proceeding were intended to either directly or indirect affect the Commission's deliberations. Similarly, media reports frame the issue as local neighborhood residents standing in the way of downtown expansion (Semerand).

The Applicant's submissions to the HLC represent that the 4th Avenue well produces between 5 million and 7 million gallons of water per day during the summer season (HAC Report, April 12, 2019, Attachment C in the Commissions' June Briefing Book). That is 15.3 to 21.5 acre feet per day or about 2,300 to 3,225 acre feet per 150 day running season.

In September 2018, the Metropolitan Water District with the City completed the 47.8 million gallon Terminal Reservoir below Olympus Hills Mall (MWDSS). There is an option to expand another 11 million gallons in storage capacity. 47.8 million gallons is 146.7 acre feet.

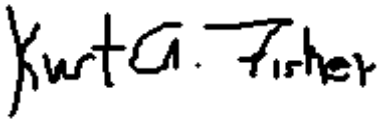
In 2014, Salt Lake City prepared a water conservation plan (SLC 2014). The plan notes that the City's surface water source capacities range from a dry year average of 286.5 million gallons per day (879 acre feet per day) to peak physical capacity of 345.7 million gallons per day (1,061 acre-feet) (*id* at Table 1-4, folio page 10). The plan further notes that the City's total annual production of potable water in 2004 was 83,238 acre-feet, projected to grow to 128,763 acre-feet in 2030 (*id* at Table 1-3, folio page 8).

The annual groundwater produced from the 4th Avenue Well is 2.7% to 4% of the City's 2004 annual production (2,300 or 3,225/83,328). In terms of daily production, the 4th Avenue Well produces 1.7% to 2.4% of the City's dry year water (5 or 7 mgd/286mpd) and 1.4% to 2% of the City's peak plant capacity. Additionally, the Terminal Reservoir stores 6.8 to 9.5 times the daily water production of the 4th Avenue Well (47.8/(7 or 5)). The City's primary water distribution system is designed to provide sufficient pressure to all parts of the City and ultimately connects back to the Terminal Reservoir.

All of the foregoing indicates that the 4th Avenue Well is "of concern" and important to the City's water supply, but to characterize the well as "critical" to the infrastructure is an exaggeration. To suggest that if the well goes out of service that downtown hotels or Avenues homes will burn down in fires from a lack of water are hyperbole that the HLC should ignore in its deliberations. The DUP may have other facts, not in the Commission's record, suggesting otherwise in particular to peak summer daily demand. But again, those facts are not in the record and should not be assumed by the Commission.

Please feel free to contact me with any questions that you may have by the means listed above.

Very Truly Yours



Kurt A. Fisher

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Semerand, T. April 4, 2019. The fight over pump house pits needs of Salt Lake City's thirsty downtown against a quiet neighborhood in Memory Grove. https://www.sltrib.com/news/2019/04/30/residents-mouth-memory/

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September 6, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com
Historic Landmark Commission
SALT LAKE CITY CORPORATION
451 South State Street, Room 326
Salt Lake City, Utah 84111

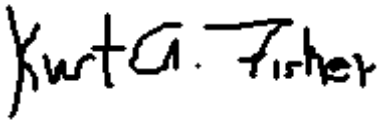
cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)

Re: 4th Avenue Well – HLC PLNHLC2018-00557 and PLNHLC2018-00558
Supplemental Backmatter on Lack of Alleged "Critical Need" for the 4th Avenue Well

Ms. Lindquist:

This letter supplements my letter of August 27, 2019 regarding allegations that the 4th Avenue Well should be constructed as requested by the Department of Public Utilities based on a "critical" public necessary argument. Attached find Figures 3-1 and 3-2 and Table 3-3 from the February 2019 Salt Lake City Water Supply and Demand Master Plan (Part I).[1] The 4th Avenue Well is one of 22 wells that provide part of the small band highlighted in brown of the City's total water supply shown Figures 3-1 and 3-2. These figures provide support for the argument made in my August 27, 2019 comment that the 4th Avenue Well, although important, is not a "critical" water supply for the downtown or the residential neighborhoods to the north of the downtown district.

Very Truly Yours

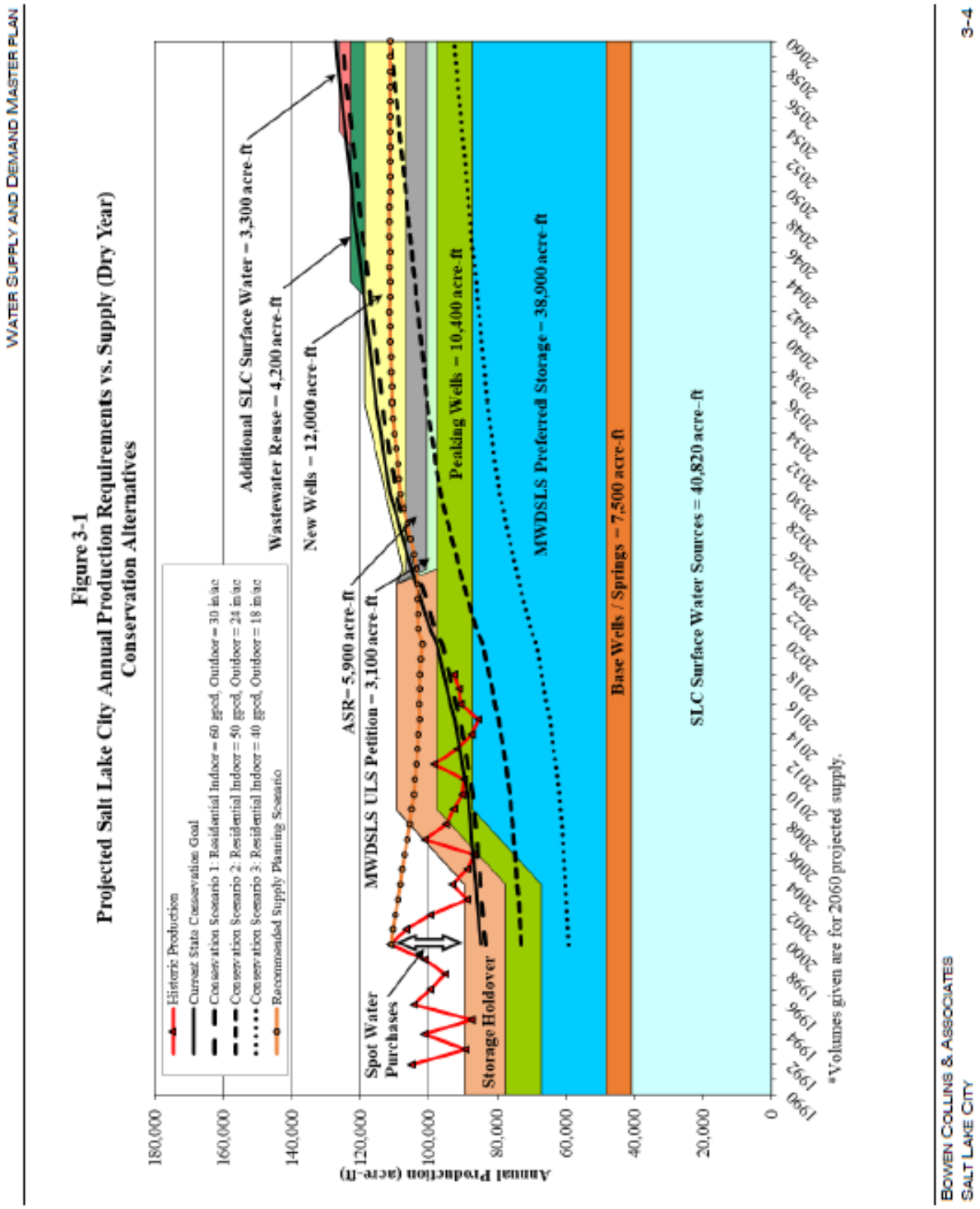


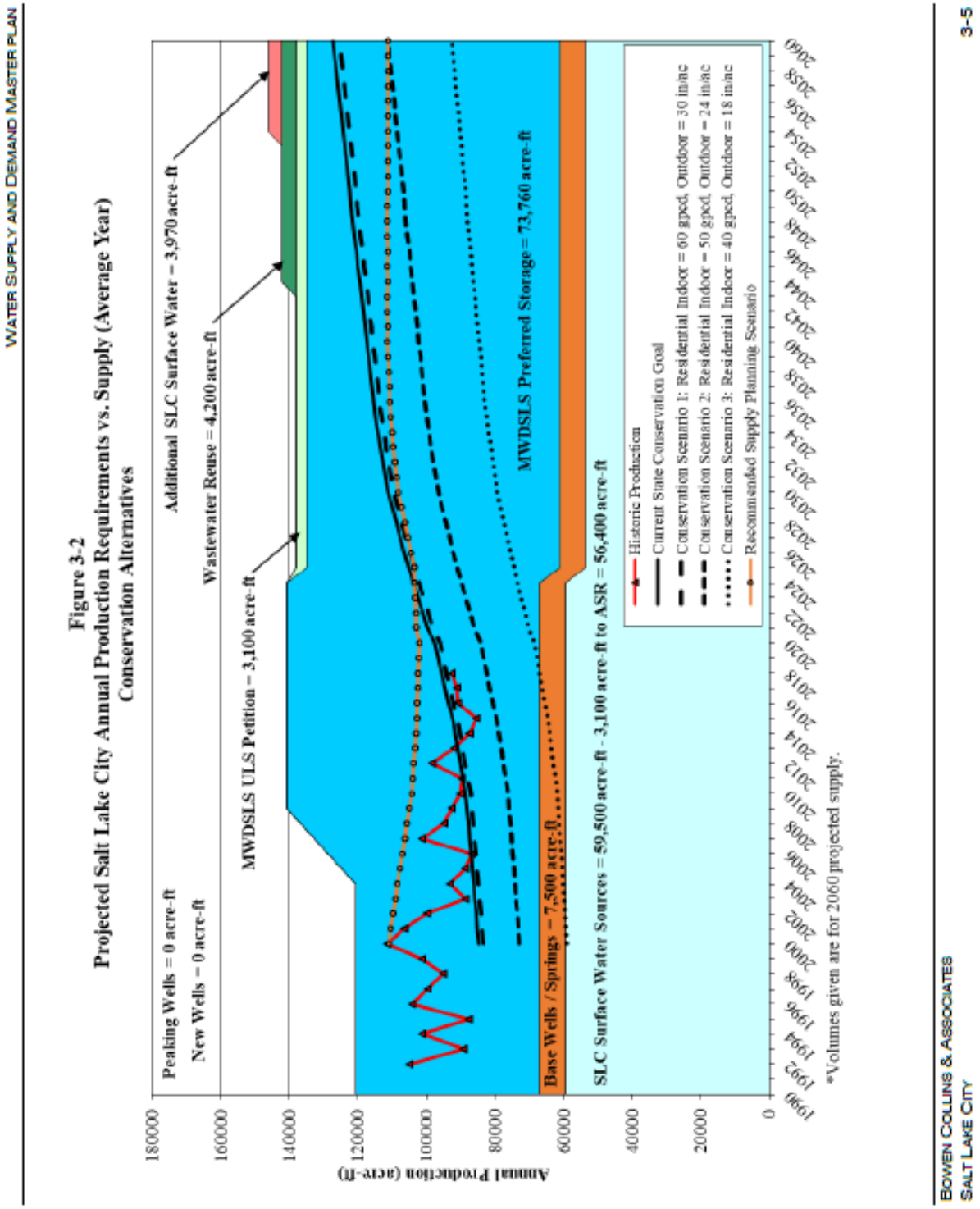
Kurt A. Fisher

References

Bowen, Collins and Assoc. February 2019. Salt Lake City Water Supply and Demand Master Plan. Part I. Original available from DUP; Fisher temporary archival copy at url: https://drive.google.com/open?id=1jeCQkczVRT7C_c34C4QsYyXtvpywXQnq .

[1] Received from the DUP pursuant to a GRAMA request on September 5, 2019.


WATER SUPPLY AND DEMAND MASTER PLAN
Figure 3-1
Projected Salt Lake City Annual Production Requirements vs. Supply (Dry Year)
Conservation Alternatives
Historic Production
Current State Conservation Goal
Conservation Scenario 1: Residential Indoor = 60 gpcd, Outdoor = 30 in/ac
Conservation Scenario 2: Residential Indoor = 50 gpcd, Outdoor = 24 in/ac
Conservation Scenario 3: Residential Indoor = 40 gpcd, Outdoor = 18 in/ac
Recommended Supply Planning Scenario
Additional SLC Surface Water = 3,300 acre-ft
Wastewater Reuse = 4,200 acre-ft
New Wells = 12,000 acre-ft
ASR= 5,900 acre-ft
MWDSLS ULS Petition = 3,100 acre-ft
Spot Water Purchases
Storage Holdover
Peaking Wells = 10,400 acre-ft
MWDSLS Preferred Storage = 38,900 acre-ft
Base Wells / Springs = 7,500 acre-ft
SLC Surface Water Sources = 40,820 acre-ft
Annual Production (acre-ft)
180,000
160,000
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
2052
2054
2056
2058
2060
*Volumes given are for 2060 projected supply.
BOWEN COLLINS & ASSOCIATES
SALT LAKE CITY
3-4


WATER SUPPLY AND DEMAND MASTER PLAN
Figure 3-2
Projected Salt Lake City Annual Production Requirements vs. Supply (Average Year)
Conservation Alternatives
Peaking Wells = 0 acre-ft
New Wells = 0 acre-ft
Additional SLC Surface Water = 3,970 acre-ft
Wastewater Reuse = 4,200 acre-ft
MWDSLS ULS Petition = 3,100 acre-ft
MWDSLS Preferred Storage = 73,760 acre-ft
Base Wells / Springs = 7,500 acre-ft
SLC Surface Water Sources = 59,500 acre-ft - 3,100 acre-ft to ASR = 56,400 acre-ft
Historic Production
Current State Conservation Goal
Conservation Scenario 1: Residential Indoor = 60 gpcd, Outdoor = 30 in/ac
Conservation Scenario 2: Residential Indoor = 50 gpcd, Outdoor = 24 in/ac
Conservation Scenario 3: Residential Indoor = 40 gpcd, Outdoor = 18 in/ac
Recommended Supply Planning Scenario
Annual Production (acre-ft)
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
2052
2054
2056
2058
2060
*Volumes given are for 2060 projected supply.
BOWEN COLLINS & ASSOCIATES
SALT LAKE CITY
3-5

City Creek Water Treatment Plant – The CCWTP is solely owned and operated by Salt Lake City. The peak capacity of the plant is 13 mgd. The plant only treats the natural runoff from City Creek and does not have access to any storage. Dry year production from CCWTP is estimated to be 4 mgd in late summer based on reliable dry yield estimates for time of year.

Wells and Springs – Salt Lake City owns and operates a number of wells and springs scattered through the City's distribution system. The estimated current capacities of City wells and springs are summarized in Table 3-3.

