



BUREAU OF RECLAMATION

WaterSMART – Applied Science Grants for Fiscal Year 2021

Project

Lake Thunderbird Predictive Level Optimization Tool (PLOT)

April 21, 2021

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TECHNICAL PROPOSAL

1.0	Executive Summary	Page 1
2.0	Approach/ Project Activities	Page 2
3.0	Project Location	Page 5
4.0	Data Management Practices	Page 5
5.0	Evaluation Criteria	Page 6
6.0	Project Budget	
	Funding Plan and Commitments	Page 17
	Budget Proposal	Page 18
	Budget Narrative	Page 18
7.0	Environmental and Cultural Compliance	Page 20
8.0	Required Permits or Approvals	Page 20
9.0	Letters of Funding Commitment Support	Page 20
10.0	Official Resolution R-2021-119	Page 20
11.0	Unique Entity Identifier and System for Award management	Page 20

TECHNICAL PROPOSAL

1.0 EXECUTIVE SUMMARY

Date: April 21, 2021

Applicant Name: Norman Utilities Authority (NUA)

City: Norman

County: Cleveland

State: Oklahoma

Category: Category A; the municipal water and sewer authority for the greater Norman area

Project Start Date: January 2022

Project Completion Date: December 2023

On Federal Facility: No

Project Summary:

The Norman Utilities Authority (NUA), working with Garver (engineer), STREAMETRIC (software and data science partner), and the National Water Research Institute (NWRI), will develop a Predictive Lake Level Optimization Tool (PLOT) for the Lake Thunderbird watershed in Central OK. This new water-balance tool will play a critical role in managing the planned lake augmentation system, with respect to the timing and duration of pumping for lake augmentation. The proposed work will seek to establish proof-of-concept for a model that, in subsequent (future) work, can link to real-time data collection, make forecasts of the lake's water-balance, and the augmentation needed. The PLOT forecasts will consider both near-term precipitation projections and statistical climatological trends to identify the preferred augmentation flows to optimize lake yield, conjunctive use of groundwater, drought risk mitigation, and augmentation volumes. The resulting smart trimming, or enhancement of the long-term augmentation pumping schedule, is expected to significantly improve the economics of the lake augmentation project.

The augmentation flows from the City of Norman's Water Reclamation Facility (WRF) will be needed to maintain optimum water levels in the reservoir. The NUA is currently testing treatment technologies to meet the State of Oklahoma's stringent water quality requirements for the discharge of reclaimed water to a surface water reservoir. Once completed, this pilot program (with support from the Title XVI Water Reuse Research Program) will inform the final design of treatment and conveyance infrastructure for the City's planned indirect potable reuse (IPR) system at Lake Thunderbird. The requested \$154,781 (50% of the total project budget of \$309,563) will support work to begin in January 2022 and finish by December 2023. As a component of the historical data collection phase, technical review of the model, and progress update meetings, the NUA team will coordinate with the USBR's regional office in Austin, and the field office in Oklahoma City, which has developed previous firm-yield models of the lake.

2.0 Technical Approach/Project Activities

The NUA, and its partners, seeks to develop a forecasting tool for managed reservoir augmentation in the Lake Thunderbird watershed. The underlying flow-balance model which is critical to the forecasting tool requires updates and testing to confirm its utility as the basis for lake-level forecasts. Therefore, the NUA requests Federal funding under this FOA to accomplish:

1. Collect and compile historical data for Lake Thunderbird and the greater watershed;
2. Develop a cloud-based (hosted on Amazon Web Services, AWS) prototype model for Lake Thunderbird water levels that is calibrated to the historical data set; and
3. Test the hypothesis that a calibrated, cloud-supported lake-yield model would provide accurate forecasts of lake water-balance and actionable, risk-based statistical information such that the NUA could reduce the cost of IPR operations (pumping and treatment).

The proposed work plan is designed to answer four critical questions for the NUA's lake augmentation project:

1. What is the relationship between target lake level/operational strategy (and potential seasonal variation in lake level) and risk mitigation for a given pumped flow rate (e.g., the original planning for the augmentation project was to build a pump station with 5 to 15 MGD of capacity)?
2. Is there a benefit to adding water storage (i.e., expanded pump station wet well volume) and oversizing pumping/conveyance facilities to optimize the daily pumping schedule (e.g., a trade-off between capital and operating expenses (CAPEX/OPEX))?
3. What is the optimal peak augmentation flow capacity? A lower peak augmentation flow will reduce CAPEX, but increase OPEX due to having a higher lake level target for the same level of risk mitigation.
4. Can a phased approach to augmentation flow capacity be utilized to defer a portion of the capital costs without significantly impacting the project's potential to mitigate risks during potential drought conditions? Specifically, how does the timing of triggers to increase augmentation from 5 MGD to 10 MGD to 15 MGD compare to the anticipated planning and construction durations for capacity expansion?

