COMMENTS OF THE CENTRAL TEXAS WATER COALITION RELATING TO LCRA'S PRESENTATION OF ADDITIONAL INFORMATION ON THE UPDATE OF ITS 2015 WATER MANAGEMENT PLAN

SUBMITTED VIA EMAIL TO LCRAWMP@lcra.org
July 31, 2018

On behalf of the Central Texas Water Coalition (CTWC), thank you for the continuing opportunity to submit comments, questions, and items for discussion with respect to LCRA's ongoing efforts to develop an updated Water Management Plan (WMP) for the operation of the Highland Lakes. These comments are generally intended to respond to matters raised during or after the most recent LCRA-hosted informational meeting on July 12, 2018, although we understand that LCRA welcomes comments on all topics at any time during its work to update the 2015 WMP. In accordance with the requested schedule for submittals of comments, these comments are timely submitted on Tuesday, July 31, 2018. Our first comments were timely submitted on Wednesday, June 20, 2018.

CTWC would like to respectfully suggest that this truncated process does NOT allow time for a thorough review of the materials presented by LCRA. Even though none of us want another process as lengthy as the 2010 process, it did allow a true dialogue and sharing of diverse concepts and ideas. We were all able to hear the comments from all parties. The modelers were available to clarify data and answer concerns. We were encouraged to debate issues and to try and understand the perspective of each stakeholder group. In contrast, it seems that this process does not allow for the interactions and open discussions that could provide important insights into the evolution and development of this Plan.

Please consider the following comments:

1. Incorporation of Watershed Changes and Low Inflows
It is our understanding that the Colorado River watershed has experienced major structural changes in terms of land use and development that are contributing to the reduction in runoff response due to rainfall events. How is LCRA incorporating these changes into the water availability model (WAM) being utilized in the WMP revision process? We believe the reduced rainfall/runoff response is not being considered in the flow naturalization process that is fundamental to WAM modeling, and therefore the modeling presented by LCRA will not be representative of likely hydrologic conditions to be experienced in the Highland Lakes region in the future. As a result, we believe that the WAM modeling undertaken by LCRA during this WMP revision process will overstate the availability of interruptible water and will exacerbate future concerns regarding the water supply for LCRA's firm customers.

The inflow issues on which we base our assertion were investigated by Kennedy Resources Company and reported in the August 2017 Report for the Texas Water Development Board (TWDB) entitled "Evaluation of Rainfall/Runoff Patterns in the Upper Colorado River Basin." (See link below)
https://www.twdb.texas.gov/publications/reports/contracted_reports/doc/1600012011_Kennedy.pdf

The Kennedy Report identified four issues that may be causing the reduction in observed inflows: 1) the proliferation of noxious brush, 2) the construction of small reservoirs, not accounted for in naturalized flows, 3) groundwater use and aquifer water level declines, and 4) changes in average temperatures and

drought conditions. A key point in the Report was the fact that these changes are not accounted for in the flow naturalization process.

A major factor in reduced run-off was the change from a sheep/goat economy to a cattle and recreational use economy during the mid 1980's to 1990's. The multiple effects resulting from this shift is detailed in an attached report entitled "Decreased Run-off from a Rancher's Perspective", provided by a long time rancher in Llano County. In summary, a cattle economy brought about re-establishment of native grasses on range- lands, and improved grasses in fields. The elimination of the sheep/goat economy (short grazers), coupled with rotational grazing of cattle, caused less run-off. Also, a shift to recreational ranching facilitated an explosion in brush, which provides deer cover. Another issue that is likely reducing inflows and not reflected in the Naturalized Flows is the large number of alluvial wells that have been drilled by the rivers and lakes.

If major changes have occurred and are continuing to occur in our watershed that are not picked up in the Naturalized Flow Process, it appears that the historical Naturalized Flows that occurred in past years would not be predictive of what inflows would occur, if these changed conditions had existed back then. This seems to create a major issue with the "stationarity" assumption, which is a critical component of water availability modeling. Specifically, the State of Texas uses historically based water availability modeling to assess the likelihood of water availability for specific intended uses. The model results can, for example, suggest that over the historical period of record, sufficient water was available for rice irrigation in X out of Y years. This information can then be used to provide estimates of the likelihood that irrigation water will be available in any given future year. We assert, however, that because the water availability modeling does not account for the changed rainfall/runoff response in the watershed, then the statistical assessments of water availability based on the WAM modeling are overstated, and potentially drastically overstated.