Table 3-3
Existing Well and Spring Capacities

Groundwater Source	Peak Day Production Capacity (mgd)	Contaminated?
13th East and 27th South Well	3.80	
5th South and 15th East Well	2.80	Yes, PCE
19th East and 27th South Well	5.80	Yes, PCE
300 East Pump Station	8.00	
48th South and 9th East Well	0.70	
4th Avenue and Canyon Road Well	5.50	
6200 South Well	4.00	
Brinton Springs Well	2.00	
Edgewood Well	2.00	
Ellison Well	2.50	
Fontaine Bleu Well	2.00	
Greenfield Village Well	1.45	
Little Cottonwood Well	1.50	
Millcreek Well	3.30	
Neff's Draw Well	0.45	
Nila Way Well	0.60	
Richard's Ditch Well	1.50	
Sugarhouse Park Well	1.70	Yes, PCE
Walker Lane Well	1.20	
Well 14	1.00	
Combined Springs (Neff's Canyon Spring, Emigration Tunnel, Lower Boundary Spring, Upper Boundary Spring)	0.37	
Total	**52.17**	
Total at 80% Planning Capacity	**41.74**	
Non-Contaminated Total	**41.87**	
Non-Contaminated Total at 80% Planning Capacity	**33.50**	

The total capacity of all Salt Lake City wells and springs is 52.17 mgd. Some wells currently have contamination that either limits or prohibits use in the City's culinary water system. When the contaminated wells' capacity is removed from the total, the available peak production capacity of the

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September 22, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com
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SALT LAKE CITY CORPORATION
451 South State Street, Room 326
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cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)
City Council (council.comments@slcgov.com)

Re: 4th Avenue Well – HLC PLNHLC2018-00557 and PLNHLC2018-00558
Public sentiment, the DPU future three design options, and HLC decision-making

Ms. Lindquist:

This letter concerns the future three options that the Department of Public Utilities (DPU) will present to the City Council and Historic Landmark Commission (HLC) pursuant to the Council's June 4th, 2019 directive.[1] I am sending this comment to you for filing in the Commission's records now, should I forget the issue between now and the future reactivation of this matter four to six months from now. Public input is an important component of HLC deliberations. When the DPU's three proposed alternatives or final selected alternatives are presented to the HLC, the Commission should give no weight to the applicant's or staff's assertions that the proposed design has been approved by the community. In the instant matter, evaluation of the public's expression of preferences was been frustrated by political maneuvering by the DPU.

HLC rules and prior practice define the role and perimeters of public participation in its decision-making process. The HLC's Rules of Procedures, Rule D(22) provide for public notice of meetings and permissive comment at hearings and work meetings (Rule E(26)). A city ordinance also provides for a general obligation to "to increase public awareness of the value of historic, architectural and cultural preservation".[2] Planners' statements to the Commission normally contain a summary of public informational hearings previously held and a public comment file. Those materials function as evidence of whether the community feels that a proposed design is compatible with an existing neighborhood. It is also common for application proponents to cite either a lack of community

[1] Salt Lake City Council. June 4th, 2019. Recap of Budget Hearing. https://www.slc.gov/council/meeting-recaps/recap-june-4-council-and-rda-board-meeting/ .

[2] Salt Lake City Rev. Ord. § 21A.06.050(c)(2).

opposition or express support for a proposal as evidence that a design is compatible with existing community design standards.

The DPU has engaged in political maneuvering to improperly anchor the range of reasonable design alternatives to just those actions that the DPU desires and to exclude what the community desires.

On June 4, the Salt Lake City Council directed the City Administration to prepare a set of three alternatives designs for the proposed 4th Avenue Well that would address concerns of the Memory Grove Residential Pocket residents (n. 1). On June 11, the Greater Avenues Community Council repeated their request that the local residents' desired alternative for moving the well to a new site.[3] On July 30, 2019, the City Department of Public Utilities stated that it was preparing three alternative designs for presentation this winter - none of which would include moving the well to a new site.[4,5] By this decision, the DUP is attempting to force a resolution where it gets only what it originally wanted by anchoring the debate to only a range of solutions that encompasses what the DUP has previously proposed and that excludes the residents' desired alternative.[6] This DPU decision is incompatible with its prior expert's opinion that moving the well could not be excluded on technical grounds but moving the well would be more expensive.[7]

In conclusion, DPU political maneuvers improperly anchored the range of reasonable alternatives to just those actions that the DPU desires. Any future assertion by planning staff or the applicant that the community has approved any of its three future proposals, or any future finally selected proposal, should be disregarded by the HLC in its deliberations as evidence that proposed designs are compatible with the existing neighborhood design standards. As stated in a prior comment,[8] the DPU's proposal is intrinsically incompatible with the HLC's design criteria applicable to the City's system of center-median parkways.[9]

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[3] Greater Avenues Community Council. June 11th, 2019. Letter on 4th Avenue Well. https://drive.google.com/open?id=10ZTWXju8e--c404TVdFR7CGbRPJ2JgxI .

[4] Salt Lake City Department of Public Utilities. July 30, 2019. Press release. Fourth Avenue Well Project Update. https://www.slc.gov/utilities/fourth-avenue-well-project/ .

[5] Fisher, K. August 6, 2019. Email with Councilperson C. Wharton. Copy in author's possession.

[6] This DPU decision also involves a waste of public resources. The DPU is preparing more plans that will not resolve the matter because the community's desire alternative is not included.

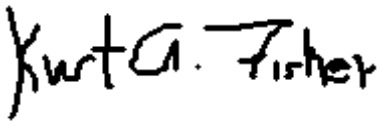
[7] Memorandum by David E. Hansen, Hansen, Allen and Luce, Inc., to B. Stewart, Salt Lake Department of Public Utilities, re: 4th Avenue Well Assessment (hereafter "HAL Report") (url: https://docs.wixstatic.com/ugd/80b28b_3607f771b2984d63a44ce7a4c3d1c7a9.pdf).

[8] Letter-Comment by K. Fisher to HLC dated June 19, 2019. http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190619WellHistoricLandMarkCommREDACTED.pdf .

[9] Preservation Handbook for Historic Residential Properties and Districts in Salt Lake City (accessed June 19, 2019) (url:

As always, you cooperation is appreciated. Please feel free to contact me with any questions that you may have.

Very Truly Yours



Kurt A. Fisher

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http://www.slcdocs.com/historicpreservation/GuideRes/ResidentialGuidelines.pdf) (hereafter "City Residential Design Guidelines in Historic Districts", re: greenbelt parkways).

> **Landscaped Medians or Parkways.** Parkway are large grassed or treed medians that line the center of a street, such as along 600 East in Central City, and on 1200 East and 200 South in the University district. They provide a unique historical landscape amenity and are often used as recreational or leisure spaces. They markedly enhance and unify the character of both the street and that part of the district. *Where they are found, parkways add a unique character to the streetscape, and consequently should remain.* Where they have been removed, consider their reinstatement. (*id* at Part II – Design Guidelines, p. 1:10, italic emphasis added).

KURT ALLEN FISHER
POB 11753
Salt Lake City, Utah 84147-0753
[redacted]

December 4, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com
Historic Landmark Commission
SALT LAKE CITY CORPORATION
451 South State Street, Room 326
Salt Lake City, Utah 84111

cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)
Cindy Gubler, Facility Process Manager, Wilkinson, Ferrari & Co. (cindy@wfandco.com)

Re: 4th Avenue Well – HLC PLNHLC2018-00557 and PLNHLC2018-00558
WFC 4th Avenue Well Facilitation Process
Comment: Historic Landmark Commission (HLC) Parkway Guidance; June 2019 Planning Staff Special Use Exception Review Memorandum; and December 2, 2019 Wilkinson, Ferrari & Co. Informational Meeting

Ms. Lindquist:

Please add this comment-letter to the Historic Landmark Commission hearing record on this matter.

I) City Construction in Median Parkways Guidance

My apologies for the delay in responding to your request from the December 2 Wilkinson, Ferrari and Co. (WFC) public information meeting. At that meeting, you asked for the citation to City design guidelines regarding median parkway lands, and I indicated that I would send you the citations to that provision from my prior HLC comments. My prior comments that cite Planning Department guidance on restricting non-natural structures in the City's greenway median parks include Letter by K. Fisher dated June 19, 2019.[1] City Residential Design Guidelines for Historic Districts provide, in part:

[1] http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190619WellHistoricLandMarkComm.pdf .

> **Landscaped Medians or Parkways**. Parkway are large grassed or treed medians that line the center of a street, such as along 600 East in Central City, and on 1200 East and 200 South in the University district. They provide a unique historical landscape amenity and are often used as recreational or leisure spaces. *They markedly enhance and unify the character of both the street and that part of the district. Where they are found, parkways add a unique character to the streetscape, and consequently should remain.* Where they have been removed, consider their reinstatement" (id at Part II – Design Guidelines, p. 1:10, italic emphasis added).[2]

The quotation appears at folio page 78 of the "City Residential Design Guidelines in Historic Districts". A screen capture of the quoted material is attached. Figure 1 is a schematic illustrating how the City's historical median parklands relate to 4th Avenue Well median park:[3]

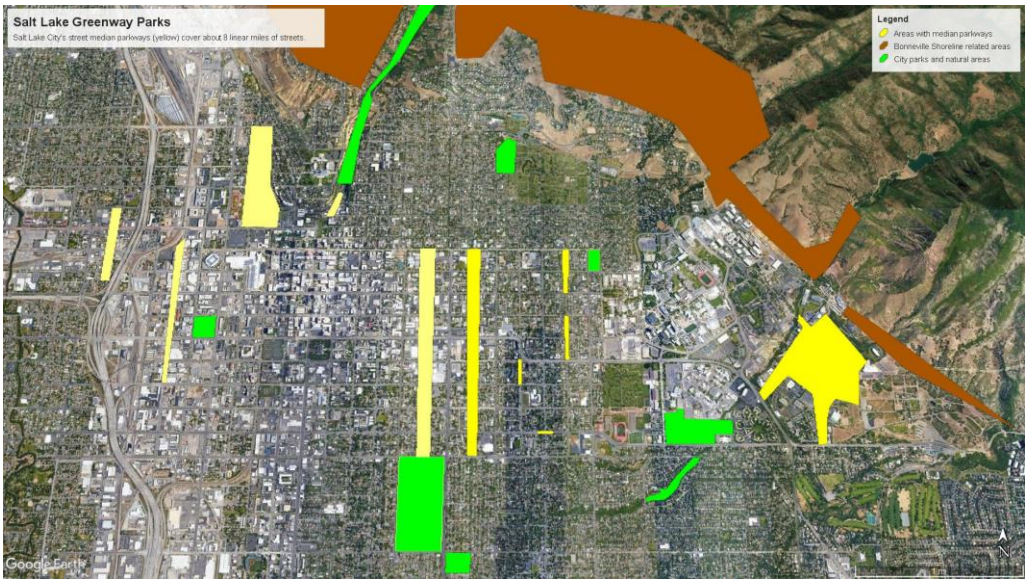


Figure 1 -Schematic of Salt Lake City's System of Median Parklands as related to Dedicated Parks. K. Fisher, June 2019. Median parkway areas are highlighted in yellow.

[2] Citing: A Preservation Handbook for Historic Residential Properties and Districts in Salt Lake City (accessed June 19, 2019) (url: http://www.slcdocs.com/historicpreservation/GuideRes/ResidentialGuidelines.pdf) (hereafter "City Residential Design Guidelines in Historic Districts", re: greenbelt parkways).

[3] Attached to Email, Fisher to Lindquist, dated June 21, 2019, 4:56 pm. Full resolution copy is attached here.

II) Implications of the Parkway Guidance on the June 2019 Staff Special Exceptions Review Evaluation[4]

The reasoning in my comments to the HLC dated June 15, 2019[5] links the above historic preservation median parkway guideline to the 1986 City Creek Master Plan through Salt Lake Ordinance 21A.02.040 and Salt Lake City Ord. 21A.52.060(A) (special exceptions). Your office's previous June 2 version of the Staff Special Exceptions Review memorandum makes reference to Salt Lake City Ord. 21A.52.060(A), which provides that "[t]he proposed use and development will be in harmony with the general and specific purposes for which this title was enacted and for which the regulations of the district were established." Planning staff evaluated the relationship between the proposal and the Open Space zoning ordinance.

The effect of Salt Lake Ordinance 21A.02.040 was not, but should be, included in the Staff Evaluation Review. This ordinance requires in part that "[a]ll master plans or general plans adopted by the planning commission and city council for the city, or for an area of the city, shall serve as an advisory guide for land use decisions." In 1986, Salt Lake City adopted a master plan for City Creek Canyon that provided, in part, that the City would use regulations "to ensure that incompatible intrusions do not develop" into the historic Canyon Road residential pocket (emphasis added). The Oxford Dictionary defines "ensure" as to "1. . . . make certain. 2 . . . secure (a thing for a person, etc.). 3 (usu. foll. By against) make safe."

The Staff Evaluation, a version of which you redistributed at the WFC December 2, 2019 facilitation meeting, does not correctly state the legal evaluation standards for the proposed water chemical treatment plant. A fair interpretation of the standards is that since the proposed utility plant is located in median parkway, it is prohibited from being constructed above ground. That is a condition predicate to the application and evaluation of new construction standards that are discussed in the existing Staff Review.

A correct comparison of whether the proposed design meets new construction standards and guidelines is the proposal's similarity to the 18 other well water pumping and treatment plants throughout the City, *in addition to the Memory Grove Residential Pocket context*. Pursuant to a document production in response to a mini-FOIA (GRAMA) discovery with the City received over the summer, I append a list of the current existing well structures (Bowen-Collins Feb. 2019 Draft Water Supply and Demand Master Plan at Table 3-3).

A partial review of those other City well structures indicates that - with one exception - the well buildings are sited as ordinary residential above-ground structures on a home lot - similar to the DeSoto Street and 5th Ave North well building implementation. The one exception is the 4th Ave

[4] June 2019 Staff Evaluation Review Memorandum (Attachment J: Special Exceptions Review Memorandum. In May 2019 HLC Application), copy attached.

[5] Letter, Fisher to Lindquist, dated June 15, 2019 http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190615WellHistoricLandMarkCommwAttach.pdf .

Well. Even there, City planners and designers of the 1940s opted to place the well underground - thus, maintaining the design integrity of the City's median parkland system. Simply put, there are no exemplar exceptions under the current guidelines or on similar structures examples throughout the City for an above-ground utility structure in a median parkway. A design that moves the well to a traditional street facing lot is the only logical design that actually complies with City planning standards and guidelines.

Of course, these and other requirements can be waived by the Historic Land Commission through the special permit process - as the applicant currently proposes - just for those waivers needed to support the DPU's position. However, as currently drafted, the Planning Staff Evaluation Review leaves the Historical Land Commission members with the misimpression that the HLC special use permit is somehow an ordinary, administrative request. It is not. A fair Staff Review Memorandum should emphasize the extreme, extraordinary nature of the DPU's petition and its intrinsic inconsistency with the parkway guideline and existing comparative examples of other City well buildings. Then, the staff review could fairly move forward to evaluating special use factors.

This is not a supercilious objection concerning a now largely irrelevant legal point. In one version, Planning staff characterize the well building as some type of ordinary special use exception application. In the second view, the applicant's proposal is framed as what it is - an extraordinary waiver request for commercial development in a residential park space that is unprecedented. These two framings of the future HLC hearing are substantively different and are intrinsically incompatible.

This, in more legalistic terms, is the point that Memory Grove Residential Pocket homeowner Cindy Cromer made at the December 2 facilitation meeting run by WFC. To paraphrase and summarize her oral comment: "The starting point for this has to be that this is a park, and it seems that everything that comes out of the City does not recognize that fact."

