Utah Lake Water Quality Study (ULWQS)
Science Panel
May 13, 1:00 PM to 2:30 PM
Virtual Meeting
Meeting Summary - DRAFT

ATTENDANCE:
Science Panel Members: Mike Brett, Janice Brahney, Soren Brothers, Greg Carling, Mitch Hogsett, Ryan King, James Martin, Theron Miller, and Hans Paerl

Steering Committee Members and Alternates: Eric Ellis and Rich Mickelsen

Members of the Public: Jeff DenBleyker, Tina Laidlaw, Renn Lambert, Dan Potts, and David Richards

Utah Division of Water Quality (DWQ) staff: Scott Daly, Jodi Gardberg, and John Mackey

Technical Consultants: Kateri Salk and Mike Paul

Facilitation Team: Heather Bergman and Samuel Wallace

ACTION ITEMS

Who	Action Item	Due Date	Date Completed
Kateri Salk	Follow up with Jeff DenBleyeker to collect Utah Division of Water Rights data on Utah Lake to calibrate the evaporation component of the hydrologic budget.	May 31	
Scott Daly	Work with Mike Brett to reach out to Dr. Maria Dittrich to discuss her involvement in the Phosphorus-Binding (P-Binding) Study.	May 27	
	Circulate the final Bioassay Study report to the Science Panel.	May 31	
Heather Bergman	Follow up with Science Panel members offline via a poll to determine whether they are comfortable and able to meet in person.	May 31	May 25

DECISIONS AND APPROVALS

- In the Carbon, Nitrogen, and Phosphorus (CNP) Budget Study, Science Panel members agreed to assess each watershed using DWQ and WFWQC data in watersheds where the WFWQC data match the distribution of the DWQ data and only using DWQ data in watersheds where there are discrepancies.
- Science Panel members agreed to estimate external nutrient loading in the CNP Budget Study using both low elevation and compromise (high) elevation as the lake boundary.
- Science Panel members agreed to use discharge monitoring report (DMR) data when wastewater treatment plants are near the lake interface and tributary monitoring data in when wastewater treatment plants are far away from the lake interface.

- Science Panel members agreed that the P-Binding Study Task Group can finalize the P-Binding Study sampling plan at their next Task Group meeting without a final review from the whole Science Panel.

CNP BUDGET STUDY - NUTRIENT AND FLOW MONITORING PROTOCOLS OVERVIEW
Kateri Salk, Tetra Tech, presented an overview of the flow monitoring protocols for the CNP Budget Study. Her comments are summarized below.

- The Wasatch Front Water Quality Council (WFWQC) follows a Total Kjeldahl Nitrogen (TKN) protocol when measuring nitrogen. Kateri Salk followed up with the WFWQC and determined their protocol calculates TKN by measuring total nitrogen, nitrate, and nitrite concentrations. Tetra Tech will be able to move forward using the WFWQC total nitrogen values.
- Kateri Salk also followed up with WFWQC on their streamflow methodology. Their raw data from 2015 to 2018 indicates five or fewer cross-sections used to generate discharge. The US Geological Survey (USGS) recommends a minimum of 10 cross-sections to measure discharge.
- Kateri Salk shared the lower reporting limits and minimum detection limits for phosphorus and nitrogen for the DWQ and WFWQC methodologies. Tetra Tech set any values below the detection limit at half the minimum detection limit. For values greater than the detection limit but lower than reporting limit, Tetra Tech retained the values as-is. In watersheds where the values were less than the WFWQC detection limit, Tetra Tech only used DWQ samples because the DWQ methodology is more sensitive. The watersheds where values were less than the WFWQC detection limit include Lehi Spring Creek for phosphorus, American Fork River for phosphorus and nitrogen, Provo River for phosphorus and nitrogen, Hobble Creek for phosphorus, and Spanish Fork for nitrogen.

Science Panel Clarifying Questions
Science Panel members asked several clarifying questions about the nutrient and flow monitoring protocols. Questions are indicated in italics with corresponding answers in plain text.

How many cases have the less intensive velocity determinations from 2015 to 2018?
Based on the WFWQC data Tetra Tech obtained from 2015 to 2018, all the cases had five or fewer cross-sections.