We trust LCRA has properly calculated the naturalized flows used in the WAM model, although we have not verified their accuracy. We assert, however, that the watershed has changed over the period of record, and the effects of these changes have not been properly accounted for in the flow naturalization process. We do not believe that the naturalized flows computed over the 1940-2016 modeled period of record will accurately reflect future basin hydrology, and therefore we cannot accept the idea that these WAM modeling results will provide a reliable indication of future water availability for LCRA's firm and interruptible customers. As such, we believe the WAM modeling presented during this WMP revision process overstates the likelihood of future Interruptible water releases and jeopardizes LCRA's ability to meet its Firm demands (including its commitments to Firm customers). We believe the WMP's proposed revisions do not adequately protect the Firm water supply for the region, and the lakes are likely to drop below the current 600,000 acre-feet combined storage "floor" during a future drought as a result.

To further illustrate our concerns, we present a statistical analysis of the Naturalized Flows (computed at the outlet of Lake Travis) and the inflows reported by LCRA (based on USGS gauges and LCRA reference factors). Dr. Bill McNeese performed this analysis. In his statistical analysis of the historical data, Dr. McNeese concludes that we have very likely shifted downward to a "New Normal" Inflow distribution beginning in 2008, which is much lower than the historical period from 1942-2007. This implies that the inflows observed from the recent 2008-2015 period are likely to be much more predictive of current and future water availability than the old 1942-2007 Period of Record. This change is graphically reflected in the SPC charts of the Naturalized Flows and Actual LCRA reported inflows (attached).

These SPC Charts show the control limits and averages for each flow distribution. The magnitude of the change can be seen by comparisons of the old historical and new distribution averages, as shown below:

Naturalized Flows	1940-2007	2008-2016	% Change
Average, acre-feet/year	1,539,869	876,570	**-43.1%**

Inflows into Highland Lakes from LCRA	1942-2007	2008-2016	% Change
Average, acre-feet/year	1,304,280	577,135	**-55.8%**

SPC charts have long been used to detect process changes in manufacturing and business applications. However, they also are applicable in examination of natural processes and day-to-day activities. Dr. Don Wheeler provided links to several articles on use of SPC to analyze hurricane/flood activities by and to analyze global temperatures by Dr. Bill McNeese.

http://centraltexaswatercoalition.org/wp-content/uploads/Why-We-Keep-Having-100-Year-Floods-Making-Predictions-Using-Historical-Data-Donald-J.-Wheeler-06-04-13.pdf

https://www.spcforexcel.com/knowledge/control-chart-examples/spc-and-global-warming

It appears that the impacts of these factors can already be seen in this year's LCRA Monthly Inflows graphic (attached), which shows 2018 Inflows running far below the historical averages and even well below the recent 2008-2015 new Drought of Record period.

Additional study is obviously required to better quantify and account in WAM modeling for these very adverse changes to inflows into the Highland Lakes, and a new more thorough TWDB study of the watershed will soon begin. However, in the near term, it appears that very conservative approaches and decisions should be taken in the WMP Update process, particularly around parameters associated with water availability to provide sufficient protections for Firm customers.

Recommendations:

A. Take a more conservative approach to Demands, as proposed by Firm customers. More conservative options include:
   - Remain with the dry-year basis only for 2025 Demands
   - Use the 2030 Demand numbers, as recommended by City of Austin

B. If LCRA will not consider the recommendation to extend the Demand Period to 2030, as requested by City of Austin, there should be an automatic adjustment in 2025 to the projected 2030 Demands, if a new WMP is not in place.

C. As recommended by Ken Gorzycki from Horseshoe Bay and supported by Firm customers: Raise the 600,000 acre-feet minimum combined storage requirement to 750,000 acre-feet to provide a more prudent cushion.