III) Relationship of the Criticality Issue, Moving the Well, and the HLC Decision-making Process

During such an extraordinary-circumstance special use permit hearing, the applicant's equitable burden should be to justify an extraordinary, compelling, public necessity that overrides the extraordinary nature of their non-complying proposal. As it stands, the DPU has failed to provide verifiable evidence of that public necessity such that the Department should not expend an additional 1.5 million USD (in addition to already approved existing 3.5 million USD) to move the well and to upgrade it at a new location. I have made a good faith review of the WFC facilitator's provision of additional information in their December 2 informational meeting statement.

A) The water supply criticality argument

With respect to the alleged public need criticality of the well, I see nothing new in that December 2 information document other than a repetition of the DPU's prior statements and, in part, false narrative. The DPU repeats that moving the well would be difficult, not impossible, and they just do not want to expend the additional money or be put to the additional construction effort or expense.

A WFC posterboard presented at the December 2 meeting continues this DPU water supply narrative: "Critical well that needs to continue to operate - provides up to 100% of water for downtown during peak demand" (id). In the WFC Dec. 2 informational document, the DPU acknowledges that the 4th Avenue well is a component of an integrated City primary water distribution system - the Victory-Tanner Pressure Zone (*see* Bowen-Collins Draft 2016 Major Conveyance Report - Executive Summary at ES-8). The historic record of the downtown primary distribution system, should the 4th Avenue well fail to produce - as it has in some prior years - is that water pressure is maintained in the downtown area by other connections to the primary distribution system.

The WFC December 2 information document notes that reliance on the primary distribution system "may be difficult due to the different pressure zones and characteristics of the distribution system and water demand patterns (id. at para. 17). Difficult does not impossible. Difficult does not satisfy a "but for" test of criticality. The DPU presents an economic convenience argument; not a public necessity argument.

Furthermore, the Draft 2016 Bowen-Collins and Associates Major Conveyance Report notes that water pressure problems in this downtown and 4th-Avenue area may be caused by blockage somewhere in the distribution system. The water pressure difficulties mentioned by the DPU in the December 2 information document may be the result of the DPU being unable to keep up with its maintenance schedule and have nothing to do with the 4th Avenue Well:

> **Victory-Tanner Pressure Zone**: 4th Avenue Well - System modeling indicates there may be an obstruction in one of the major pipes between the 4th Avenue Well and Victory Reservoir. It is recommended that Salt Lake City personnel conduct a field investigation to locate the problem so it can be eliminated" (id. at ES-8).

I recommend for future WFC informational meetings or HLC hearings, that the DPU file a report on whether this system blockage (that prevents adequate water pressure in the 4th Avenue and downtown areas) was investigated and resolved. (It is likely that the matter was investigated and resolved, but it is an appropriate due diligence item with respect to the DPU's current, unverified 4th Avenue well claims concerning water supply pressure.)

B) The new shigellosis criticality argument

At the Dec. 2, 2019 information meeting, Director Briefer offered a new item not mentioned in the WFC memorandum in support of the DPU's criticality and public necessity claims - that there have been two reported cases of shigella - a water borne bacterial infection - in the upper floors of downtown buildings.

Preliminary review of the October 2019 Utah Department of Health Monthly Communicable Disease Report indicates that attributing those occurrences to 4th Avenue well contamination is a speculative conclusion in the absence of random spatial analysis (Utah Dept. of Health 2019). Shigella is transmitted via the fecal–oral route, including through direct person-to-person or sexual contact or

indirectly through contaminated food and water (CDC 2019). The October 2019 Utah Communicable disease report recites the following state-wide data regarding shigellosis:

Table 1 - Statewide Reported Shigellosis Cases – October 2019. Source: Utah Dept. of Health (Oct. 2019).

Item	Number of Reported Shigellosis Cases
Oct 2019	2
5-yr Oct avg	3
2019 YTD	47
5-yr YTD avg	18.2

Downtown office buildings, hotels and the new 400 South high density apartments are located in the 400 South corridor - an area that has been long known to be a hot-spot for communicable diseases, in particular hepatitus A, associated with the restaurants located along that boulevard. Given that Bowen-Collins identified a potential main distribution pipe defect south of the 4th Avenue well and that the two reported cases may be the result of non-water borne routes of transmission - such as restaurant contamination or sexual contact, it is simply speculative to attribute these two cases of rare transmission events to contaminated water emanating from the 4th Avenue well.[6]

Such speculative DPU claims of public necessity could be verified by time series analysis of shigellosis reports paired to DPU water quality reports taken from the East Canyon and 500 North reservoirs. Spatial random analysis of the 47 statewide cases of reported shigellosis through October 2019 would also be helpful in distinguishing whether these two rare reports are simply the result of the random distribution of a disease frequency. Absent such further investigation, such supplemental DPU speculative claims regarding criticality based on two rare reports of shigellosis should be discounted.

III) Relationship to New Construction Standard Prohibiting Faux Historical Buildings

At the December 2 informational meeting, there was some discussion concerning the extent to which Chapter 12 of the Preservation Handbook for Historic Residential Properties and Districts in Salt Lake City should guide the exterior design of the approximately 500 sq. ft. concept design. Chapter 12 provides in part that "[i]mitating historic styles found in a historic district is generally discouraged." Considering that the HLC has already sent back or deferred the DPU's proposals on three prior occasions, my feeling is that this is not a practical constraint. The matter may come on for its continued hearing during the Spring 2020 and after twenty-two months of its inception, any compromise design is likely to be approved by the HLC. Like all the other State and City standards

[6] The April 2019 HAL Report also identified a subsurface casing defect at the 4th Avenue well from which bacteria could infiltrate into the water supply. Again, that is an ordinary maintenance repair that is separate from the DPU's proposal for an above-surface building upgrade. That there may be an ordinary DPU maintenance backlog does not justify the conclusion of public necessity.

and guidelines applicable to this matter, the no-faux design guidance is up for waiver in a special use hearing. Standards up for waiver are not limited to only those that support the DPU's position.

IV) Other miscellaneous comments on the December 2 WFC informational document

In the WFC December 2 document and at the December 2 information meeting, the DPU continues its false narrative that the Memory Grove Residential Pocket homeowners are attempting force the abandonment of the well. This is simply an intentional mischaracterization not borne out by the many comments made by myself (an Avenues non-pocket resident) and Memory Grove pocket residents. Feasible alternative designs that retains the existing well-head have been proposed by residents, and have been evaluated by the DPU's expert Hansen, Allen and Luce (HAL Report, April 2019). HAL did not find those alternatives unfeasible; simply, HAL found them "not optimal" (id).

At the December 2 meeting the DPU announced its mew negotiation stance of not discussing with residents moving the well to a new location. The DPU simply choses out of economic convenience for the benefit of downtown multifamily unit building developers - and not out of public necessity - to not consider those alternatives because the City or downtown developers might have to provide some additional funding in order to achieve their hyper-gentrification goals. Instead, for the sake of their convenience alone (the City, the DPU, and downtown business interests), they have chosen the simpler alternative of transferring the adverse life and economic consequences of their hyper-downtown gentrification plans to an existing residential neighborhood.

Much like the DPU's announcement at the end of the previous informational meeting that unless residents took the current deal, the DPU would invoke an emergency declaration to force what it wants to construct, this December 2 DPU policy announcement of non-negotiation essentially de-legimatizes the current WFC facilitation process.[7]

V) Other Required Studies

There are two residual issues raised in my June 4 and June 7, 2019 letters to the Historic Landmark Commission, in particular the June 4 letter (in addition to the comment on preserving parkways in the June 19 letter discussed above):

1) A site-specific flood analysis that conforms to the International Building Code should be submitted by the applicant; and,

2) A site-specific geotechnical analysis that conforms to the International Building Code should be submitted by the applicant.

While I have stated above that the approximate 500 sq. ft. design moots most of the health and safety objections that I previously put before the Commission (since all but 50 lbs. of chlorination tablets have been removed), I continue to assert that the two above IBC study requirements should be

[7] *See* Email K. Fisher to WFC dated November 5, 2019 re "legitimacy".

complied with as a pre-condition to the HLC hearing this matter. Here, my purpose of commenting to the HLC that these analyses should be a pre-condition to further Historical Landmark Commission hearings on this matter (rather than leaving them to the building permit phase) is prophylactic. Should the current approximate 500 sq. foot design be implemented, I feel it prudent that a present public record be made of the unique geotechnical site constraints at the 4th Avenue Well site that underlie the reasons of the approximate 500 sq. ft. design. It is probable that over the life of the well that the DPU will return to request the building's expansion.

The two reports will have to be prepared in any event, and doing them early during the HLC approval process as opposed to later is the better hearing process option. Requirements for these reports should be addressed in a revised Planning Staff Special Use Exceptions Memorandum.

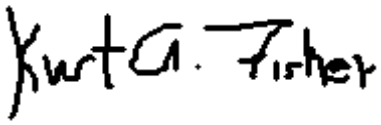
VI) Conclusion

Again, I wish to thank Bowen-Collins P.E. Bagley, CRSA Architect Tripplet and DPU P.E. Jesse Stewart for the current redesign proposal - which represents a creative minimum above-ground footprint concept. The current minimum engineering footprint design reflects progress on the differences between the stakeholders. That design addresses and moots almost all of my health and safety issues raised in my June 4 and June 7, 2019 letters to the Historic Landmark Commission by minimizing chlorine contained in the structure to 50 lbs. of solid tablets.

Above, I have identified several proposed revisions, previously proposed, to the Planning Department's Special Use Exceptions Review memorandum. I ask that you and the HLC consider them in your agency's revised review memorandum that will be filed with the Historic Landmark Commission sometime in the future.

Please feel free to contact me with any questions that you may have by the means listed above.

Very Truly Yours



Kurt A. Fisher

Attachments:

Salt Lake City Planning Dept. May 2019. Attachment J: Special Exception Review Standards. In Historic Landmark Commission Hearing Record, HLC PLNHLC2018-00557 and PLNHLC2018-00558.

Screen Capture of Median Parkway Guideline from "“City Residential Design Guidelines in Historic Districts” (2019).

Map of City Median Parkways by K. Fisher (June 2019) (file: 20190620MapSLCMedianParkways.jpg).

List of City Well Sites from City Water Conservation Plan (2014) (file: Table3_3.png). Referenced in Letter by K. Fisher to HLC dated August 27, 2019.

References

Bowen, Collins and Associates. Nov. 2016. Executive Summary to Draft Major Conveyance Study prepared for the Salt Lake City Department of Public Utilities. Copy in author's possession. Produced by DPU to author in response to a GRAMA request during 2019. (File: 20161100Major_Conveyance_Study_Executive_Summary.pdf).

Center for Disease Control, Watkins, L.F.K., Appiah, G.D. 2019. Shigellosis. Chapter 4 in CDC Yellow Book 2020. https://wwwnc.cdc.gov/travel/yellowbook/2020/travel-related-infectious-diseases/shigellosis

Fisher, K. Letter to HLC dated June 4, 2019 re: IBC seismic and flood risk study requirements http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190604WellHistoricLandMarkCommwAttach.pdf .

Fisher, K. Letter to HLC dated June 7, 2019 re: IBC seismic and flood risk study requirements http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190607WellHistoricLandMarkComm.pdf .

Fisher, K. Letter to HLC dated June 15, 2019 re: Parkway Preservation Guideline. http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190615WellHistoricLandMarkCommwAttach.pdf .

Fisher, K. Letter to HLC dated June 19, 2019 re: Parkway Guideline and comparisons with existing exemplar City well structures. http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190619WellHistoricLandMarkComm.pdf .

Hansen, David E. Memorandum by David E. Hansen, Hansen, Allen and Luce, Inc., to B. Stewart, Salt Lake Department of Public Utilities, re: 4th Avenue Well Assessment (hereafter "HAL Report") (url: https://docs.wixstatic.com/ugd/80b28b_3607f771b2984d63a44ce7a4c3d1c7a9.pdf). In Attachment C: Application Materials, Historic Landmark Commission Hearing Record, HLC PLNHLC2018-00557 and PLNHLC2018-00558.

Salt Lake City Planning Dept. (2019). A Preservation Handbook for Historic Residential Properties and Districts in Salt Lake City (accessed Dec. 4, 2019) (url: http://www.slcdocs.com/historicpreservation/GuideRes/ResidentialGuidelines.pdf) (hereafter “City Residential Design Guidelines in Historic Districts”, re: greenbelt parkways).

Utah Department of Health. October 2019. Utah Monthly Communicable Disease Report. http://health.utah.gov/epi/data/monthlysummary/2019/October.html .

Wilkinson, Ferrari and Co. Dec. 1, 2019. Action Memorandum for Dec. 2, 2019 Informational Meeting. (Copy in possession of author, DPU and WFC).

Wilkinson, Ferrari and Co. Dec. 2, 2019. Posterboards Presented at December 2 Informational Meeting. (Copy in possession of author and WFC).

ATTACHMENT J: SPECIAL EXCEPTION REVIEW STANDARDS

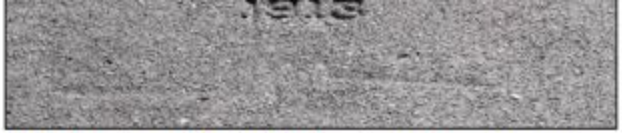
21a.06.050(c) of the Zoning Ordinance authorizes the Historic Landmark Commission to review and approve or deny certain Special Exceptions for properties located within an H Historic Preservation Overlay District, including modifications to bulk and lot regulations of the underlying zoning district, where it is found that the underlying zoning would not be compatible with the historic district and/or landmark site.

21A.52.020(A): Definition: *A "special exception" is an activity or use incidental to or in addition to the principal use(s) permitted in a zoning district or an adjustment to a fixed dimension standard permitted as exceptions to the requirements of this title of less potential impact than a conditional use but which requires a careful review of such factors as location, design, configuration and/or impacts to determine the desirability of authorizing its establishment on any given site.*

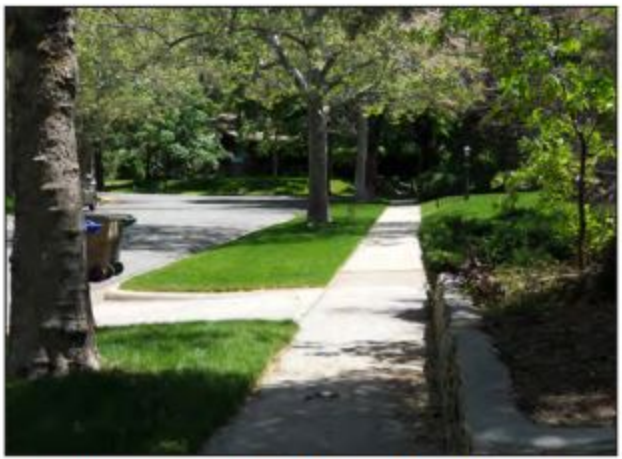
General Standards and Considerations for Special Exceptions	Finding
A. Compliance With Zoning Ordinance And District Purposes: The proposed use and development will be in harmony with the general and specific purposes for which this title was enacted and for which the regulations of the district were established.	**Complies** The purpose of the Zoning Ordinance is to "promote the health, safety, morals, convenience, order, prosperity and welfare of the present and future inhabitants of Salt Lake City." The requested special exceptions will allow the proposed pump house to be constructed in a way that efficiently utilizes city resources for the purpose of supplying drinking water to Salt Lake City residents. This is in harmony with the purpose of the zoning ordinance in that it will help to promote the health and welfare to the City. The subject property is located in the OS zoning district. The purpose of the OS zone is to: *"Preserve and enhance public and private open space, natural areas, and improved park and recreational areas. These areas serve to provide opportunities for active and passive outdoor recreation; provide contrasts to the built environment; preserve scenic qualities; protect sensitive or fragile environmental areas such as wetlands, steep slopes, ridge lines, meadows, and stream corridors; preserve the capacity and water quality of the storm water drainage system; encourage sustainability, conservation and renewable energy and provide pedestrian and bicycle transportation connections."* The proposed special exceptions are related to the setbacks from property lines along street frontages. Allowing the building and parking stall to encroach into these areas preserves more the continuous open space within the park and reduces the amount of existing landscaping that would need to be disturbed. This is consistent with the purpose of the OS zone in that it allows more space within the park for active and passive recreation.