Does the WFWQC have more cross-sections in their data from 2019 to 2020?
The only WFWQC data that Tetra Tech has is from 2015 to 2018. The most recent data is not in the Water Quality Data Portal yet.

Will the low number of velocity determinations across cross-sections be fixed in WFWQC's data from 2019 and 2020?
Yes.

Science Panel Discussion
Science Panel members discussed the nutrient and flow monitoring protocols for the CNP Budget Study. Their comments are summarized below.

- WFWQC's protocol has been to collect ten data points across a cross-sectional transect. They are now collecting 20 data points when a stream is wider than 10 meters. They are planning to compare the methodology where they collect 10 data points to the methodology where they collect 20 data points to see if there are statistical differences between the

results. WFWQC would collect five or fewer data points when the stream was five meters wide or smaller.

- Right now, Tetra Tech only has access to WFWQC raw data from 2015 to 2018 with five points or fewer for each transect. It would be helpful if the WFWQC could provide raw data with ten points across the cross-section.
- At sites with differences between the DWQ and WFWQC data, Tetra Tech should use the DWQ data because DWQ protocols meet standard data collection protocols. There are not many differences between the DWQ and WFWQC data, except in a couple of watersheds.
- The Science Panel should consider not using the 2015-2018 WFWQC flow data until there is more resolution on the data.
- There are a couple of potential paths forward: 1) only use DWQ data for flow, which would mean only using DWQ data for nutrient loads as well, 2) assess each watershed and use DWQ and WFWQC data in watersheds where the WFWQC measurements match the distribution of the DWQ data and in watersheds where there are discrepancies, only use DWQ data. There were only two watersheds where there was a big discrepancy between the DWQ and WFWQC data distribution.
- Science Panel members agreed to assess each watershed using DWQ and WFWQC data in watersheds where the WFWQC measurements match the distribution of the DWQ data and only using DWQ data in watersheds where there are discrepancies.

CNP BUDGET STUDY - HYDROLOGIC BUDGET OVERVIEW

Kateri Salk, Tetra Tech, presented an overview of the hydrologic budget for the CNP Budget Study. Her comments are summarized below.

- The inputs for the hydrologic budget include:
    - Direct streamflow measurements from monitored watersheds
    - Modeled streamflow and runoff results from unmonitored watersheds, using the Model My Watershed (GWLF-E) program
    - Groundwater and precipitation estimates according to the Environmental Fluid Dynamics Code (EFDC) model
- The outputs for the hydrologic budget include:
    - Direct measurements of the Jordan River
    - Evaporation estimates according to the EFDC model
- The total stream inflow estimates in the CNP Budget Study align well with estimates from previous studies. This alignment is a good sign because it suggests that monitored flows are not over or under-predicting flows compared to other approaches. There was a concern that grab-bag sampling would bias results during wet years or dry years compared to a modeling approach. The consistency of streamflow estimates across studies suggests that the CNP Budget Study can estimate loads with some certainty.
- The Jordan River outflow estimate in the CNP Budget Study is much lower than previous studies by at least 120,000 acre-feet/year. This result may be due to a few factors. First, Tetra Tech only used daily outflow values at the Narrows when there was a paired nutrient value. However, when they incorporated daily streamflow data, including data points without a paired nutrient value, it only increased the estimated streamflow by 10,000 acre-feet/year. Secondly, when crews observed zero flow at the Jordan River outlet from December to February, Tetra Tech replaced the non-zero values at the Narrows with the zero value. They replaced the non-zero values with a zero value because observed zero outflows at the outlet of Utah Lake trumps the non-zero values at the Narrows, which is further downstream.

- Tetra Tech used outflow data from the Jordan River from 2015 to 2020. During this period, Utah Lake was gaining in elevation, and the outflow from the Jordan River was lower. There is a decent amount of interannual variability related to the Jordan River outflow, making the outflow estimate differences less concerning.
- The proportion of inflows from streams and runoff is similar in CNP Budget Study hydrologic budget compared to other studies. Notably, the proportion of outflow from the Jordan River is lower in the CNP Budget Study compared to other studies.
- From 2015 to 2020, the Utah Lake had a net positive water balance of 88,000 acre-feet/year.