2.1 Phase 1

In Phase 1, the NUA and its partners will compile a contiguous, historical data set describing water into and out of the lake of a duration equal to or exceeding 5 years (as defined to also include a period of extended drought). STREAMETRIC will develop data pipelines to collect the historical data from NUA, clean, process, and store it in STREAMETRIC's cloud infrastructure. Key parameters to be collected and compiled include (see Table 1):

Table 1 Parameters to be included in the historical data sets for Lake Thunderbird

Parameter	Min. required duration/ granularity	Possible sources	1 st -Level Coordination
Lake inflows (rivers, creeks, WWTPs, other)	Last 5 years / daily	USACE, USGS, USBR, COMCD	Oklahoma-Texas Area Office of the USBR, Austin, TX
Lake water level	Last 5 years / daily	USACE, USGS, USBR, COMCD	
Lake outflows (city water, industry, dam overflow, other)	Last 5 years / daily	USACE, NUA, COMCD, USBR, City of Del City, City of Midwest City	
Temperature (water)	Last 5 years / daily	USACE, USGS, USBR, COMCD, NUA	
Precipitation (in.)	Last 5 years / daily	3 rd party services, USACE	
Temperature (air)	Last 5 years / daily	3 rd party services, USACE	
Lake evaporation rate	Last 5 years / daily	USACE, USGS, USBR, COMCD	

2.2 Phase 2

During Phase 2, the team will develop accurate forecast model(s) to determine the water level of Lake Thunderbird for specific forecasted time periods. This work will be completed using historical data compiled in Phase 1. The underlying mass balance computations are fairly straightforward given accurate accounting of all the inputs and outputs to the lake. However, it will be essential to the success of the forecast model to develop accurate near-term projections of inputs and outputs based on available forecast parameters and to develop long-term statistical projections to inform augmentation operations. At the anticipated maximum capacity, the monthly augmentation flow is approximately 1,400 acre-feet/month, which is significantly less than peak inflows due to precipitation in the watershed (for reference, the inflows exceeded 18,000 acre-feet in March 2020). As such, the lake level will not be significantly influenced by augmentation flows in the short-term. Augmentation flows will be essential for maintaining lake levels during drought periods, as continuous augmentation over an extended period provides significant volume (for reference, at 15 MGD continuous operation for approximately 6.3 years, the volume of the augmentation flows would equal the conservation pool volume of approximately 106,000 acre-feet).

STREAMETRIC will perform statistical analysis on the historical data to understand the relationships between mass-balance model inputs (e.g., inflows, usage, releases, evaporation, precipitation, etc.) with (1) the combination of previous historical information (e.g., water usage, temperature, precipitation, evaporation, etc.) and (e forecasted variables (e.g., time of year, precipitation, temperature, sun/cloudiness, wind).

For example, municipal water demand will generally vary with time of year, but additional variation will occur based on recent past and forecast temperature and precipitation, which impact water use for outdoor irrigation purposes. Additionally, statistical analysis will identify relationships between time of year and mass-balance model inputs that will be essential for the Monte-Carlo risk evaluations to provide statistical metrics of potential risk-reduction resulting from lake augmentation. These risk evaluations will be able to utilize both long-term historical data sets and potential climatological changes due to natural and/or anthropogenic effects. The results of these statistical analyses will support STREAMETRIC’s efforts to build a forecast model(s) to predict the lake’s water level and inform augmentation decisions. The model(s) will be trained on historic inflow, outflow, overflow, temperature, evaporation, precipitation, and lake water level. The model(s) will be evaluated to determine the model(s) accuracy using test dataset withheld using the training process. STREAMETRIC will upload, host, and support the model(s) on STREAMETRIC servers that will be accessible to NUA’s project team. The model(s) will help the project team and NUA understand the short- and long-term lake water levels to improve decision making.