B. No Substantial Impairment Of Property Value: The proposed use and development will not substantially diminish or impair the value of the property within the neighborhood in which it is located.	**Complies** There has been no evidence submitted to indicate a diminishing or impairment of property value associated with these requested special exceptions.
C. No Undue Adverse Impact: The proposed use and development will not have a material adverse effect upon the character of the area or the public health, safety and general welfare.	**Complies** The subject property is located in the avenues Local Historic District. Development in this district must be reviewed in accordance with historic preservation standards to determine the projects compatibility with the character of the area. Staff has reviewed the proposal according to the applicable standards and believes the proposal will not have a material adverse effect upon the character of the area. The proposal will also not have a material adverse effect upon the public health, safety and general welfare. In fact, the project is necessary to improve the public health, safety and general welfare. The proposed structure is a required upgrade to an existing well that provides drinking water to Salt Lake City.
D. Compatible With Surrounding Development: The proposed special exception will be constructed, arranged and operated so as to be compatible with the use and development of neighboring property in accordance with the applicable district regulations.	**Complies** The site is located within the Avenues Local Historic District, which is regulated by H Historic Overlay (21A.34.020). The new construction requires the approval of the Historic Landmark Commission. The Historic Landmark Commission utilizes the new construction standards (21A.34.020.H). These standards review compatibility of the development with the neighboring properties and Staff has found that the project complies with the applicable standards.
E. No Destruction Of Significant Features: The proposed use and development will not result in the destruction, loss or damage of natural, scenic or historic features of significant importance.	**Complies with Conditions** The proposed pump house will occupy more space on the subject property than the existing well and will require the removal of three trees, but the grass and landscaping are not the historic features of significant importance on the subject property. The subject property has been developed as a park; however, its historic function has been to provide drinking water to Salt Lake City. The pump house is an important safety improvement of the historic feature of significant importance on the property. In regard to the loss of existing trees, the applicant is proposing to work closely with an arborist, Urban Forestry and a Landscape Architect to ensure preservation of the largest tree onsite. The proposed conditions require Public Utilities to submit a tree mitigation program to Urban Forestry. The tree mitigation will require the replacement of the lost vegetation.

F. No Material Pollution Of Environment: The proposed use and development will not cause material air, water, soil or noise pollution or other types of pollution.	**Complies** The proposed facility includes components not uncommon to the treatment of drinking water. Salt Lake City Public Utilities manages facilities that utilize chlorine within residential neighborhoods. Additionally, there are strict regulations and protocols in place that ensure that the pump house will not cause material air, water, soil, noise or other types of pollution. Additionally, the proposed pump house has been designed to comply with these regulations and protocols.
G. Compliance With Standards: The proposed use and development complies with all additional standards imposed on it pursuant to this chapter.	**Complies** This proposal does not incorporate additional standards of review, per chapter 21A.52.030.



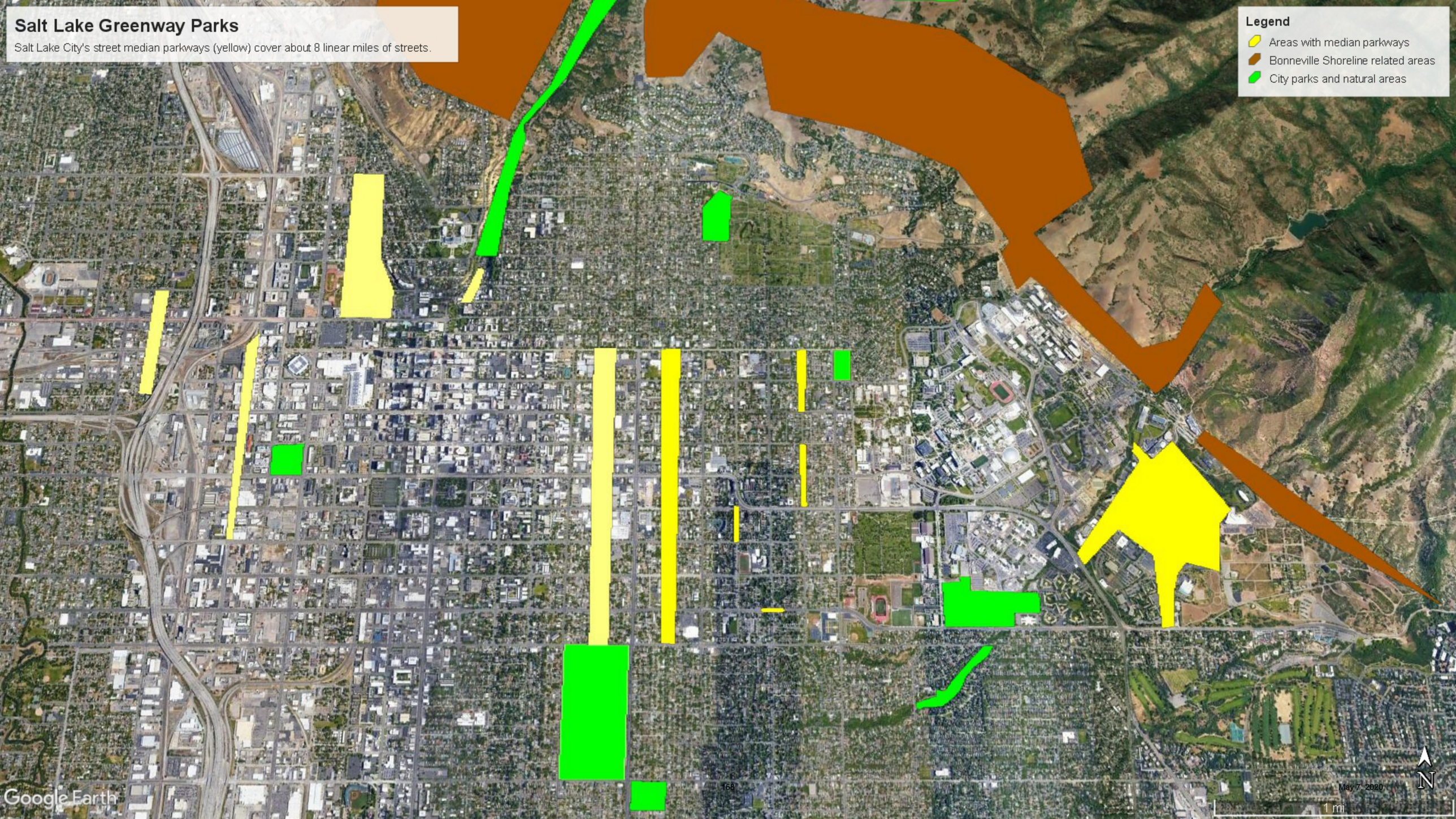
Historic paving will include both natural stone and concrete.



A park strip is often experienced as an extension of the front yard, integrating private and public spaces, and enhancing the established character of the neighborhood.

Landscaped Medians or Parkways

Parkway are large grassed or treed medians that line the center of a street, such as along 600 East in Central City, and on 1200 East and 200 South in the University district. They provide a unique historical landscape amenity and are often used as recreational or leisure spaces. They markedly enhance and unify the character of both the street and that part of the district. Where they are found, parkways add a unique character to the streetscape, and consequently should remain. Where they have been removed, consider their reinstatement.


Salt Lake Greenway Parks
Salt Lake City's street median parkways (yellow) cover about 8 linear miles of streets.
Legend
Areas with median parkways
Bonneville Shoreline related areas
City parks and natural areas
Google Earth
168
May 7, 2020
1 mi
N

City Creek Water Treatment Plant – The CCWTP is solely owned and operated by Salt Lake City. The peak capacity of the plant is 13 mgd. The plant only treats the natural runoff from City Creek and does not have access to any storage. Dry year production from CCWTP is estimated to be 4 mgd in late summer based on reliable dry yield estimates for time of year.

Wells and Springs – Salt Lake City owns and operates a number of wells and springs scattered through the City's distribution system. The estimated current capacities of City wells and springs are summarized in Table 3-3.

Table 3-3
Existing Well and Spring Capacities

Groundwater Source	Peak Day Production Capacity (mgd)	Contaminated?
13th East and 27th South Well	3.80	
5th South and 15th East Well	2.80	Yes, PCE
19th East and 27th South Well	5.80	Yes, PCE
300 East Pump Station	8.00	
48th South and 9th East Well	0.70	
4th Avenue and Canyon Road Well	5.50	
6200 South Well	4.00	
Brinton Springs Well	2.00	
Edgewood Well	2.00	
Ellison Well	2.50	
Fontaine Bleu Well	2.00	
Greenfield Village Well	1.45	
Little Cottonwood Well	1.50	
Millcreek Well	3.30	
Neff's Draw Well	0.45	
Nila Way Well	0.60	
Richard's Ditch Well	1.50	
Sugarhouse Park Well	1.70	Yes, PCE
Walker Lane Well	1.20	
Well 14	1.00	
Combined Springs (Neff's Canyon Spring, Emigration Tunnel, Lower Boundary Spring, Upper Boundary Spring)	0.37	
Total	**52.17**	
Total at 80% Planning Capacity	**41.74**	
Non-Contaminated Total	**41.87**	
Non-Contaminated Total at 80% Planning Capacity	**33.50**	

The total capacity of all Salt Lake City wells and springs is 52.17 mgd. Some wells currently have contamination that either limits or prohibits use in the City's culinary water system. When the contaminated wells' capacity is removed from the total, the available peak production capacity of the

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[redacted]

December 9, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com
Historic Landmark Commission
SALT LAKE CITY CORPORATION
451 South State Street, Room 326
Salt Lake City, Utah 84111

cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)
Cindy Gubler, Facility Process Manager, Wilkinson, Ferrari & Co. (cindy@wfandco.com)

Re: 4th Avenue Well – HLC PLNHLC2018-00557 and PLNHLC2018-00558
WFC 4th Avenue Well Facilitation Process
Salt Lake GRAMA Case No. C071272-110719
Comment: Well Criticality Supplemental Note and December 2, 2019 Wilkinson, Ferrari & Co. Informational Meeting[1]

Ms. Lindquist:

Please add this comment-letter to the Historic Landmark Commission hearing record on this matter. At page 8 of the December 1, 2019 Wilkinson, Ferrari & Co. Informational Meeting Action Memo, the Salt Lake City Department of Public Utilities provides additional information regarding whether the 4th Avenue Well is a critical water infrastructure facility (copy attached). In a prior comment, I have documented several false narratives published by the DPU, Mayor Biskupski's office and other public officials claim the Well so "critical" that the downtown hotels will be without water or homes in the high Avenues or Ensign Peak will burn in wildfires.[2] In Salt Lake City GRAMA Case No. C071272-110719, the DPU instead of producing documents as required by the City's mini-GRAMA ordinance concerning how the City's primary water distribution system related to the Well, the DPU stated that it would instead provide a description of that system and how it

[1] Wilkinson, Ferrari and Co. Dec. 1, 2019. Action Memorandum for Dec. 2, 2019 Informational Meeting. (Copy in possession of author, DPU and WFC).

[2] Letter, Fisher to HLC, dated August 27, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190827WellHistoricLandMarkComm.pdf), supplemented by Letter, Fisher to HLC, dated September 6, 2019 (url: http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190906WellHistoricLandMarkComm.pdf).

relates to the Well in the WFC December information meeting.[3] The provided description is at page 8 of the WFC memorandum, copy attached.

The additional information provided by DPU indicates that the Well is not critical in the sense that it has been used in various City communications to the public. Webster's defines "critical" as:

> b: indispensable, vital a critical waterfowl habitat a component critical to the operation of a machine
>
> c : being in or approaching a state of crisis a critical shortage a critical situation. [Merriam-Webster Online Dict.: "Critical".[4]]

The Dec. 2nd DPU meeting information indicates that the Well is:

> There are times during the summer when the 4th Avenue well provides 100 percent of the water to areas of downtown Salt Lake City. If the 4th Avenue well fails, SLCDPU would need to use another water source to meet demand. This may be difficult due to the different pressure zones and characteristics of the distribution system and water demand patterns. This could result in water supply or water pressure disruptions in downtown Salt Lake City.
>
> SLCDPU also manages its water sources and system to ensure there is redundancy in case of emergencies. For instance, if there is a situation where one or more of the streams cannot be used in the water supply due to infrastructure or water quality issues, groundwater resources, including the 4th Avenue well can help meet demand and avoid water supply disruptions. If the 4th Avenue well fails, the area it serves would lose that redundancy. [DPU in WFC Dec. 1 Memo. at 8].

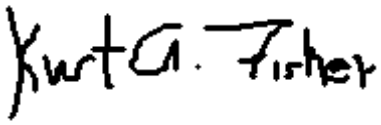
In short, the Well is an *important* component of a redundant system, but it is not the only means by which the City can deliver water to the downtown district or fight fires around Ensign Peak or the High Avenues. It is not an *indispensable* component, in the sense that water will not flow to the downtown, if water does not flow from the Well. As stated in my August 27 letter-comment, the 4th Avenue Well is "of concern" and important to the City's water supply, but to suggest that if the well goes out of service that downtown hotels or Avenues homes will burn down in fires from a lack of water are hyperbole that the HLC should ignore in its deliberations.

[3] Letter, DPU Director Briefer, to Fisher, dated Nov. 18, 2019 in Case No. C071272-110719.

[4] url: https://www.merriam-webster.com/dictionary/critical .

Please feel free to contact me with any questions that you may have by the means listed above.

Very Truly Yours



Kurt A. Fisher

Attachments:

Wilkinson, Ferrari and Co. Dec. 1, 2019. Page 8 re: Well Criticality. Action Memorandum for Dec. 2, 2019 Informational Meeting. (Copy in possession of author, DPU and WFC).

water sources include surface water from the Wasatch Mountains and groundwater. The surface water sources emanate from Little Cottonwood, Big Cottonwood, Parleys, and City Creeks, as well as stored water in Deer Creek as part of the Provo River Project and Central Utah Project. The surface water sources are conveyed by gravity to water treatment plants, where they are treated and enter into the distribution system. The City's groundwater resources are collected from wells and springs along the east bench of Salt Lake County. Groundwater resources are pumped directly into the City's distribution system.

The City's water system is very efficient in that the collection, treatment, and distribution system primarily uses gravity rather than large pumping systems to move the water to where it is needed.