Science Panel Clarifying Questions
Science Panel members asked several clarifying questions about the hydrologic budget. Questions are indicated in italics with corresponding answers in plain text.

All of the studies compared against the CNP Budget Study estimate flows over different sets of years. How well do the flow estimates compare across the same set of years?
The Su and von Stackelberg study uses the same streamflow dataset as the CNP Budget Study but does so from 2006 to 2018. The CNP Budget Study uses the same dataset from 2015 to 2020. During the overlapping period from 2015 to 2018, the estimates should be the same because both studies used the same daily streamflow measurements dataset.

Is the Jordan River outflow much lower than the other studies because the years selected for the CNP Budget Study were different than the other studies?
Yes, Tetra Tech is confident that the Jordan River was drier from 2015 to 2020 than in previous years. The other studies included very wet years, most notably 2011, where there was high discharge from the Jordan River.

From 2015 to 2020, does the hydrologic budget indicate that 70% of the water leaving Utah Lake is doing so via evaporation?
Yes, according to the estimates.

Has Tetra Tech compared the observed lake volumes/elevations to the CNP Budget Study's estimates of inflows, outflows, etc.?
The next step for Tetra Tech is to compare their model to Utah Lake's volumes/elevations. They will be conducting that analysis in the following week.

Science Panel Discussion
Science Panel members discussed the CNP Budget Study hydrologic budget. Their comments are summarized below.

- It is important to have accurate information on the amount of water leaving Utah Lake through the Jordan River and the amount leaving Utah Lake via evaporation to understand the Lake's nutrient mass balance.

CNP BUDGET STUDY - UNMONITORED WATERSHED MODELING
Kateri Salk, Tetra Tech, presented an overview of the CNP Budget Study unmonitored watershed modeling. Her comments are summarized below.

- The original plan for unmonitored watersheds was to use a paired watershed approach. This approach would involve applying data from watersheds to unmonitored watersheds with similar characteristics. The issue with that approach is that several unmonitored

watersheds have ephemeral flows with no monitored counterparts. The revised plan is to use a simple model to estimate flows and nutrient loads from unmonitored watersheds.

- Tetra Tech will use the Model My Watershed program to estimate flows and nutrient loads for unmonitored watersheds. Specifically, they are using the Watershed Multi-Year Model, which simulates 30 years of daily data with the Generalized Watershed Loading Function Enhanced (GWLF-E) model. The hydrology of that model uses NHDplus version two medium resolution flow lines, which includes watersheds with ephemeral flows. The nutrient loading component accounts for farm animal populations, point sources, land cover, and soil nitrogen and phosphorus.
- The Science Panel should note that the calibration of the Watershed Multi-Year Model was conducted for some western watersheds, but there were no calibrations conducted in Utah.
- Tetra Tech ran the Watershed Multi-Year Model for 54 unmonitored watersheds, which represents a small proportion of the surrounding Utah Lake watersheds. The outputs from the model include the monthly hydrology and annual nutrient and sediment loads. The hydrology value includes overland flow and streamflow, which together account for the total surface flow. For nutrients, the model provides total nitrogen and total phosphorus valuess.
- The model indicates a low load of nutrients from the unmonitored watersheds and intermediate loads of water.

Science Panel Clarifying Questions

Science Panel members asked several clarifying questions about the unmonitored watershed modeling. Questions are indicated in italics with corresponding answers in plain text.

How do the modeled stream nutrient concentrations compare to the observed nutrient concentrations for adjacent watersheds?

The model only produces a value for nutrient loads and not nutrient concentrations. Comparing unmonitored watersheds' nutrients loads to adjacent monitored watersheds' nutrient loads is possible if the land use is similar.

Does the model give flow estimates as well?

- It does, but different components of the model generate flows and nutrient loads. It may be possible to back-calculate nutrient concentrations using the modeled flow and nutrient load values, but the result would represent an average flow-weighted value for nutrient concentrations. It may be a better approach to directly compare nutrient loads between unmonitored watersheds and adjacent watersheds based on area without back-calculating nutrient concentrations.

Are the hydrologic inflow from the unmonitored watersheds coming from the model?