D. Increase the mandatory Interruptible customer cut-off point from 900,000 acre-feet to 1,000,000 acre-feet of Combined Storage.

E. Rapid declines in reservoir storage need to be managed in a quicker manner to avoid many issues relating to meeting future needs of water users. This topic should be explored further as a stand-alone discussion. (see item 8)

2. Impacts of Hydroelectric Power Generation on Water Management
LCRA reports minimal releases of water on their Annual Water Use Reports for meeting Emergency Shortages or Ancillary Power. However, from study of their Annual Water Use Reports submitted to TCEQ, LCRA is producing large quantities of hydroelectric power when it makes releases through each dam to meet downstream water demands. Is there a conflict between being stewards of the water and generating hydroelectric power? Although CTWC requestors have obtained a limited amount of information from LCRA about its hydroelectric operations, we understand that some of our questions (including requests for financial information) will not receive responses without a legal process.

When stored water is released to generate power, we believe there are significant financial consequences that impact both the water and electric businesses. Disclosure of relevant financial information will allow the public to understand this critical water/electricity interface.

Interface Related Questions:

A. Why is water used by LCRA in the production of hydroelectric power not included as a Demand?
B. How is the LCRA Water Business compensated for water used to generate hydroelectricity?
C. How much revenue does LCRA make each year from generation of hydroelectric power?
D. How do LCRA decisionmakers handle the apparent conflict of interest between water needs and electricity production?

3. Accounting for Downstream Losses. Please explain how LCRA's water modeling accounts for conveyance and distribution losses for stored water releases to downstream Interruptible irrigation customers. Where and how are downstream losses considered in the modeling? What are the specific assumptions in the WAM modeling for losses in the Colorado River between the storage reservoirs and the downstream diversion points? Based on our review of the recent WAM modeling performed for this LCRA WMP revision, there are no channel losses between Lake Travis and Bay City (as specified on the CP definitions in the WAM input file). Is LCRA accounting for these losses in some other way within the WAM?

4. **Accountability for Lost Water from Stored Releases.** Interruptible stored water allocations should be charged for all Orders from Stored Water versus allowing irrigators to reject the stored water as it passes the Diversion Point. LCRA's stated position that is has always been done this way is not a good business practice as water becomes more precious with reduced inflows being the norm. This would also make the WAM modeling more accurate. At the same time, LCRA may need to increase its oversight over the total volumes of irrigation water that are applied to a customer's fields, to assure that water that is diverted is not wasted and that water conservation efforts are promoted.

5. Water for Emergencies. Wildfires are currently a huge concern for all areas, both urban and rural. Hundreds of acres began burning a few days ago in Burnet County in the Inks Lake State Park area. Public comments made at the July meeting by an Assistant Fire Chief have reminded us that Travis County Emergency Services District 8 relies heavily on the water in Lake Travis in times of emergency, and a fire fighter's ability to access water for firefighting is significantly reduced when Lake Travis falls to 650 feet above mean sea level (msl). Even more frightening, water access for firefighting is primarily limited to only one location on the shores of Lake Travis when lake levels fall to 640 feet above msl (or less). We strongly recommend water management practices that assure that minimum lake elevations are maintained in reservoirs that are potential sources of water for public safety. Please consider methods to address these concerns and to allow water for firefighting to be considered in the modeling results and overall objectives for lake storage. How can the needs for firefighting safety in this basin be factored into water planning in the update of the WMP?

6. **Modeling Results Showing Lake Elevations**. Our review of the recently provided WAM modeling appears to show that Lake Travis would drop to a level of 583 feet above msl (see attached graphic), which would be a detail causing great concern to many, for many reasons, including the devastating impact on the ability of fire fighters to access lake water in cases of emergency. Will you please include the lake levels of both Travis and Buchanan in the outputs and narrative explanations of LCRA's modeling runs, so that this impact can be better understood?