The 4th Avenue well is a critical water resource for the City. As with all of the City's other wells, the 4th Avenue well is currently used during the summer when water demand is higher, primarily due to outdoor irrigation. There are times during the summer when the 4th Avenue well provides 100 percent of the water to areas of downtown Salt Lake City. If the 4th Avenue well fails, SLCDPU would need to use another water source to meet demand. This may be difficult due to the different pressure zones and characteristics of the distribution system and water demand patterns. This could result in water supply or water pressure disruptions in downtown Salt Lake City.

SLCDPU also manages its water sources and system to ensure there is redundancy in case of emergencies. For instance, if there is a situation where one or more of the streams cannot be used in the water supply due to infrastructure or water quality issues, groundwater resources, including the 4th Avenue well can help meet demand and avoid water supply disruptions. If the 4th Avenue well fails, the area it serves would lose that redundancy.

18. **Provide a Meeting Summary:** This meeting summary was completed and distributed to area residents on November 5, 2019.

19. **Schedule Next Meeting:** A facilitated working group meeting will be held on December 2, 2019, from 6:30 to 8:30 pm at Memorial House. Area residents were sent information about the meeting on November 19, 2019.

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December 10, 2019

VIA EMAIL: Kelsey.lindquist@slcgov.com
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451 South State Street, Room 326
Salt Lake City, Utah 84111

cc: Holly Mullen, Communications and Engagement Manager (holly.mullen@slcgov.com)
Cindy Gubler, Facility Process Manager, Wilkinson, Ferrari & Co. (cindy@wfandco.com)

Re: 4th Avenue Well – HLC PLNHLC2018-00557 and PLNHLC2018-00558
WFC 4th Avenue Well Facilitation Process
Supplemental Baseline Noise Data and December 2, 2019 Wilkinson, Ferrari & Co. Informational Meeting

Ms. Lindquist:

Please add this comment-letter to the Historic Landmark Commission hearing record on this matter. The December 1, 2019 Wilkinson, Ferrari & Co. Informational Meeting Action Memorandum reports that the Salt Lake City Department of Public Utilities took various background baseline noise readings:

> The current dB readings at the site were measured on 11/25/19 and 11/26/1919. The decimeter was run for 3.25 hours and 4 hours during each measurement period. The average and maximum dB readings were 55.2 and 72.4 on 11/25/19 and 58.6 and 70.1 on 11, 26,19, respectively. *These reading were taken midday*. [WFC at para. 14, page. 5 (emphasis added).][1]

Fifty db is equivalent to a "[q]uiet suburb, conversation at home. *Large electrical transformers at 100 feet*"[2] (emphasis added). Large exterior electrical transformers are part of past and current concept designs for the upgraded Well building.

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[1] Wilkinson, Ferrari and Co. Dec. 1, 2019. Page 5 re: Background Noise. Action Memorandum for Dec. 2, 2019 Informational Meeting. (Copy in possession of author, DPU and WFC).

[2] IAC Acoustics. Dec. 2019. Comparative Examples of Noise Levels. url: https://www.industrialnoisecontrol.com/comparative-noise-examples.htm .

Using an uncalibrated smart phone application,[3] I took the following readings during late evening and early morning hours. Readings where complicated by the fact that the faux City Creek stream that runs next to the well site was operating. During the winter and spring, it would be anticipated that with the faux stream turned off, the neighborhood would be quieter. A more accurate neighborhood background noise was taken approximately 150 feet to the east along 4th Avenue. These readings are visually documented in screen shots in the Addendum to this letter. The right-hand noise spikes in the figures are an artifact of pressing the screen capture button on the smart phone.

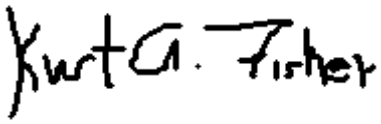
Table 1 - Informal Background Noise Readings by K. Fisher

Date	Time	Location	Faux stream operating?	Transformer or pump noise heard?	Figure	Est. Average db
May 23, 2019 Thurs.	1:59 am	150 feet east of Well site on 4th Ave.	Yes	No	1	50
June 16, 2019 Sun	11:56 pm	150 feet east of Well site on 4th Ave.	Yes	No	2	60
Dec. 10, 2019, Tues.	1:56 am	150 feet east of Well site on 4th Ave.	Yes	No	3	50
Dec. 10, 2019 Tues.	1:56 am	At cobble wall at Well site on 4th Ave.	Yes	No	4	60

These readings document three nighttime background level in comparison to the mid-day day traffic levels recorded by the DPU. There is no significant difference between these uncalibrated night time spot readings and the City's daytime decimeter readings. The faux City Creek stream located next to the 4th Avenue Well was a significant noise contributor that adds 10db to background noise (Figure 4). Natural noises do not cause the same level of irritation to humans as artificial noises like the buzz of a large electrical transformer such as that heard at the 500 North-Capitol site.

Please feel free to contact me with any questions that you may have by the means listed above.

Very Truly Yours



Kurt A. Fisher

[3] Physics Toolbox Suite, an Android application. url: https://play.google.com/store/apps/details?id=com.chrystianvieyra.physicstoolboxsuite&hl=en_US .

Addendum

Screenshots Documenting 4th Avenue Well Background Noise Readings

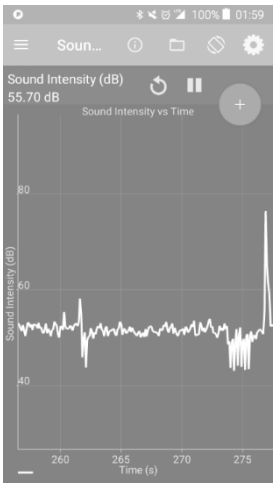


Figure 1 - May 23, 2019

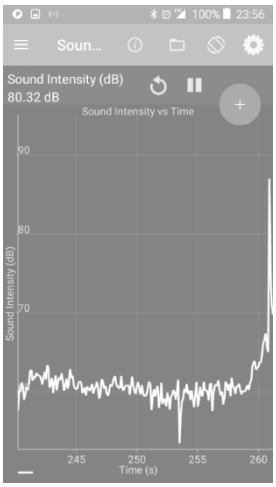


Figure 2 - Jun. 23, 2019

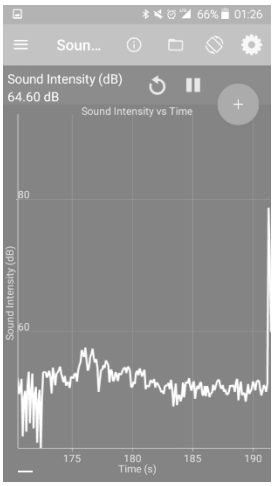


Figure 3 – Dec. 10, 2019

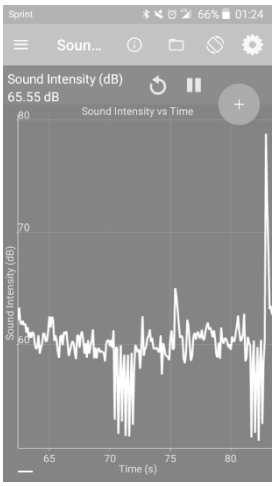


Figure 4 – Dec. 10, 2019 at 4th Ave Cobble Bridge

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June 8, 2019

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VIA EMAIL: c/o jo.walz@slcgov.com
Jackie Biskupski, Executive Director
Chris Wharton, Vice Chair of Board of Directors
SALT LAKE CITY REDEVELOPMENT AGENCY
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cc Via Email: Jackie Biskupski, mayor@slcgov.com
Chris Wharton, District 3 council person, chris.wharton@slcgov.com
Holly Mullen, DPU Community Engagement Manager, holly.mullen@slcgov.com

Re: Supplemental Funding to Move the 4th Ave Well: Over 75 Years, the Future Stream of Revenues from 4th Ave Well Water will collect $325 Million; Spending $5-$6 Million to Move and Build the Well Right is Not Excessive

Comment with respect to:

a) RDA Board Meeting scheduled June 11, 2019: Item No. 1 – General Comments
b) Council Working Session scheduled June 11, 2019: Item 2 – Unresolved Budget Issues and Items. Department of Public Utilities ("DPU") 2019-2020 Budget Request, DPU Detailed Project 5132268-2015-0213 and the General Comments Segment of the Council's Formal Meeting
c) Council Formal Session scheduled June 11, 2019: Item 11 - 10. Ordinance: New Water and Sewer Rate Structure related to the Department of Public Utilities budget for Fiscal Year 2019-20
d) Historic Landmark Commission, postponed June 6, 2019 hearing concerning PLNHLC2018-00557 and PLNHLC2018-00558.

Sirs:

This comment concerns economics relating to proposals to expend an additional $1.5 million (above the additional budget request of approximately $3.6 million) to move the proposed DPU 4th Avenue Well to the May 9 open house Option 2c site, the park at State and

Canyon Road in a redesigned anti-terrorist and earthquake hardened structure.[1] Some have suggested that the cost of a more robust pump house moved to a different site would an outlier in the distribution of the total costs of constructing such critical water facilities. That is a false narrative.

Whether a particular public infrastructure improvement is unreasonably expensive depends on its important to the community and the projected gross and net revenues expected to be received over the lifespan the facility. Net revenues from the current or proposed Well design are not available publically available. But gross revenue data sufficient to make a simple estimate of the economic value of the future value of the Well's gross revenue stream is publicly available.

The June 2018 water rate structure for the DPU[2] recites that residential users are charged at a rate of 748 gallons per "Unit Measure" at a cost of $1.85 per unit. A typical City residential consumers in the Block 2 category are using between 11 and 30 "unit measures" per month. This implies that the mean revenues per gallon of water sold are 0.0025 dollars per gallon[3] or about 400 gallons for one dollar. Assume that the rate of growth in DPU water rates is 2 percent per year and the long-term rate of inflation over 100 years is 3.22%.[4]

The DPU has stated that the 4th Avenue Well Water typically supplies 3 to 7 million gallons of water per day during the summer and dry seasons months.[5] Assume this covers the 5 months from June to October (or 150 days) and the mean delivered volume is 5 million gallons per day. Assume the useful life-span of the pump station and chlorination plant is 75 years.

Based on these simplifying assumptions, the present annual estimated revenue stream to the City from the 4th Ave Well has an economic value of $1,875,000 USD per five-month long summer season.[6] (In comparison, the 2017 Annual Report for the DPU recites $72,699,328 in

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[1] Memorandum by David E. Hansen, Hansen, Allen and Luce, Inc., to B. Stewart, Salt Lake Department of Public Utilities, re: 4th Avenue Well Assessment (hereafter "HAL Report") at 15 (url: https://docs.wixstatic.com/ugd/80b28b_3607f771b2984d63a44ce7a4c3d1c7a9.pdf).

[2] DPU. June 2018. Water Rates (url: http://www.slcdocs.com/utilities/PDF%20Files/UtilityRates/WaterrateswebCurrent.pdf).

[3] $1.85 / 748 gallons = 0.0025 dollars per gallon.

[4] 1913-2013 based on CPI (https://inflationdata.com/Inflation/Inflation_Rate/Long_Term_Inflation.asp).

[5] HAL Report at 1 (3 to 7 million gallons per day); *see* Semerad, T. April 30, 2019. The fight over pump house pits needs of Salt Lake City's thirsty downtown against a quiet neighborhood in Memory Grove. The Salt Lake Tribune (3 to 7 million gallons per day) (url: https://www.sltrib.com/news/2019/04/30/residents-mouth-memory/); Stevens, Taylor. June 6, 2019. Pump house fight in Memory Grove neighborhood takes center stage during Salt Lake City budget hearing. The Salt Lake Tribune (url: https://www.sltrib.com/news/politics/2019/06/05/salt-lake-city-budget/).

[6] 5,000,000 gallons per day x 150 days x 0.0025 per gallon. $1.85 per unit / 748 gallons = $0.0025 per gallon in revenues.

revenues from all of the DPUs water sales.[7]) Over a 75 year life span, the total amount of revenues that the City will collect selling 4th Avenue Well water, not adjusted for 2% compounded growth or discounted for inflation, is $140,625,000.[8] With water rates growing at approximately 2% per year and over 75 years, the total amount collected by the City from the stream of future revenues will be $326,639,265[9] If the $326,639,265 is discounted to present value at a 3.22% long-term annual inflation rate, then the present value of that future income stream is $84,848,491.[10]

These are gross revenue stream estimates and do not include cost-of-operations and cost-of-goods. However, since the principal cost-of-goods component of the DPU's water sales is the cost of the water itself – which is free to the City since the City owns the water rights – a 50% profit margin on gross sales is not an unreasonable guess. The DPU may make as net income from the 4th Avenue Well – that is monies available to defer the cost of other DPU and City operations – $326,639,265 times 50% or about $163,319,633 in future revenues – or $84,848,491 times 50% – that is about $42,424,146 in future net income discounted to present value.

A $5 million 4th Ave Well moved to a new location would cost only about 1.5% of the $326,639,265 in future revenues and 5.9% of the $84,848,491 present value of those future gross revenues. The net margins on future revenues is so large that bonding the $5 to $6 million cost of a relocated 4th Avenue well is an obvious option to finance the project at an alternate site.

These estimates are rough; obviously far more sophisticated estimates could be prepared by the City's and DPU's financial staff. However, one point is inescapable: *Spending $5 or $6 million to build a better 4th Avenue Well relocated to a new site is not an unreasonable capital facility expenditure-investment.*

Arguments that a relocated Well is an unreasonable cost outlier in the distribution of total costs of analogous public water treatment and pump house facilities also lack merit. The 4th Avenue and North Canyon Road site has unique design challenges and site characteristics. It should be expected to cost more and be a right-tail outlier in terms of total costs.[11] Similarly, the location of the Well – whose water is needed not for the Memory Grove residential pocket homeowners but to fuel economic growth in the Central Business District – provides a unique and disproportionate economic benefit to the City as a whole as compared to the City's approximately 20 other ground water wells. That unique economic benefit justifies spending more on the facility.

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[7] DPU. 2018. 2017 DPU Annual Report (url: http://www.slcdocs.com/utilities/PDF%20Files/Annual%20Reports/Annual%20PU%202017.pdf).

[8] $1,875,000 per year x 75 years.

[9] Excel Formula: -FV(0.02,75,1875000,0,1).

[10] Excel Formula: -PV(0.0322,75,1875000,326639265,1).

[11] *Compare* to the 5th Avenue and "U" Street Chlorination Water Treatment Plant also proposed in the DPU's 2019-2020 budget.

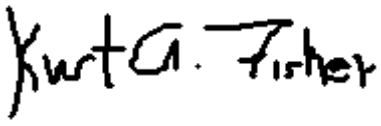
Salt Lake City Department of Public Utilities proposed Well at approximately 200 North Canyon Road in Salt Lake City should be moved to the May 9 open house Option 2c site[12] to the park at State and Canyon Road in a redesigned anti-terrorist and earthquake hardened structure, admittedly at an increased cost (*id*). As noted in other comments, the stasis of the dispute between the DPU and local residents is: "Who will pay an additional 1 to 1.5 million USD to move the DPU's proposed well from 4th Avenue and Canyon Road to the park to the south, or such other location as the DPU might determine is appropriate?"

Previously, to find the needed $1.5 million in supplemental funds, your commentator has suggested either deferral of other DPU projects to the future and reallocating budget authority to the 4th Avenue Well or authorizing an 8 mill increase in the DPU water, sewer and lighting rates.[13] A third option was suggested using tax increment funds of the Redevelopment Agency pursuant to an interlocal agency agreement as authorized by Utah Code Annotated § 17C-1-207(1)(a)(i)(B) (effective May 14, 2019)[14] and-or Utah Code Annotated § 17C-1-204 (effective May 14, 2019)[15,16].In this comment, bonding is suggested.