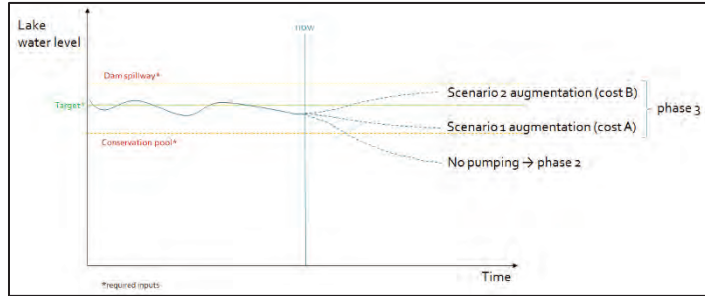


Figure 1 Lake water level forecast concept

2.3 Phase 3

In Phase 3, the cloud-based model will be used to complete simulations of the long-term period of record and synthetic forcing data sets. The model evaluations will be utilized to evaluate potential phasing alternatives for augmentation capacity, as well as operating costs, yield increases, and risk mitigation associated with different operational strategies for the IPR facility. The process will simulate the operation of the IPR facilities as if they had received a 7-day forecast at the beginning of each week for the water-balance of Lake Thunderbird.

The simulated IPR operations data will be utilized to update previously developed life-cycle cost models for the NUA’s IPR program. Garver developed for the Engineering Report an expected annual operations budget for the dedicated water purification facilities to produce the IPR flow, and the annual operations cost for conveyance of the IPR flow to the lake. These costs, as most life-cycle cost analysis will do, only considered the scenario where IPR discharge flows were constant for a given 24-hr period, over 365 operating days. The data collected in Phase 3 will provide a unique look at the potential cost impacts of a *smart* IPR augmentation program that utilizes machine-learning with large historical and real-time data sets. The NUA team will prepare a comparison of the original life-cycle costs projected for the IPR program to the IPR program costs determined from the Phase 3 modeling evaluations.

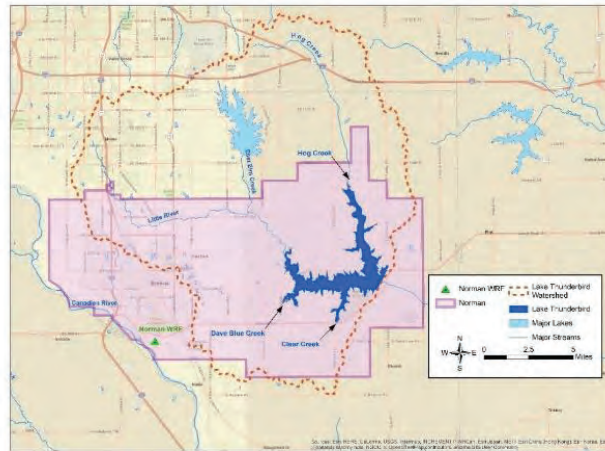
2.4 Developing a Roadmap to Full-Scale Application

The NUA team will work with the NWRI, and its director Kevin Hardy, to form a panel of experts to review findings from Phases 1-3. The goal of the panel review will be to develop recommendations for pilot-testing of a cloud-hosted system to run the developed model

autonomously for augmentation. The panel will publish its recommendations for data inputs to the STREAMETRIC’s pilot system and expected performance metrics in a documented report to be published by the NWRI, then disseminated to its member water authorities and water professionals. The documented report will also provide guidance on potential applications for the system, including traditional out-of-basin water transfers, conjunctive use of surface and groundwater supplies, IPR augmentation of surface water supplies, use of DPR to offset surface water withdrawals, etc. The pilot (future) program is likely coincide with the construction project for the augmentation pump station at the Norman WRF.

3.0 Project Location

Lake Thunderbird is in Cleveland County, OK, on the east side of Norman and south of Tinker Air Force Base. It was constructed in 1965 based on water needs in Central Oklahoma identified by the U.S. Bureau of Reclamation (USBR). The Central Oklahoma Master Conservancy District (COMCD) was established by the three municipalities funding the project (Norman, Midwest City, and Del City) to oversee the reservoir and maintain infrastructure for conveying the permitted allocation of 21,600 acre-feet per year (AFY), or an average of 19.28 million gallons per day (MGD). Figure 2 presents a map of the Lake Thunderbird Watershed and the proximity of the Norman WRF to the lake. Note that the future augmentation discharge to Dave Blue Creek will represent a transfer of water from the Canadian River watershed to the Little River watershed. The Lake Thunderbird watershed is not currently impacted by any point-source discharges of municipal effluent, or other forms of inter-basin water transfer.