7. **Understanding Irrigation Modeling for Garwood**. At the July informational meeting, LCRA presented water modeling and demand information on some of LCRA's irrigation water customers. Would you please provide the corresponding information on the Garwood irrigation operations? And explain how the Garwood demands and commitments are included in the water modeling for the WMP? Also, we wish to thank LCRA for explaining how the Corpus Christi water right is considered in its water modeling.

8. **Management of Lake Storage**. We urge LCRA to implement changes to allow a faster, more nimble response to rapid declines in lake storage. As an LCRA manager noted in recent discussions, shortening the time period to trigger a drought designation from 24 months to 18 months would be an option. In addition, in view of the almost non-existent inflows to the lakes in recent weeks, it seems appropriate to add a criterion regarding a minimum quantity of inflows over a period of time, so that periods of extremely low inflows will not continue for months before the WMP reacts to this alarming situation. An LCRA Daily River Operations Report, which stated: "Yesterday's total gauged inflows into the Highland Lakes were 15 acre-feet" should trigger an immediate response under the new WMP.

Please continue to evaluate management tools that avoid precipitous drops in reservoir storage; facilitate LCRA's ability to maintain control over this limited water supply; establish minimum combined storage volumes that adequately protect LCRA's Firm customers in future years; and assure that LCRA can satisfy its Firm water commitments without the need for emergency orders or curtailments that pose threats to public health and safety. We believe these topics deserve priority attention and discussion.

Sincerely,

Jo Karr Tedder

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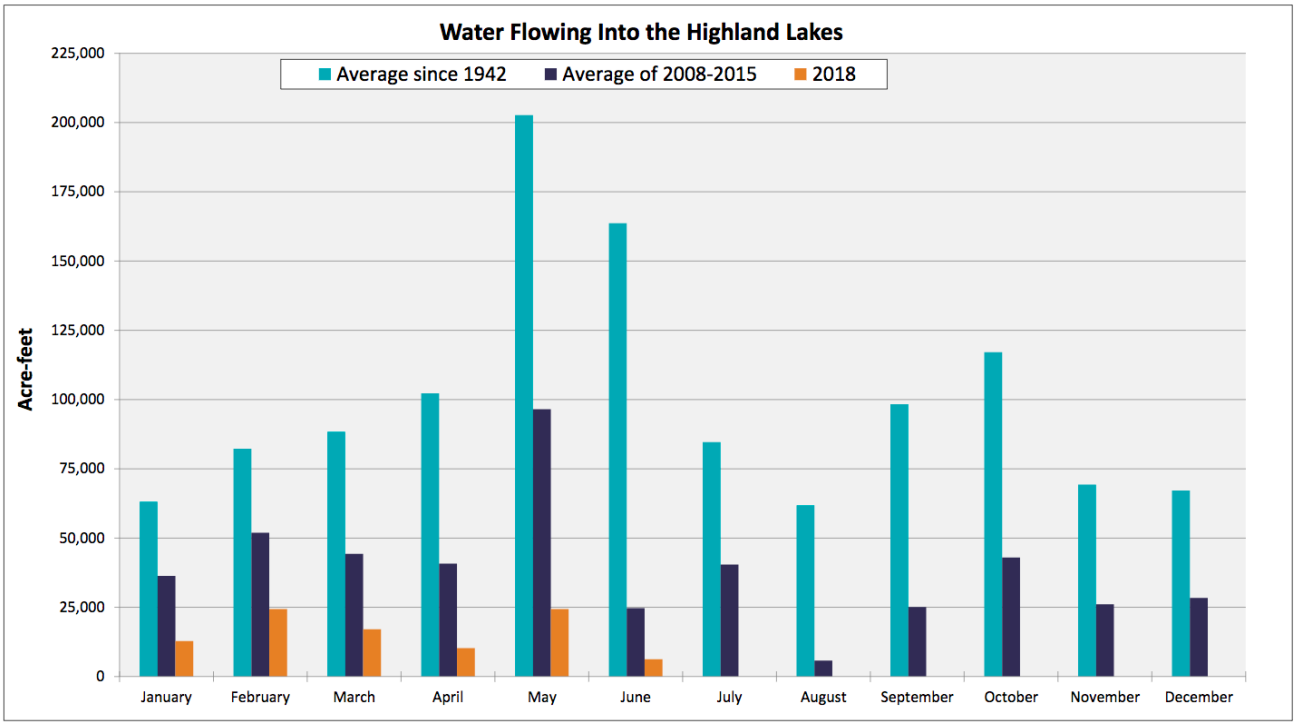

Period: June (acre-feet)	
Since 1942, June Average:	163,677
2008-2015, June Average:	24,716
June 2018:	6,275

* Inflows: the estimated amount of water flowing into the Highland Lakes from rivers and streams.