The relevance of the facts and reasoning of this comment to June 11 City Council budget deliberations and to its June 11 planned adoption of DPU rates and to the June 11 RDA budgeting and project proposal meeting is self-evident. With respect to future Historical Landmark Commission deliberations, the Commission is principally concerned with structure height, width and mass and not economics; however, Commission members may have been influenced by various economic arguments reported in the media. Therefore, I ask that this comment concerning economics of moving the Well to an alternative site also be entered into the Briefing Materials record of the Historical Landmark Commission.

Arguments that moving the 4th Ave Well makes the project too expensive is a false narrative, not based in fact. As always your cooperation is appreciated. Please feel free to contact me with any questions that you may have.

Very Truly Yours



Kurt A. Fisher

[12] HAL Report at 15.

[13] Letter by K. Fisher to City Council dated May 28, 2019.

[14] url: https://le.utah.gov/xcode/Title17C/Chapter1/17C-1-S207.html.

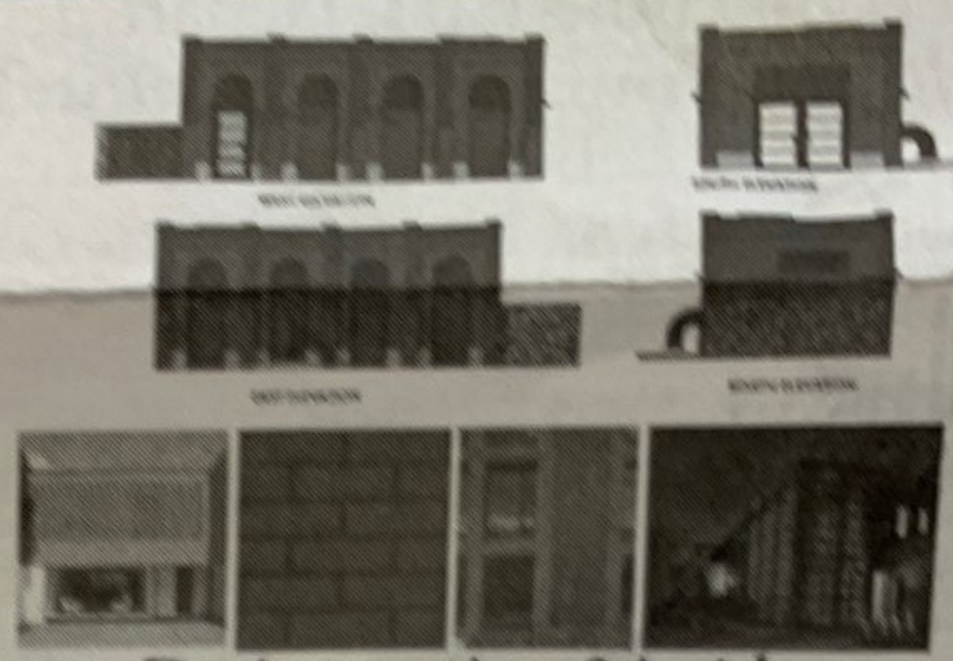
[15] url: https://le.utah.gov/xcode/Title17C/Chapter1/17C-1-S204.html.

[16] Petition by K. Fisher to RDA dated May 31, 2019.

a park.

On June 4, 2019, the City Council asked the SLCDPU to come back with alternatives addressing and incorporating community concerns such as building size, impact, safety, and noise.

The SLCDUP did just that and restarted the whole process with neighborhood input. "We understand that this is a special area that residents feel deeply about," said SLCDPU Director Laura Briefer. "We have been working hard with residents who live near the site to obtain input and make adjustments so that we can develop a solution that will work for everyone." They held meetings with neighbors and talked about what each felt had to be in the solution. The City said that the pump could not be moved off site. The neighbors listed their needs. Then they began to work to design something better.



Design option 3A side

SLCDPU revised their plan downward and removed anything from the building that wasn't necessary. The planned 500/600 sq. ft. building is now about the size of a 2-car garage. They eliminated the on-site emergency generator. They can quickly bring one to the site if needed. They eliminated fluoride and changed from liquid chlorination to a tablet calcium hypochlorite disinfection system. It has been designed with noise mitigation that will be less than the 50 decibels the County required. They have been working with the Urban Forester to limit the number of trees impacted. Hopefully only two will be lost.

During several meetings neighbors discussed many ideas including modern vs historical designs and which materials to use. On March 16th, 2020, SLCDPU and design firm CRSA presented their designs to the neighbors during a virtual meeting. These included 3 basic designs, 2 variations for each design and 4 different roof styles. The drawings included the actual not imagined trees that would be on site. CRSA also presented the idea of creating a partial stone fence (think Brigham Young's garden wall) that could be on the north and east sides of the building to conceal the electrical equipment for security and aesthetic purposes.

Many comments and thoughts were expressed by the Canyon Road neighbors. These designs, updated variations with other colors and materials, and shown in different seasons, will be available to see at the Virtual Open House on March 30, 2020, from 10 to 11 am. You can attend this open house and make your own comments by going to **www.facebook.com/SLCGovernment/.** The site will be up for about a week after the open house.

In a situation like this, we can never have everything we wish. It doesn't work that way. But it is a way to get the best possible outcome for both groups given the limitations under which we worked. Thank you SLCDPU for listening and working with us.

What is next in the story?

- SLCDPU will submit a packet to SLC Planning and Historic Landmarks Commission April 2020
- Historic Landmark Commission public hearing May/June 2020
- Council briefing during spring/summer 2020
- Procurement spring/summer 2020
- Construction fall/winter 2020/21.

You can see all the options that were presented at the March 16th virtual meeting on the GACC website: **SLC-Avenues.org.**

by Jill Van Langeveld

A New Concessions Stand Is Coming To Lindsey Gardens!

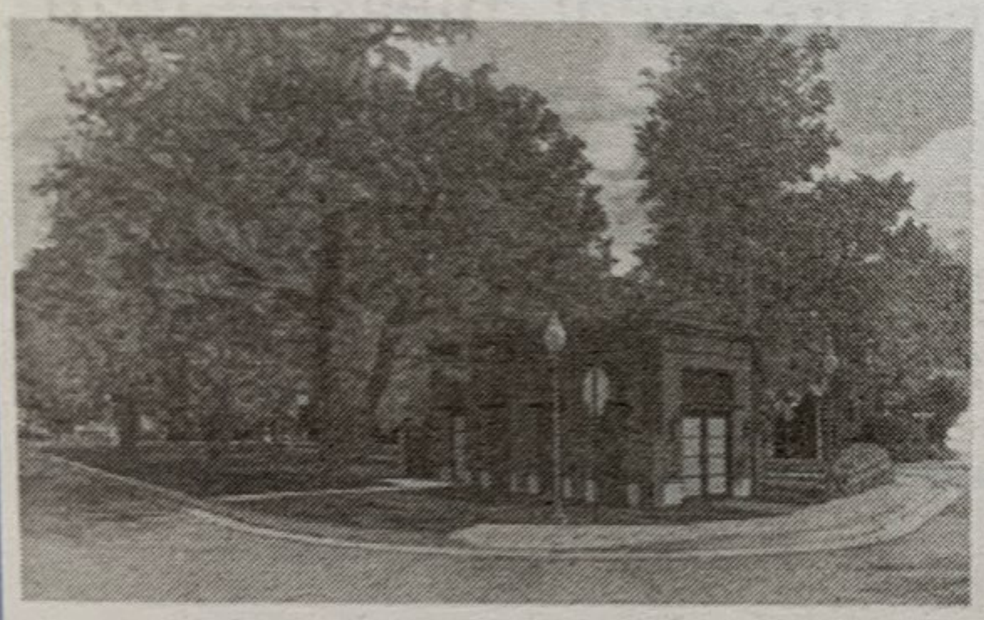
The Parks Division has started a design to replace the facility currently located at home plate on the lower field. Last year, Avenues Baseball submitted a constituent application to the City's Capital Improvement Program for a new concessions building. City Council awarded General Fund dollars in fall 2019. Avenues Baseball is a vibrant youth baseball league that has partnered with Public Lands to make numerous field improvements over the last five years. This project will replace an underperforming facility that does not meet current standards and cannot be remodeled cost effectively. The project scope includes demolition of the existing concessions building, design for the new building, water and sewer connections, electricity, and food preparation equipment.

The new concessions building will be centrally located between the middle and lower fields to improve access. New stairs

Moving Forward . . .

The story of the 4th Avenue Well Project by the Salt Lake City Department of Public Utilities has been long and sometimes contentious.

We were first informed of the project when the SLCDPU came to the GACC Meeting of July 11, 2018 to present their plan to (1) keep a very productive and important well on line and (2) bring it up to state codes for worker safety. On August 16th they held a public open house so everyone could see their plan which included a 2,900 sq ft area surrounded by a 6 foot high wrought iron fence enclosing a 998 sq. ft. building for adding fluoride and chlorine and a generator building. Six large trees would need to be removed for the project



Design option 3A

Neighbors' voiced concerns that (1) this was planned for a park and they would lose beautiful green open space, (2) six wonderful old trees would be removed, (3) it was too large for this small island park space, and (4) they worried that as the City planned for the safety of their employees they were forgetting about the safety of the residents closest.

The SLCDUP presented their plans on March 7, 2019 to the Historic Landmarks Commission (HLC) who had to give a certificate of appropriateness and grant the wavers they needed to bypass zoning rules. The HLC told the DPU that they needed to go back to the drawing board because what they had planned was not appropriate for a park.

On June 4, 2019, the City Council asked the SLCDPU to come back with alternatives addressing and incorporating community concerns such as building size, impact, safety, and noise.

The SLCDUP did just that and restarted the whole process with neighborhood input. "We understand that this is a special area that residents feel deeply about," said SLCDPU Director Laura Briefer. "We have been working hard with residents who

Design option 3A side

Inventory of materials: City Creek, Memory Grove, Freedom Trail open spaces

compiled March 12-17, 2019 by Cindy Cromer

The linear park spaces are divided by block initially and then by features. Photographs are generally in the order listed except that photographs of the Freedom Trail precede ones from the west side of City Creek along the paved road. As the photographs indicate, the materials are overwhelmingly stone and concrete/aggregate/composite. I did not list metal park benches, metal containers for waste/recycling, or concrete sidewalks.

2nd to 3rd Avenue

Cobbles
-stream bed
-access ramp on the State St. side
-retaining walls (2 places)
-wall at intersection with 3rd Ave.

Sandstone
-both bridges
-edging for the stream bed
-seating tuffets (2 places)
-decorative pavers (not holding up well)
-bike racks

Aggregate/Composite
lamp posts

Granite
City Creek Park signs (2)

3rd to 4th Avenue

Cobbles '
-protective wall
-stream bed
-2 bridges, 1 with sandstone.
-curbing on west side

Aggregate/Composite
-lamp posts

Granite
-Crismon Mill marker

Sandstone
-Catherine Hofmann memorial

4th Avenue to Connector at 236 N Canyon Road

Cobbles

-bridge
-stream bed
Aggregate/Composite
-lamp posts

Connector to Memory Grove Gate

Sandstone
-wall along water feature
Aggregate/Composite
-entry designed by Slack Winburn
-lamp posts

Memory Grove Gate to the Austin Stairs

Concrete
-mid-century fountain
-Liberty Bell supports
-base of flagpole with metal plaques
Cobbles
-Rotary stairs
-stream bed
-bridge at the north end
Marble
-Korean memorial
-WW I Memorial with bronze plaque
-Beason Chapel and benches
Granite
-Medal of Honor memorial with concrete bench
-Field Artillery memorial
-bike racks (at the end of the photographs)
-marker at Rotary Stairs
-Pearl Harbor survivors
-top of the Dorothy Alexander podium#
Sandstone
-Afganistan memorial
-stairs to Beason Chapel
-bench at Beason Chapel
-stairs north of Memorial House
-drinking fountain across from Memorial House
-sidewalk on the east side of Canyon Road
-curbing
Aggregate/Composite
-lamp posts
-base of the Dorothy Alexander podium# with metal plaque
Stucco
-Memorial House
Brick

-the details on Memorial House The brick is a raked-faced unit and has been painted white along with the mortar so that the bricks and mortar appear to be one material. A raked-faced brick would not have been original to the structure constructed in the 1890's as a stable.

Austin Stairs to the steel bridge (Freedom Trail) returning by the road

Concrete
-casing around drain with metal railing
-bridge
-bridge with arch*
-sitting area
-bridge with concrete arch (camouflaging utility pipe)
-base for granite sundial^

Cobbles
-stream walls
-retaining walls
-"gambion" retention structures (cobbles in wire)-extensive use
-pillars
-historic "patio"+
-curbing just above Memorial House on the paved road west of City Creek

Sandstone
-detailing on arch mentioned* under "concrete"
-historic "patio"+ on the foundation

Wood
-pressure treated wood foot bridge
-slats on concrete benches
-stairs made of railroad ties
-fencing hiding Chevron's facility on the west side of the paved road west of City Creek

Mixed Stone
-curved bench
-boulders in sitting areas
-granite and concrete sundial ^ with stone pavers

Metal
-steles
-conduit resting on concrete
-oil pipeline
-metal bridges (2)

Inventory of materials: City Creek, Memory Grove, Freedom Trail open spaces

compiled March 12-17, 2019 by Cindy Cromer

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-stream bed
-2 bridges, 1 with sandstone.
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Aggregate/Composite

-lamp posts

Granite

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Sandstone

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4th Avenue to Connector at 236 N Canyon Road

Cobbles

-bridge
-stream bed
Aggregate/Composite
-lamp posts

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Concerns Regarding the 4th Avenue Well Project

February, 2020

My name is Dave Jonsson. My wife and I own the property nearest the well, at the northwest corner of Canyon Road and 4th Avenue.

We believe there are so many unanswered questions about this massive well upgrade we don't know how the present pace of this project can be justified.

Jesse Stewart was quoted in the press as saying that notwithstanding comments from neighbors—many of which are sensible, logical and deserving of serious attention—the project continues to go "full steam ahead."

This is a slap in the face to those of us asking that all aspects of the facility be discussed and that alternatives be considered.

I have some questions for the city:

- Why has no public hearing been scheduled? Is this an urgent project? Could this project be delayed a year for further study?
- Does the well have a good 70-year safety record? It is excellent.
- Is the underground aquifer large enough that a new well in a less sensitive location might be just as productive? In light of the existing wells nearby, I believe that it is.
- Will this water treatment plant be totally silent? Probably not.
- Can the city come up with a harmonious design that fits the historic character of the neighborhood? Probably never!
- Is the safety of this project assured? No.

Would the neighbors be alright with the project if you wanted to put it on Yale Avenue, or Harvard Avenue? Absolutely not!

A Compromise Suggestion For The Look Of The New 4th Avenue Well Pump Upgrade

It seems inevitable that the residents of Memory Grove will have to accept a water treatment plant in our neighborhood.

While we oppose the large (14-foot-high!) industrial-style building the city is planning, if the treatment plant is inevitable, then I believe there are alternatives that should be studied.

Here is a suggestion that fits perfectly into the historic nature of this quiet jewel in the midst of an historic area: *Make the building into a replica of an old-time sawmill with a large water wheel dipping into City Creek*. It couldn't be more historic: some 150 years ago there was a sawmill on this exact spot!