Yes.

Science Panel Discussion

Science Panel members discussed the CNP Budget Study unmonitored watershed modeling. Their comments are summarized below.

- Any comparison between unmonitored watersheds and adjacent watersheds should account for land use and size.

CNP BUDGET STUDY - EXTERNAL MASS BALANCE OVERVIEW

Kateri Salk, Tetra Tech, presented an overview of the CNP Budget Study external mass balance. Her comments are summarized below.

- The loading estimates do not account for in-lake processes that impact the transformation of nutrients (e.g., sediment uptake and release, macrophyte uptake and senescence, nitrification, denitrification, phosphorus binding, and biogeochemical impacts of wetting and drying).
- The other studies and requests for proposals document the importance of changing lake levels and sediments on nutrient conditions in Utah Lake. It is not the purpose of the external loading calculation to estimate what happens to the nutrients once they are in the Lake; the external loading calculation only focuses on nutrients that cross the boundary of Utah Lake.
- Utah Lake experiences substantial elevation changes. From 2010 to 2020, the Lake elevation changed by 10 feet.
- Several wetlands around the Lake can take up, release, and/or transform nutrients. There is a remaining question on how to account for wetlands if they are sometimes inundated.
- The Science Panel will need to designate a single lake level across the period of record for the CNP Budget Study.
- An important elevation to consider with Utah Lake is the compromise elevation, which is 4489.045 feet. From 2010 to 2020, Utah Lake reached the compromise elevation twice, once in 2020 and once in 2011 when it exceeded compromise elevation.
- Tetra Tech calculated how likely it is that Utah Lake will exceed a specific elevation on any given day. They determined the probabilities for the lake elevation from 4481 feet to 4490 feet.
- Utah Lake's changing elevation is particularly important for two watersheds of interest: the Powell Slough Watershed and the Mill Race Watershed. There is limited data from these sites because DWQ and WFWQC can only collect samples when the sites are not inundated. In the Powell Slough Watershed, DWQ and WFWQC downstream monitoring sites are below compromise elevation. In the Mill Race Watershed, the WFWQC has downstream monitoring sites below compromise elevation.
- There is a substantial intra-annual and inter-annual variation in the Utah Lake elevation, which affects the downstream monitoring sites in both Powell Slough and the Mill Race Watersheds.
- There are two potential options for defining the lake boundary:
    - Option A is to set the lake boundary at the compromise (high) elevation. Option A implies that any nutrients reaching sometimes inundated locations are considered a load to the Lake, regardless of the processing that may happen at low lake level. Under Option A, Tetra Tech would calculate loads at a point directly upstream of compromise and would need to eliminate DWQ and WFWQC downstream sampling sites. It would not account for any nutrient transformation occurring during non-inundated periods.
    - Option B is to use the low elevation and use the data points from the low-level monitoring sites. Option B implies that nutrients are only considered a load to the Lake if they reach an inundated location at the time of loading. Under Option B, Tetra Tech would calculate loading at the most downstream location where there would be limited data due to sites not being sampled when inundated. This option would bias the data results toward times when Utah Lake is at a low level.

Science Panel Discussion

Science Panel members discussed whether they preferred to set the lake boundary at the compromise elevation or low elevation. Their comments are summarized below.