Data for 2017 and 2018 is preliminary and subject to change.

Decreased Run-off from a Rancher's Perspective

Stanley Miller and Richard Golladay

July 24, 2018

A 75-year-old rancher named Stanley Miller in Llano County knows exactly what has decreased run-off to the Highland Lakes in recent years. Below are his observations over a lifetime.

The biggest impact on run-off was return of the coyotes (following the ban of 1080 poison), because it ended the sheep and goat business forever in most of the Hill Country during the decade of the 1980's, except on small tracts of 50 acres or less. Coyotes also eliminated the over-population of rabbits. (Sheep, goats, and rabbits are short grass grazers, so they left the land bare and allowed a lot of run-off when it rained.) Ranchers were forced to switch to raising cattle, almost exclusively.

Also, during the predominantly sheep and goat raising economy (before 1980), ranchers planted small grains or hay grazer. Plowing and laying the fields bare between crops created more erosion (and run-off). "We were carrying rocks out of fields as they were uncovered from the erosion."

Following the shift to a cattle economy, two innovations drastically changed ranching: (1) planting and fertilizing improved perennial grasses in the fields, and (2) rotation grazing of cattle. Rotation grazing, in particular, enabled older native perennial grasses to be re-established on the range land not in fields. Both re-established native grasses on range lands, and improved grasses in fields, drastically reduced run-off and erosion, since it means more year-round ground cover. This transition began in the 1990's.

Another factor greatly affects run-off: Invasive species of trash brush, cedar, mesquite, and cactus were formerly somewhat controlled by sheep, goats and rabbits, because these short grass grazers eat these plants when they first sprout. But now these invasive plants have exploded in size and numbers, because cattle predominately eat only grass. These plants lowered the ground water table, even though the grass cover was holding it. All but the biggest springs are dry, and water levels in wells are noticeably deeper. It took a few years for the invading trees and brush to be noticeable, but now ranches are being overrun and they are not being controlled fast enough. Also, almost all land is now being bought for recreational use. Livestock ranching can't pay for land any longer. Brush cover enhances deer numbers and most owners see no need to control invaders. The Texas prairie is disappearing.

Although total rain may be the same, on average, there are fewer 3 and 4 inch rains. Also, many earthen dams were built as far back as the 1950's, which often were full and overflowed during the sheep/goat raising economy. Now, because of less upstream runoff (because of cover of perennial grasses), more and more of these dams are usually dry. If they have water, an inch a day can evaporate on hot summer days. (And summers are hotter). On his ranch there are 1200 acres that drain into two draws - each of which drain into an earthen dam which used to be permanent livestock water sources,

but are now usually dry. "I have probably seen my dams overflowing only 10 days in the last two years."

The increase in perennial grasses, rotational grazing, recreational ranching, brush out of control, more dams, a lower water table, and more wells being drilled for people moving to the Hill Country means less run-off, fewer springs, and less in-flow for the lakes. The downward trend will continue.

Mr. Miller sells ranch real-estate in the Hill Country, and the observations he makes about ranches in Llano County applies to ranches all over the Hill Country.