Example of old mill

According to “Tales of a Triumphant People”* a mill sat at 4th Avenue in about 1858, powered by the sometimes tumultuous and unpredictable City Creek. It operated for several years. According to the excellent DUP book, *“many will probably remember the picturesque old sawmill, which stood at Fourth Avenue, with the long wooden flume, dripping with water and covered with moss, which carried water from above to the large wooden wheel, which furnished power to the mill.”*

Numerous commercial ventures were tried in the canyon, including several mills and a silk producing enterprise. All were phased out as Brigham Young sold off the property for residential development.

The present well, in service since 1947 but never chlorinated, is said to be unsafe for the workers who must maintain it. It operates only during the summer months and provides up to 15 percent of the city's water during that time. It is shut down from October through April.

The city says a tall above-ground pump is necessary and that mandates a tall structure. Plus, the city says, chlorination must be added. The present well is submerged in its casing and the vault is covered by a steel hatch only about 18 inches high.

My suggestion is to rotate the planned building to an east-west orientation (and take it away from the nearby tree roots as much as possible) and bring it to the edge of the creek.

The water wheel, on the building's east face, would dip into a cut in the creek bank. It would be inoperable, though a similar water wheel in Brigham Young Park *does* turn.

Plenty of room to rotate the planned building toward the bed of City Creek

The new pump's height could be incorporated into the peaked roof of the structure, with the sides sloping down to a more reasonable height, as in the example photo above. Wood construction is off the table, but a cobblestone facing might work, given that that is the look of the bridge abutment and the creek lining already there.

*Daughters of the Utah Pioneers, Stevens & Wallis Press, 1947, p. 59.

If The New Pump Upgrade Building Doesn't Itself Destroy The Park, The Construction Activity Will

Construction activity always usurps an area much larger than the footprint of the structure that is being built. There's the storage of the building materials, the parking of construction vehicles, the cleared space around the actual footprint of the building, the space to store excavated soils and the maneuvering space around the excavation.

Our little park north of Fourth Avenue is a tiny expanse of lawn and trees, bisected by a creek, that is tucked in between two very narrow streets. The street to the east is little more than two cars wide, while the main road is not much wider.

I cannot see how a structure such as this can be built without the contractor using up all of the park for maneuvering space, plus the bridge across the creek, plus part of the other park to the south, plus, occasionally, the street itself.

The movement of the construction equipment among the trees is sure to cause lasting damage to the trees if not destroying one or more of them altogether. The lawn will be destroyed from spilled chemicals and oil. Even trees far from the construction will be in peril. The shrubbery will suffer. Damage will be widespread.

This will all go on during the months between October and April. There will be noise, fumes and mud. Beeps from backing machinery will be incessant. Parking for visitors will be problematic to say the least. During the daytime, construction workers will monopolize street parking throughout the area.

Department of Public Utilities is being quite vague as to whether there will an ongoing noise. Once the building is finished and when the well is in operation, the plant will not be totally noise-free. I believe a low humming sound will permeate the neighborhood 24/7 during the summer months. There are plans to incorporate air conditioning units (more than one) and they may run full-time. We have been promised the building's walls will be thick enough to deaden the noise to the levels equal to a quiet summer night.

If they fail at this goal, what then?

The 4th Avenue Well Is Not An 'Either Here Or Nowhere' Situation. There Are Probably Numerous Possible Well Sites Nearby.

The LDS Church owns several nearby wells and should be at the table in these discussions.

I was surprised to learn that there are other wells in the downtown area. The LDS Church has several in Temple Square, as well as one in the Brigham Young Park, and there is one on the near west side of downtown plus there is an artesian well on 8th South and 5th East. The conclusion seems obvious: this aquifer is huge, and likely has abundant water.

The Church has three water rights on Temple Square. The Church is not using most of their wells, but one was producing at least as of last year.* The water rights attached to these wells date back decades. Some of the water produced is used for heating and cooling of facilities, and some of it is returned to either the aquifer or to the city storm drain. Some water may be used in the curtain of water that cascades down the front of the Conference Center.

It is my contention that the City Creek aquifer is very large and a new well site can be found near to the present well but in a far less damaging and contentious location. The present plans for the Fourth Avenue well are a demonstration of the city going after the low-hanging fruit, so to speak.

Now, I am not a well digger or water engineer. I have no scientific/engineering background, certainly not in reference to the present 4th Avenue Well. So I cannot speak with any authority on this subject.

I do believe, however, that because of the presence of wells very near to Fourth Avenue, the City Creek aquifer is very large. And the owner of those nearby wells, in this case the LDS Church, should be at the table in these discussions.

**https://www.waterrights.utah.gov/cgi-bin/wuseview.exe?Modinfo=Indview&SYSTEM_ID=2008*

Respectfully submitted,

Dave Jonsson

[redacted]

[redacted]

From: cindy cromer
To: Lindquist, Kelsey
Subject: Fw: 4th Avenue Well Project
Date: Tuesday, June 4, 2019 1:31:23 PM

From: Lisa Livingston [redacted]
Sent: Tuesday, June 4, 2019 1:27 PM
To: cindy cromer
Subject: Re: 4th Avenue Well Project

Just sent this to Chris Wharton.

On Tue, Jun 4, 2019 at 1:26 PM Lisa Livingston [redacted] wrote:

> City Council Member, Chris Wharton,
>
> My name is Lisa Livingston, I live at 236 N Canyon Rd and will be directly impacted by the "chemical treatment plant" that is planned to replace the 4th Avenue Well. The size and design of the proposed pump house is an **insult** to all who will have to live with it on a daily basis as it does not fit into this unique space and adhere to the strict rules that homeowners are held to in this Historic District.
>
> While I acknowledge the need to update the Well for safety reasons, I strongly question the modern design and outdated mechanics that will diminish the useable green space, block sight lines and add noise and odor pollution to this Historic neighborhood.
>
> It is not a matter of "people not having clean water" if this project doesn't get pushed through. The City's own study shows that the Well is viable for the next 30 yrs and water analysis proves the purity of the water from this well.
>
> It is your responsibility to consider ALL of the costs of this project. It will have far reaching, rippled effects in countless ways. Here are a couple that I personally feel strongly about, but there are many, many more.
>
> Have you considered the costs that the loss of green space demand?
>
> There is a grand awareness and movement globally to open up and preserve green space, especially close to city centers, due to the measurable benefits of the physical and mental health of citizens using them. I can attest to the number of people tapping into this resource in the Canyon Rd Park as I see them every day - no matter the weather.
> These "costs" can only be measured after it's too late- in the medical expenses of health care.
>
> Have you considered the costs of criminal behavior?
>
> Based on the "Principles of Crime Prevention Through Environmental Design" (CPTED) that the Salt Lake City Council is relying on to justify the project in Pioneer Park; Kristen Riker, director of parks and Public Lands, describes CPTED as "natural surveillance through

landscape design. These principles help reduce mischief and crime by opening up sight lines and making a space inviting for positive uses." *quote found on slcgov.maps.arcgis.com*

It appears that this concept is not being applied to the 4th Ave Well project in Canyon Rd Park as the sight lines **that have been open** since the Park's beginning in 1907, **are being thoughtlessly blocked.** If **opening** sight lines diminishes criminal behavior then the logical assumption is that **blocking** sight lines will increase - or invite- criminal activity by providing a hiding place for mischief. Yet another unaccounted for cost of this project.

It feels like the homeowners in this neighborhood are being disregarded as an unfortunate casualty by those who have been trusted to protect them. We are being asked to assume ALL of the risks of this project without our consent. We have been very active in this whole process and have found it to be a frustrating pretense of PU's asking for "public input".

As a tax paying, law abiding care taker of this neighborhood, I ask you to please consider ALL of the costs of this project. This project should be placed on hold until it is infallibly proven to be the best option with the least amount of "damaging costs" for this unique space and its care takers.

Thank you for your time and consideration. You have the power to make sure this is done correctly with respect for the setting.

Lisa Livingston

From: cindy cromer
To: Lindquist, Kelsey
Subject: Fw: City Council 6/4: Alternatives at City Creek Park
Date: Tuesday, June 4, 2019 12:51:13 PM

Please forward to members of the Landmarks Commission if time permits. With apologies and thanks, cindy cromer

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From: cindy cromer
Sent: Tuesday, June 4, 2019 11:33 AM
To: cindy cromer; cindy gmail
Subject: Alternatives 6/4 City Creek

My name is Cindy Cromer. In the last 20 years, I have survived 6 major land use battles in our historic Liberty Park. In all six cases, what is in Liberty Park today is an alternative to what was proposed initially. Three of the 6 petitions were approved by the Landmarks Commission and granted a Certificate of Appropriateness. Then they were overturned or set aside. In the one potentially relevant to the 4th Avenue well, the City Council intervened with a budget amendment and removed the funds, shifting them to an emergency on 900 South. In another Jeff Niermeyer was standing outside in the hallway when I told him about the approval by the Landmarks Commission. Jeff said that the project wasn't necessary; Public Utilities had solved the problem the previous year. That was my favorite because Jeff took care of everything after our conversation.

Last fall I wrote up the stories about projects in our historic parks and sent the information to your staff and Council Member Wharton. It is challenging to write about things that didn't happen. No one keeps track of the information if it didn't happen. And nobody complains about alternatives that work; people don't even know that what they are enjoying in Liberty Park are alternatives.

People think that alternatives will be more expensive than the original proposal. If we look at the examples from Liberty Park, the opposite is true. The City Departments did spend funds on proposals which were never constructed, but the alternatives were less expensive in each case when you factor in the collateral damage associated with the initial proposals. Of course there was the approved project that was unnecessary...the one that Jeff took care of. The current Youth City building in Liberty Park is another example. That historic building needed to be renovated any way. The initial building that the Anderson Administration proposed using was scheduled for demolition. It is cheaper in the long run to work on a building with a future.

So we already have a bunch of alternatives in Liberty Park and I can show you that they are cheaper than the initial proposals. I am asking you to consider that there could be alternatives

to the budget item for the 4th Avenue well in City Creek Park. I will explain to you in a letter why the initial proposal cannot be the correct one all of the time.

From: Linnea Noyes
To: Lindquist, Kelsey
Subject: Letter to HLC regarding 4th Ave pump house
Date: Wednesday, June 5, 2019 3:16:43 PM

Kelsey,

Please replace my previous letter with the attached document and make sure this is the one that goes to the members of the commission. I've made some corrections. One other document will follow shortly.

Thank you.

Linnea Noyes

To member of the Historic Landmarks Commission:

The following are my views concerning the 4th Avenue Well Project:

I live directly east of the building proposed by Salt Lake Public Utilities at 204 Canyon Road. I moved to this neighborhood in 1993 and would especially like to describe to you the character of this neighborhood. People who live here are invested and involved. It might be tempting to think that this is a reflection of self-interest, but on the contrary, I believe our community cares a great deal about protecting the soul and unique historical character of this area, not only for themselves but for the considerable number of people who walk, ride, and play here on a daily basis. There is a **generosity** underlying the choice to live in a neighborhood defined by so much public use. This is reflected in the time and energy people put into building improvement, landscaping and maintenance (including considerable pooper scooper activity associated with so many dog walkers). Great pride is taken in contributing to the overall charm of the area.

Salt Lake City's stewardship of the Memory Grove area began in 1902 and has continued to the present day.The neighborhood and park came fully to life during the extensive renovation of the park and the Canyon Road parkway in the mid 1990s .City Creek itself was 'daylighted' in a cobblestone riverbed from Memory Grove to North Temple and State Street, where it flowed into two parks created by the LDS church. The improvements included several charming bridges, new landscaping, and street lights throughout the area. All of this was done with impeccable attention paid to building materials and creative design. The bridges, for example, are a combination of concrete, cobblestone, and sandstone. Each bridge is unique and charming. The entire process was done with consideration and input from residents. Several years later, in 1999, a tornado moved up Canyon Road and through Memory Grove and destroyed 478 mature trees. A steering committee for park planning and reconstruction was led by the mayor and supported by the efforts of thousands of volunteers and a diverse array of supporters. This resulted in many improvements and significant beautification of the park.This quote from the 1986 Master Plan for City Creek has aptly guided improvement and reconstruction efforts since the plan's creation in 1986:*The historic homes and quaint*

residential environment along Canyon Road are unique, being so close to the Central Business District. Policy for this area is to preserve and enhance these homes, and the low density neighborhood atmosphere. The large trees should also be preserved.

A deep sense of **personal stewardship** is also tied to living in such a special place. Changes in my own home were done in collaboration with the HLC, with extra money spent on stone walls, for example, that were expensive alternatives, but complement and blend with the elements in the rest of this historic neighborhood. Over the years I purchased and made improvements to two separate apartment buildings on 4th Avenue and Canyon Road respectively. Though previously unattractive with problematic tenants, they are now beautifully landscaped with quiet tenants who are assets to the neighborhood. Other neighbors has made similar kinds of investments for which both the neighborhood and city have benefitted.

So knowing the care and pride that has historically characterized Salt Lake City's involvement with our historic district, as well as the residents of the Memory Grove neighborhood, it is very painful to interact with SLCPU. I support the upgrading of the well and infrastructure. It should of course be safe for the individuals who service it. I support safe drinking water for the community at large. What I would really appreciate would be a commitment to making any proposed building appropriate in size, design, and impact to the tiny plot of land it will sit on. This would likely take time, some money, and creativity, in lieu of the designs that have been presented so far. I would also appreciate a commitment to minimizing sound, finding an alternate chlorination site, and finding solutions to protect the beautiful,100 year old sycamores.

It is also my experience that the cart has been before the horse. Two of my neighbors are engineers and have come up with no less than eight engineering options that would enable the footprint of the building to be reduced. If the engineering was addressed first, an appropriate building might more easily follow.

I hope SLCPU will be held to the same historical standards as the rest of us in the neighborhood. It should be something that is appropriately scaled and, minimally, does not detract from the charm of our dear neighborhood., and is designed in such a way that it does not draw attention to itself, but is subtle and blends in with the park.

Respectfully,

Linnea S. Noyes, PhD
Psychologist
204 N. Canyon Road
Salt Lake City , UT 84103

From: Spencer Stewart
To: Lindquist, Kelsey
Subject: Memory Grove Water Treatment Plant
Date: Saturday, June 8, 2019 5:33:32 AM

Dear Kelsey,

I cannot stress enough how shortsighted the planning and protection of Memory Grove seems to be. As a Salt Lake City and Avenues native I regretfully and repeatedly view the hyper-growth agenda of the city and state as Penny-wise and pound-foolish. Memory Grove offers not only the downtown and avenues community immediate access to nature and tranquility, but also visitors to our state. The suggestion of the plant baffles me considering it puts at risk the nature and tranquility that has been pivotal to our ongoing economic boom. Modern cities protect their most valued assets and greenspaces not because they are nice to look at but because they add REAL economic value. The plant will tarnish one of the few assets that our downtown retains.

Thanks so much for your time and consideration.

Sincerely, Spencer Stewart

Spencer Stewart / Portfolio Manager / Seven Canyons Advisors
[redacted]
sevencanyonsadvisors.com

4th Avenue Pump House Project City Statement

Cecile Paskett (231 N. Canyon Rd.)