- One reason for setting the lake boundary at compromise elevation is that nutrients in the vicinity of Utah Lake will eventually get into the Lake even if they do not reach the Lake immediately. For example, when the lake area floods, the nutrients in the flooded area will be brought back into the system. The compromise elevation is also a relevant boundary for management.
- De-nitrification and nitrogen-fixing can be important at inundated locations. Additionally, discharging nutrients into a stream that will subsequently dry out will increase the likelihood phosphorus will bind with calcium or other constituents. Then, once the stream bed is re-wetted, it may not un-bind with that constituent. These dynamics make it complicated to set a lake boundary.
- One reason for setting the lake boundary at low elevation is that Utah Lake only reached high elevation twice in the past twenty years. Most of the time, Utah Lake is at a lower elevation with a higher concentration of nutrients, which is when blooms are more intense.
- The Science Panel should consider a third option to use the middle elevation between the low and high elevations. The issue with selecting a middle elevation is that there are not many data points at the middle monitoring sites in both the Powell Slough and Mill Race Watersheds. Most of the data is from the monitoring sites just above compromise elevation and at the most downstream sites.
- The Science Panel should consider processing the nutrient loads at the low and high lake elevations and compare the results. Since lake levels are actively controlled, it would be interesting to see how much nutrient loading is occurring at both lake levels.
- The lake levels only affect a few sites, so the differences between the nutrient loads at the high and low lake levels may amount to a rounding error. However, when Tetra Tech calculated preliminary results for the Powell Slough and Mill Race Watersheds, the nutrient load value doubled when they used the downstream estimates compared to when they used the upstream estimates. That is not a final result, but the preliminary result does suggest a substantial difference. This result may be partly because there are few samples at the downstream sites due to periodic flooding.
- The question of nutrient attenuation is still outstanding regardless of whether the Science Panel selects the low or high lake elevation for the CNP Budget Study.
- The extra workload for Tetra Tech to calculate nutrient loading at both high and low elevation is negligible.

Science Panel Poll

Science Panel members were polled on what they think should be defined as the lake boundary for the purpose of estimating external nutrient loading. Nine of ten Science Panel members were in attendance. The results of the poll are below.

What should be defined as the lake boundary for purposes of estimating external nutrient loading?

Response	*Number of Responses*	*Percentage of Responses*
Compromise (high) elevation	1	11%
Low elevation	0	0%
Both	8	89%

Science Panel Decision
Science Panel members agreed to estimate external nutrient loading using low elevation and compromise (high) elevation as the lake boundary.

CNP BUDGET STUDY – TRIBUTARY MONITORING AND DMR DATA
Kateri Salk, Tetra Tech, presented an overview of the tributary and DMR monitoring data for the CNP Budget Study. Her comments are summarized below.

- In watersheds with wastewater treatment plants (WWTPs), there are two estimates of load. The first estimate is from direct tributary monitoring, and the second is from the WWTP's discharge monitoring reports. The DMR data is only reporting direct discharges and does not account for natural nutrient loads.
- The Science Panel needs to decide whether to estimates loads using the tributary monitoring data, DMR data, or both.
- There are six watersheds with WWTPs and seven WWTPs, with one watershed containing two WWTPs. In watersheds where WWTPs are farther from the lake monitoring site, the DMR annual flow is much lower than the monitored flow. This dynamic occurs in three watersheds: Spring Creek – Springville, Dry Creek – Spanish Fork, and Benjamin Slough.
- There are three options for generating a load based on specific data:
    - Option A is to use only tributary monitoring data to estimate nutrient loads. The benefit if this option is that it incorporates both wastewater and natural loads, but the caveat is that the estimated loads would be lower than or equivalent to the estimated loads from only using DMR data.
    - Option B is to use only DMR data to estimate nutrient loads. This option would only incorporate wastewater loads. The caveat is that upstream tributary monitoring data is limited, so it would be difficult to quantify the natural loads along with the DMR loads. The estimated loads using DMR data would be higher than or equivalent to the loads estimated only using tributary monitoring data.
    - Option C is to use a mix of tributary and DMR data. In watersheds where the WWTP is near the tributary outflow, Tetra Tech can use DMR data. These watersheds include the Timpanogos Special Service District, Powell Slough, and Mill Race Watershed. In watersheds where the WWTP is far from the tributary outflow, Tetra Tech would use tributary data. These watersheds include Spring Creek – Springville, Dry Creek – Spanish Fork, and Benjamin Slough.

Science Panel Clarifying Questions
Science Panel members asked several clarifying questions about the DMR and tributary monitoring data. Questions are indicated in italics with corresponding answers in plain text.

Does the data indicate that the discharges occurring far from the Lake are taking a sub-surface flow path to Utah Lake?
The monitored flows are higher than the DMR flows, which means the streams are gaining water between the WWTP point of discharge and the monitoring site, not losing water.

What does the streamflow data look like at or above the point source flows?
The data is more limited at or above the point source flows compared to the downstream sites. DWQ has more data resolution at the lake interface. There have been other monitoring programs since 2015 that have collected data at monitoring sites upstream from the WWTPs for waste load analysis, but overall, the resolution is much better at the lake interface.