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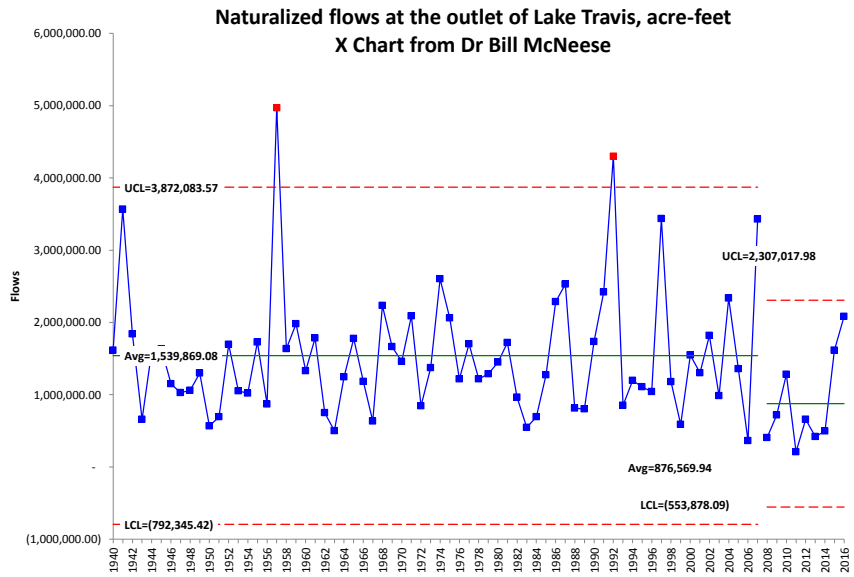
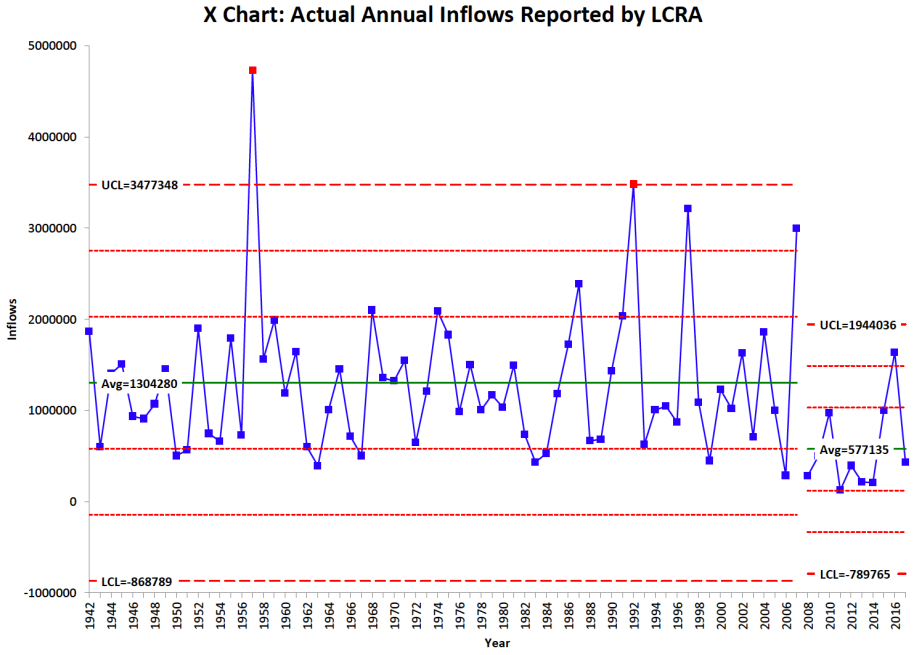
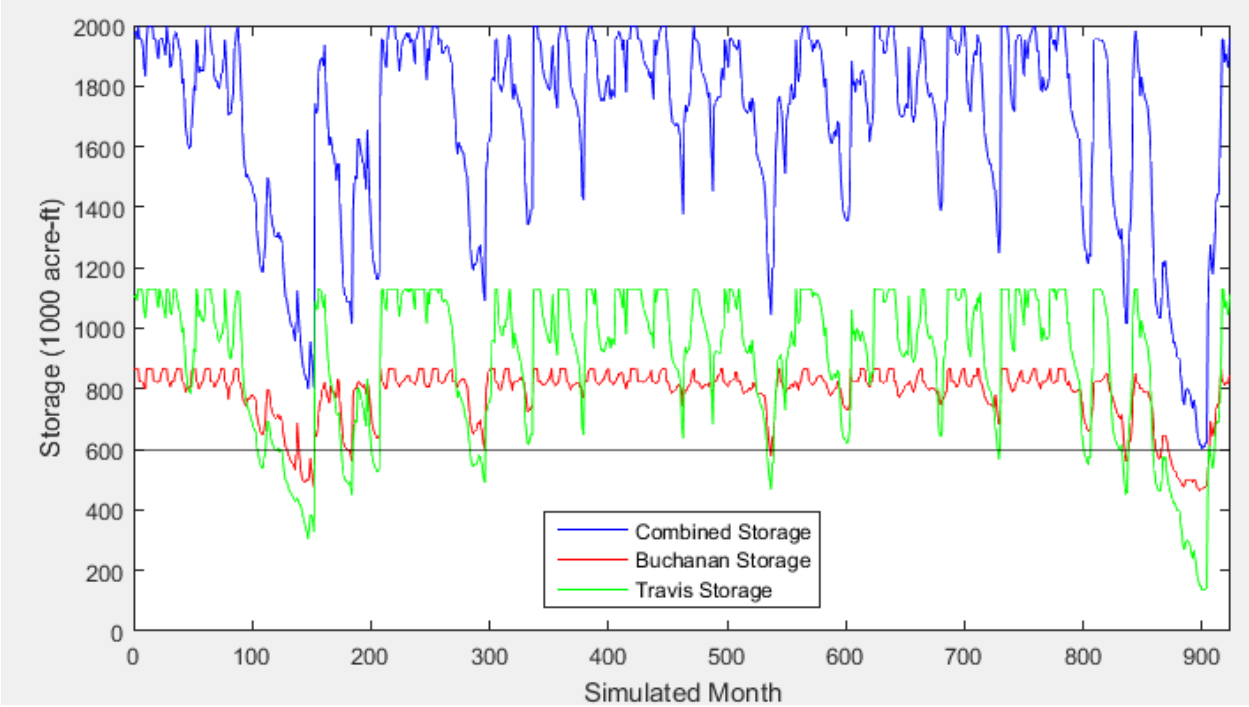
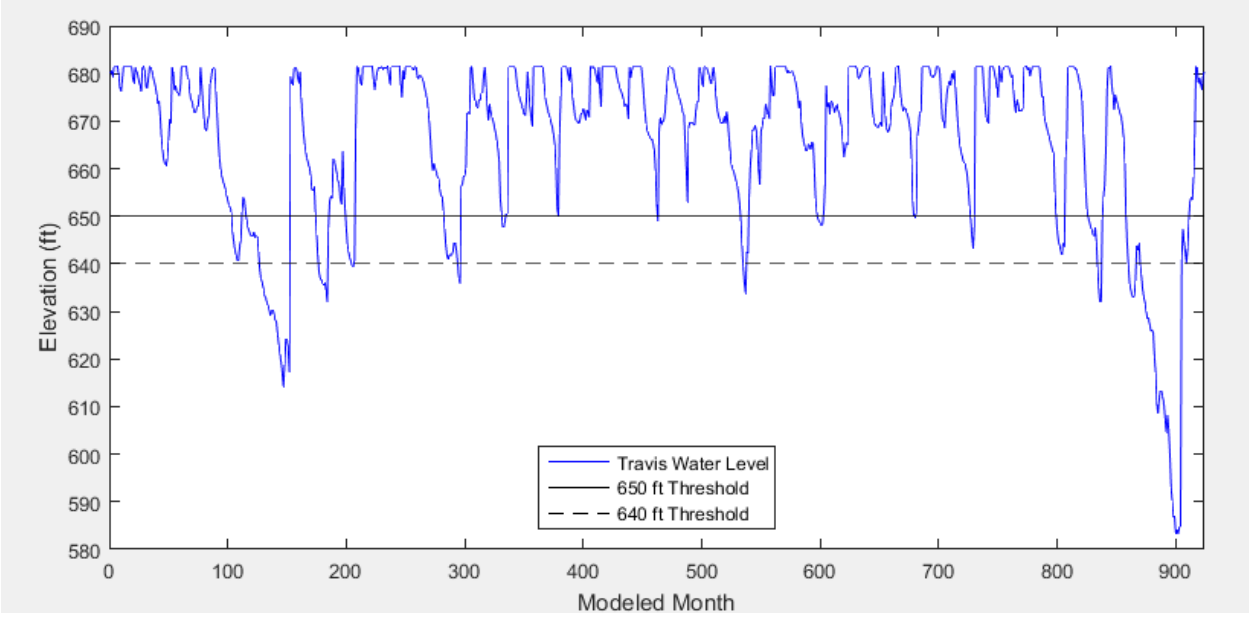
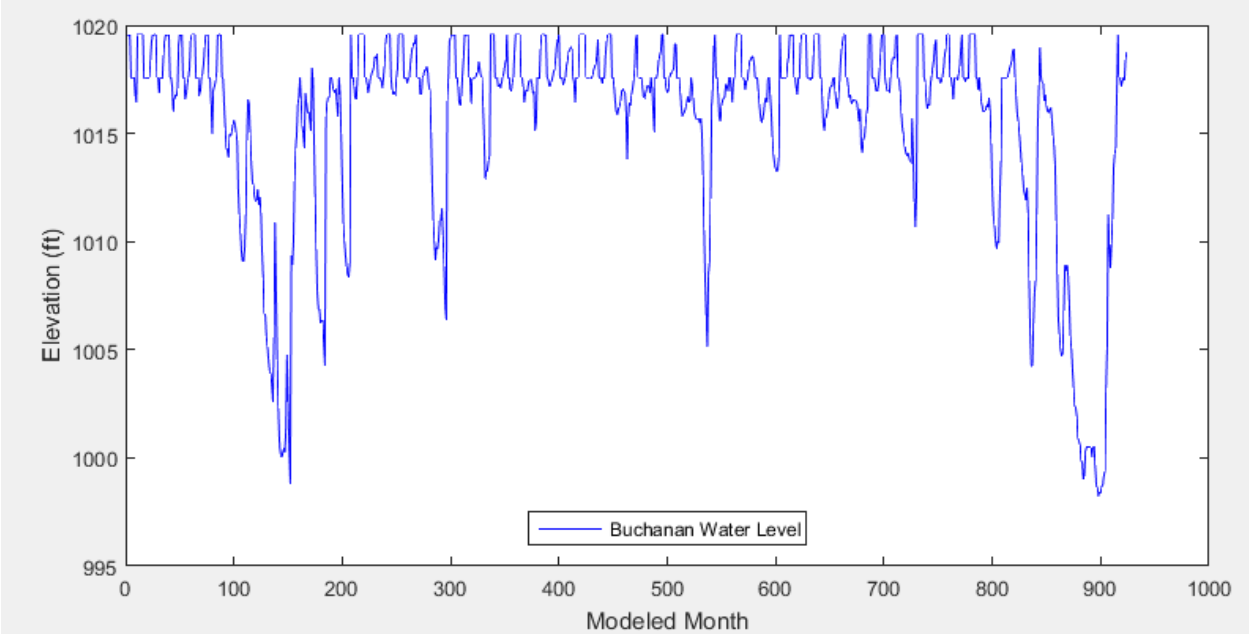

Naturalized flows at the outlet of Lake Travis, acre-feet
X Chart from Dr Bill McNeese
Flows
UCL=3,872,083.57
Avg=1,539,869.08
LCL=(792,345.42)
UCL=2,307,017.98
Avg=876,569.94
LCL=(553,878.09)


X Chart: Actual Annual Inflows Reported by LCRA
Inflows
Year
UCL=3477348
Avg=1304280
LCL=-868789
UCL=1944036
Avg=577135
LCL=-789765


Storage (1000 acre-ft)
Simulated Month
Combined Storage
Buchanan Storage
Travis Storage


Elevation (ft)
Modeled Month
Travis Water Level
650 ft Threshold
640 ft Threshold


1020
1015
1010
1005
1000
995
Elevation (ft)
0
100
200
300
400
500
600
700
800
900
1000
Modeled Month
Buchanan Water Level