I live on Canyon Road, near the proposed 4th Avenue Pump House. As such, there are a few comments I would like to make about this project:

1. The Public Utilities office has stated that the pump house will not hurt property values and it cannot be built another way. They have made a number of claims regarding the project, but have yet to provide studies or evidence to the public to back up some of these claims. Professionals in the field have already commented on the designs and how they can be done differently to make the facility smaller. Further, I would like to suggest that this project could have a real, negative impact on surrounding property values. This has not been the focus of the neighborhood's comments, as I feel most residents are sincerely more concerned about the project's potential impact on the neighborhood's historic character and its visitors, but it bothers me that Public Utilities has glossed over this issue, as it is likely an outcome of this and other similar pump house projects.
2. I'd like to remind the commission about the Capitol Hill Cortez Pump Station – from what Capitol Hill residents have shared with Canyon Road residents, this project was built, but then its landscaping was allowed to die and the pumps weren't even turned on. I am concerned about whether this will also happen on Canyon Road.
3. I have some issues with how the Public Utilities office has handled their interactions with neighborhood residents. They used a misleading naming convention in their early advertisements about the project and speak about their design as an inevitability. Some Canyon Road residents feel they are being railroaded by the office. These residents are often retired or in established careers. Though they may feel like they are being pushed around by Public Utilities, they have the luxury of time – time to make comments, time to organize with neighbors. What happens, though, when Public Utilities plans projects in other neighborhoods, those with younger families—people with small children—who are earlier in their careers or have to work multiple jobs? These are families for whom time is a rare resource and who may not feel they have the capacity available to represent their interests. What precedent do we want to set with this project?

Please hold Public Utilities accountable when they propose major projects in established neighborhoods.

From: Briefer, Laura
To: [redacted]
Subject: RE: (EXTERNAL) Re: Virtual Public Open House Information
Date: Monday, March 30, 2020 1:03:49 PM

Good afternoon Dave and thank you and everyone for participating in our first ever virtual open house today. The 4th Avenue Well project continues to take priority and we will propose to include the project in our upcoming budget.

We are aware of and staying apprised of how the pandemic might impact our capital and operations budgets. One point of information - Salt Lake City Public Utilities' revenues are different than many other city functions because we are considered an enterprise of Salt Lake City. This means our revenues are based on fee for service, and are primarily from the sale of water – your water bills. We do not collect or rely on taxes like other city functions. We do bond for larger projects and pledge our revenues for those bonds (these are revenue bonds, not general obligation bonds).

Our draft fiscal year 2020-2021 budget (effective July 1 2020 through June 30 2021) has been prepared with an assumption that the economic impacts of the pandemic will decrease our revenues due to a combination of factors. These factors include decreased sales of water due to closures of businesses and institutions, and a possible increase in people who might find it hard to pay for water they use. As a side note, Public Utilities is not turning water off due to non-payment of water bills at this time.

Because we have significantly scaled down our draft budget for the upcoming fiscal year due to the pandemic, we will be proposing to the Mayor and Council that the budget reflect some capital projects as deferred to future years. However, the 4th Avenue Well project has a very high criticality rating, meaning it is extremely important to our ability to provide drinking water to the City's residents. It also has a condition rating such that failure of the well could happen at any time. Therefore, the 4th Avenue Well project continues to be prioritized in our draft budget for fiscal year 2020-2021, with construction anticipated in the Fall of 2020.

Because of the impacts from the pandemic, we will be proposing to make substantial budget cuts to defer some of our other larger capital projects to future years when our community is hopefully on the road to recovery. Our proposed budget is still in draft form and will need to be presented to the Mayor and City Council for their review and approval in the coming months.

Thanks for your question, and please let us know if you have additional questions. I hope you all stay healthy and safe in this unprecedented time.

Laura Briefer

Director

Department of Public Utilities
Salt Lake City Corporation
Office: 801.483.6741
Cell: 385.252.9379

www.slc.gov/utilities
www.slcgardenwise.com

From: Dave Jonsson [redacted]
Sent: Monday, March 30, 2020 11:01 AM
To: Cindy Gubler <cindy@wfandco.com>
Cc: Kimmel, Austin <Austin.Kimmel@slcgov.com>; [redacted]

[redacted] Virtual Public Open House Information

Thanks for the meeting. You answered some of my questions. Many remain.
Even more important than the design of the project is the spectre that it may not go forward at all.

The present global emergency will be felt in our city in profound ways, including the almost certain collapse in revenues for Salt Lake City government.

It is unrealistic to believe that collections of various fees and taxes will continue as planned.

Every revenue source will be affected, and every government function and activity

will have to be reviewed for its immediate need and prioritized.

Projects and services that can be postponed will have to postponed.

Please tell us how and why the funding for this project is still considered secure—if it is secure—or if you are now considering pushing the construction to a later time.

From:	Kurt A. Fisher
To:	Lindquist, Kelsey
Subject:	Re: Request to Correct 4th Ave Well Hearing Record - Attachment "K" to HLC Meeting Materials for June 6th Hearing
Date:	Tuesday, June 4, 2019 1:03:02 PM
Attachments:	20190528WellTransHistoricLandMarkCommFinalwAttach.pdf 20190530EmailTransMayorLtrtoHLC.pdf 20190530Well4LtrtoMayor.pdf 20190601TalkingPoints.pdf

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Mr. Lindquist, Kelsey.lindquist@slcgov.com

This is to request that your correct Attachment "K" to the Historical Landmark Commission Meeting Materials. Attachment "K" assembles "all of the public comments are organized chronologically starting with the most recent." This statement in the record is inaccurate. I have sent various comments for inclusion in the record. The most significant of those was my letter of May 28th that included Attachments "A" through "E". As incorporated in the public record, this document has been substantially modified by your staff. In particular, Attachment "B" to my May 28th letter, an evidentiary record of the history of flooding at the proposed site, was removed. Other attachments and pages were removed, and reordered. Attachment "E" to the May 28th letter was removed and substituted with another person's comment.

Therefore as planned, I am unable to quickly refer to supporting materials during an oral comment at the June 6th hearing.

Please correct Attachment "K".

The following re-transmittal of items is enclosed.

May 28th Letter with attachments "A" through "E"
File:
"http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190528WellTransHistoricLandMarkCommFinalwAttach.pdf"

May 30th Email Comment attaching Letter to Mayor re USG siting assistance
File:
"20190530EmailTransMayorLtrtoHLC.pdf"
File:
"http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190530EmailTransMayorLtrtoHLC.pdf"

I would appreciate you including the following item sent to you on June 1 and after the May 31 issuance of the staff briefing materials:

Talking Points for June 4th Budget and June 6th HLC meetings dated June 1
"http://fisherka.csolutionshosting.net/misc/FourthAveWell/20190601TalkingPoints.pdf"

Later today, I will have one additional comment in the form of a letter concerning the staff recommendations released May 31. In short, because the staff and applicant did not do supplemental site specific floodplain and earthquake studies that are optional under ICBO Chapter 16, the structure height, width and size of the building as being considered by the Commission do not represent what ultimately will be built. The current design is based on the default flood classification in the FIRMs map with a flood risk of less than 1 in 500 years, and that assumption will very likely will be rejected by the Building Department Office. The FIRMS and the national seismic hazard maps are not fixed documents, and the discretion of a building officer can be particularized with site specific studies. A site specific flood and seismic hazard study will result in a

further redesign of this ICBO Use Class III or IV and Seismic Design Risk Classifications E or F structure. The building being considered by the Commission is not what ultimately be required by building officials to be constructed.

Sincerely,

Kurt A. Fisher
[redacted]

From: Kurt A. Fisher
To: Kimmel, Austin
Cc: Wharton, Chris; City Council Liaisons; Lindquist, Kelsey; Holly.Mullen@slc.gov
Subject: RE: Status Request on 4th Avenue Well Matters / D3
Date: Friday, August 2, 2019 12:05:47 AM

Thank you all for taking the time to respond to my information request of August 1, 2019. Your responses fulfills my request. In closing, the upshot of this matter remains that during the 1940s, a questionable engineering decision was made to locate the well at 4th Ave. That engineering judgment may have been sound in the 1940s and was a well-meaning choice to conserve public funds. But given what has become known over the last 70 years about the geotechnical risks at the site (high hazard earthquake, repeated high-snow pack flooding, and potential cloudburst-fire flooding), it is not tenable from a public safety perspective to site a building above-ground facility at that location. The well and upgrade chemical plant should be moved out of City Creek's geologic streambed. This generation will have to foot the bill for our predecessor's error in judgment. It will cost more to move the well and treatment plant, but less than the 5 million USD originally proposed by the DPU in August 2018, and the increased cost is justified by the public safety and the site's now known geotechnical risks. - Sincerely, Kurt A. Fisher

> Mr. Fisher,
>
> This may not be news to you, but I wanted to let you know Public Utilities
> is in the process of preparing two additional well project designs for
> consideration, in addition to the current design. Each of the three total
> designs will be brought to 30% design. From what we understand, those
> three designs will be available for public review and feedback to consider
> the pros and cons of the options. Following a public outreach process, the
> most preferred design will then be brought to 60% design and reviewed with
> the Council. As Council Member Wharton mentioned, the timeline is still
> not clear, but we expect that to be sometime in the fall.
>
> As requested, attached is the engineering criteria developed by some of
> the neighbors in the area. This was also shared with the Department of
> Public Utilities.
>
> I hope this information is helpful. Please let me know if I can assist
> with anything else.
>
> Best,
>
> Austin Kimmel
> Salt Lake City Council Staff
>
> OFFICE of the CITY COUNCIL
> SALT LAKE CITY CORPORATION
>
> TEL 801-535-7600
>
> SLC.gov/Council
>
> To assure proper attention to your email, please 'Reply to All' or

> include city.council.liaisons@slcgov.com on the address line of this
> email.
>
>
> -----Original Message-----
> From: Wharton, Chris
> Sent: Thursday, August 1, 2019 2:01 PM
> To: [redacted]
> Cc: Kimmel, Austin <Austin.Kimmel@slcgov.com>
> Subject: Re: Status Request on 4th Avenue Well Matters
>
> Hello Mr. Fisher,
>
> My apologies for the delay in getting back to you. Here are the answers to
> your questions, to the best of my knowledge:
>
> 1) This is up to the Administration. As far as I am aware, nothing is
> anticipated until next spring. But DPU and the HLC would be the ones to
> make those decisions.
> 2) A report has not been made to the City Council since the budget was
> adopted.
> 3) There are no scheduled presentations before the City Council as of now.
> Last time I spoke with Director Briefer, the Department was going to go
> back to the engineers and architects with the feedback from the Council.
> My impression is that it would take several months before we heard
> anything.
> 4) Yes, I am happy to share what has been given to me. I will have my
> constituent liaison, Austin (cc'ed above) forward that to you.
>
> Best,
> Chris
>
> --
> Chris Wharton
> Salt Lake City Council Member
> District Three
>
> City & County Building
> 451 South State Street, Room 304
> Salt Lake City, UT 84114
> Direct: 801-535-7726
> Cell: 801-910-6795
>
> www.slcdistrict3.com <http://www.slcdistrict3.com/> On 8/1/19, 8:27 AM,
> "Kurt A. Fisher" [redacted]
>
> Councilperson Wharton,
>
> I would appreciate a direct response from you to my July 16 email, at
> your
> convenience.
>
> Sincerely,
>
> Kurt A. Fisher
>
> > Ms. Lindquist, Ms. Mullen and Councilperson Wharton,

> >
> > This is to request a status update on 4th Avenue Well matters.
> >
> > 1) When do you anticipate that this matter will be next rescheduled
> before
> > the Historic Landmark Commission?
> >
> > 2) Has the Administration prepared the report requested by the City
> > Council on June 4th?
> >
> > 3) What is the next scheduled presentation before the City Council?
> >
> > 4) Mr. Wharton, I understand that you have received some
> engineering
> > criteria from a committee of three residents. May I have a copy?
> >
> > Sincerely,
> >
> > Kurt A. Fisher
> > [redacted]
> > ([redacted]
> >
> >
> >
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>

I'm James Livingston, I live on Canyon Road in Salt Lake. I hold a master's degree in applied economics and a Ph.D. in accounting. Economists and accountants spend their careers assessing costs and benefits. There are two kinds of costs and benefits – direct and intangible. Direct are obvious and easily measured. While the word "intangible" leads some to think these costs and benefits are imaginary or made up, they are, in fact, very real. They may be difficult to precisely quantify but they can be reasonably estimated. The many costs of air pollution borne by society is an example.

Public Utilities and their engineers have failed to consider intangible costs in their analysis of Fourth Avenue Well options. In deciding to go with the current alternative they only factor in direct costs such as the cost of the pumphouse and equipment versus the cost of relocating the well. Interestingly, they often refer to the intangible benefits of worker and public safety, though they never attempt to quantify these. Like motherhood and apple pie, almost everyone feels good about worker and public safety.

But how do you feel about pollution? Specifically, noise pollution in the form of a high-pitched whine from a 450 horse power electric pump, day and night in the summer when you want to be outside? How would feel about increased maintenance traffic right in front of your home? How would you feel about lost greenspace and large trees? And speaking of public safety, how would you feel about frequent delivery of toxic chemicals across the street from your home and in the park where your children play? Did you know that if there were a toxic chemical accident at the pumphouse that residents living upstream would be trapped, with no way to evacuate? How would you feel about a 30+% estimated decrease in the value of your home? These costs, and more, will be borne by neighbors of and by everyone who used to enjoy peaceful visits to the park.

When all costs are counted it will be clear that the current proposal is the most, and not the least costly option. I urge the City Council to table Public Utilities' request for budgetary approval of the fourth avenue well until all costs are considered.

To: Chris Wharton, Laura Briefer, Craig Ogan, Cindy Cromer

From: David Garcia

Date: November 21, 2019

Topic: Need for review;
Submersible pump, 4th Avenue Pump Station

The leading reason cited by Public Utilities for abandoning the submersible pump configuration at the 4th Avenue Pump Station has been that Rocky Mountain Power would no longer supply a 2300 volt feed. In light of information from Rocky Mountain Power, this is incorrect and misleading. Consequently, skepticism arises regarding a key feature that Public Utilities insists is necessary. That insistence has significant negative implications regarding noise and size for the proposed new installation.

****
At the transformer encasement now functioning on site, Rocky Mountain Power is supplying 7200 volts from the overhead line. That 7200 volts is stepped down to 2300 volts to power the existing submersible pump. Rocky Mountain Power will continue to have a 7200 volt feed available to the site, and by extension 2300 volts will, if desired, be available at the site. Period.

Public Utilities plans to run the new above-ground configuration on 480 volts. All other things being equal, lower voltage means, at the least, bigger cables to deliver the same amount of power. And the frequent follow-on is that the equipment itself (in this case the pump) will be bigger.

****

For their plans, Public Utilities has stated a submersible configuration won't fit ("there is not enough room in the well"). But this apparently hinges on their 480 volt design (lower voltage = bigger equipment). The present submersible pump configuration, operating for decades on 2300 volts, is over two hundred feet below the surface. Hence, there is NO ASSOCIATED NOISE. Further, changing the configuration to a vertical axis pump would add A SIGNIFICANT VERTICAL COMPONENT to the new building on the site.

Quieter and smaller is better. The variance of information between Public Utilities information and Rocky Mountain Power has important implications regarding noise and size. The planned abandonment of the submersible pump configuration deserves careful re-examination.

file: PumpHouse / voltage