If the streams are gaining water downstream from the WWTP, are the concentrations declining, or are the concentrations comparable to what is being reported at the discharge points?
The nutrient concentrations are lower at the lake interface but not in proportion to the amount of water being added. Preliminary results indicate that the load in the DMR data is either equivalent or greater than the load in the tributary data.

Science Panel Discussion
Science Panel members discussed the DMR and tributary monitoring data. Their comments are summarized below.

- There are numerous springs and high groundwater sources around Utah Lake, so it makes sense that the monitored flows are higher than the DMR flows.
- In the Benjamin Slough Watershed, the WWTP are discharging water, and then further downstream, people are using the stream water for flood irrigation. These variables create a dynamic where it would be better to use the tributary monitoring data at the lake interface when the WWTP is far away from Utah Lake.

Science Panel Poll
Science Panel members were polled on what data they think should be used to generate external nutrient loads in watersheds with wastewater treatment plants. Nine of ten Science Panel members were in attendance. The results of the poll are below.

Which data should be used to generate external nutrient loads in watersheds with wastewater treatment plants?

Response	*Number of Responses*	*Percentage of Responses*
Tributary Data	0	0%
DMR Data	0	0%
Both	9	100%

PUBLIC COMMENT AND QUESTIONS
Members of the public provided comments on the CNP Budget Study. Their comments are summarized below.

- The rate of change of Utah Lake's water levels due to the dam and pump house are the main concern to Utah Lake. Capturing the history of the implementation of the dam and pump house is critical. The quick rate of change of Utah Lake's water levels has scrubbed the shoreline.
- Utah Lake is a highly regulated reservoir, and the Division of Water Rights conducts detailed accounting of what goes in and out of the reservoir. The Division of Water Rights' numbers could be another data point to validate the hydrology model.
- Looking at both high and low lake levels is a good idea. There is an assimilation of nutrients along the shoreline and significant evapotranspiration when Utah Lake is at a low elevation level. This dynamic means there are lower nutrient concentrations and a substantial reduction of flow that gets to the open water.

Public Clarifying Questions
Members of the public asked several clarifying questions about the CNP Budget Study. Questions are indicated in italics with corresponding answers in plain text.

What are the differences between the percentage of evaporation that compromises the outflow budget in the CNP Budget Study and other studies?
In the CNP Budget Study, 71% of the outflow budget is due to evaporation. The Su and von Stackelberg study suggested that evaporation makes up 56% of the outflow budget. The Su and von Stackelberg study was based on a different set of years when the flow of the Jordan River was higher, so the Jordan River represented a greater percentage of the outflow budget in the Su and von Stackelberg study.

Does that mean that evaporation makes up 40 to 70% of the outflow budget?
Yes, depending on the year. Evaporation also changes depending on Utah Lak elevation.

CNP BUDGET STUDY – EVAPORATION RATE
Science Panel members asked several questions and provided comments on the evaporation component of the CNP Budget Study hydrologic budget.

Clarifying Questions
Science Panel members asked several clarifying questions about the CNP Budget Study. Questions are indicated in italics with corresponding answers in plain text.

How did Tetra Tech calculate the evaporation value?
The EFDC model determined an evaporation rate in units of centimeter. Tetra Tech applied that rate to the area of Utah Lake at the compromise elevation to get the volume of water loss to evaporation. Applying the evaporation rate to a changing Utah Lake area would lower the calculated amount of water loss to evaporation. The compromise elevation level represents the potential maximum loss of water due to evaporation.

Why would Tetra Tech not calculate the amount of evaporation based on the difference between the monitored outflow and inflow?
Utah Lake was gaining in elevation during that period, so they did not assume the discharge was zero.

Would it be possible to apply a steady-state model and calculate the evaporation using that approach?
It is possible if the Science Panel thinks it is a good idea to balance the model on evaporation.

Science Panel Comments
Science Panel members provided comments on the CNP Budget Study. Their comments are summarized below.

- Tetra Tech should calculate evaporation value directly using the difference between the inflow and outflow based on the steady-state model. They should compare the result of that calculation to their current modeled evaporation value.
- Kateri Salk will follow up with Jeff DenBleyeker to collect Utah Division of Water Rights data on Utah Lake to calibrate the evaporation component of the CNP Budget Study hydrologic budget.
- A nice output from EFDC predictions would be animating (time and spatial) the computed evaporation rates over the Lake for the period of simulation. This output could be something that Tetra Tech calculates later.

P-BINDING STUDY UPDATE
Scott Daly, DWQ, provided an update on the P-Binding Study. Their comments are summarized below.

- Josh LeMonte, Steve Nelson, and Greg Carling, BYU, are developing the P-Binding Study sampling plan and literature review documents. The P-Binding Study Task Group will be meeting with them on May 27 to discuss the sampling protocols, so the contractors can begin sampling. The Task Group will review the sampling plan and reports in advance of that meeting.
- Mike Brett, James Martin, Mitch Hogsett, Janice Brahney, and Theron Miller compose the P-Binding Study Task Group.

Science Panel Discussion
Science Panel members discussed the P-Binding Study. Their comments are summarized below.

- Science Panel members agreed that the P-Binding Study Task Group can finalize the P-Binding Study sampling plan without a final review from the whole Science Panel.
- Dr. Maria Dittrich from the University of Toronto has expertise in phosphorus mineralization, particularly as it relates to calcium. She is interested in working on Utah Lake and should serve as a supplemental advisor for the P-Binding Study in a formal capacity. Josh LeMonte, the P-Binding Study primary investigator, committed to reaching out to her. Science Panel members agreed that Scott Daly and Mike Brett should reach out to Dr. Maria Dittrich to provide supplemental advice on the P-Binding Study. Scott Daly and Mike Brett will reach out to Dr. Maria Dittrich to discuss her involvement in the P-Binding Study.

OTHER STUDY UPDATES
Scott Daly, DWQ, provided updates on other ongoing Science Panel studies. Their comments are summarized below.

Bioassay Study

- Dr. Zach Aanderud, BYU, finishedhis final report for the Bioassay Study. The Bioassay Study Task Group, composed of Hans Paerl, Ryan King, and Mitch Hogsett, with support from Kateri Salk, provided final comments on the report. The Bioassay Study report is essentially final.
- Hans Paerl suggested Mike Brett review the final Bioassay Study report from the perspective of bioavailability. Once Mike Brett has reviewed the final report, Scott Daly will circulate the final Bioassay Study report to the Science Panel.
- The Task Group was working with Zach to develop a factsheet with the highlights from the report. The next step for the Bioassay Study is to develop the factsheet to send to the Steering Committee. This factsheet may be tied to the Science Panel's future work of sharing what information they have gathered related to the charge questions.

Littoral Sediment Study

- DWQ released the Littoral Sediment Study request for proposals last fall, but no one submitted proposals. Soren Brothers, Utah State University, has assembled a team to conduct the Study. DWQ is working on contracts and is hopeful they can have a finalized agreement in the next couple of weeks.
- The timeline for the Study is to collect data in the late summer and fall and present the results in late winter or early spring. DWQ staff will likely handle the geographic

information system (GIS) components of the study. The Utah Lake storage capacity curves developed by James Martin will help immensely with the GIS component of the study.
- Once an agreement is in place, the next steps for the Littoral Sediment Study are to approve the Littoral Sediment Study sampling plan, likely with the support of a Science Panel task group.

Utah Lake Model Development Project
The Utah Lake Model Development Project involves enhancing the EFDC/WASP model and developing a watershed model. DWQ received a few proposals, and Science Panel members are reviewing the proposals. In two weeks, they should select a proposal and begin developing a work package. The goal is to have someone selected and onboarded to begin developing the model in a month to six weeks.

Public Comments
No members of the public commented on the update on the Science Panel studies.

NEXT STEPS
Utah state office buildings are opening up again, and the mask mandate has been lifted. Whether the Science Panel can meet in person depends on the rules each Science Panel member has to follow set by their institutions. Based on the Utah system and DWQ protocols, the Science Panel is close to coming back for in-person meetings. Heather Bergman will follow up with Science Panel members offline via a poll to determine whether they are comfortable and able to meet in person.