4.0 Data Management Practices

The collected historical data will be ingested and transformed to a csv/json format and saved in an Amazon Web Services (AWS) s3 bucket. Version control will be enabled to preserve the integrity of the original data. All associated metadata will be logged using AWS cloud watch. All transformation performed during the Extraction Transformation Load (ETL) will be documented in code and committed to a bitbucket repository. It is not anticipated that any geo-spatial data will be utilized for the proposed work.

STREAMETRICs cloud architecture contains multiple layers of security mechanisms. Its data base and communication are encrypted. The access to the databases as well as the user interface is password protected and access is strictly controlled.

5.0 Evaluation Criteria

5.1 Evaluation Criterion A – Benefits to Water Supply Reliability

5.1.1 Water Management Issues

Currently, all available water-rights are allocated. The three (3) municipalities with daily withdrawals for water supply, the effective management of Lake Thunderbird for all its designated uses is a critical need for the region. Cyclical drought in Central OK has made meeting the full beneficial-use needs (without forms of water conservation) practically impossible on two (2) occasions in the last 20 years. The drought of 2006 set record low water levels for the lake, and prompted Federal (HR 3263, 2011) legislation to allow the importation of water from Lake Atoka in SE OK. However, when the majority of the state is under severe- to extreme-drought, as was seen again in periods of 2012, the benefits of a surface water importation pipeline can be limited. For this reason, the COMCD applied for Title XVI funding and completed a feasibility study for alternative means of lake augmentation. The 2012 Feasibility Study identified municipal wastewater as a reliable, cost-effective means of augmentation of Lake Thunderbird, even during prolonged periods of drought. Following the 2012 Feasibility Study, the COMCD contracted with Garver to identify the facilities needed, and potential costs of augmenting the lake with treated effluent from the City of Norman. The resulting Engineering Report developed a phased construction approach that would initially bring 5 MGD of lake augmentation capacity online, with the ability to expand to as much as 15 MGD of augmentation flow in the future. This planning project coincided with the City of Norman’s updated water supply plan which noted a future water supply gap for the City of up to 15 MGD (by 2060). As seen in Figure 3, the City’s future water supply plan will see the need for significant Lake Thunderbird augmentation – in addition to improvements to its conjunctive use of groundwater aquifers. Through augmentation, the City hopes that the lake will remain a vital contributor to its future growth and economic development.

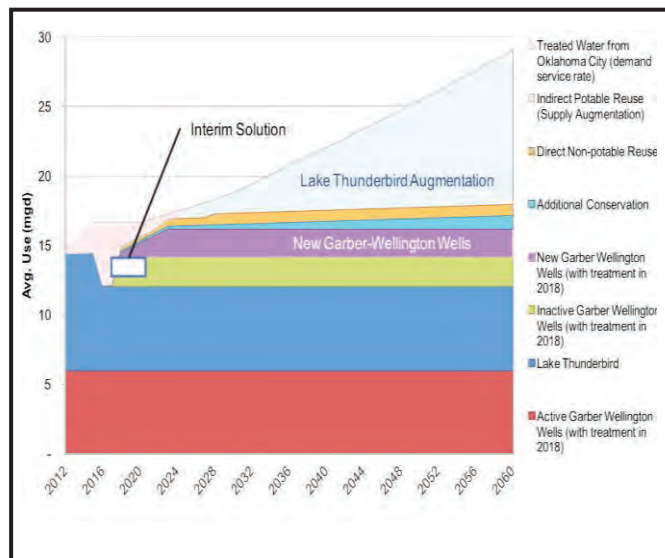


Figure 2 NUA’s Phased Water Supply Plan

The extensive periods of drought Central Oklahoma has experienced in recent years and loss of wells to high metal concentrations (e.g., arsenic above the MCL) have created an unmistakable imbalance in Norman’s water supplies. In 2016, the COMCD reduced the allocation from Lake Thunderbird to the City of Norman by 27.8% to 6,832.9 AFY (6.1 MGD). Consequently, the City of Norman has increased its reliance on groundwater wells and purchased finished water, which comes at a premium cost. NUA also utilized agreements with Midwest City and Del City to purchase portions of their unused allocations to meet daily demands. On an annual basis, the NUA has withdrawn as much as 20% more than its existing Lake Thunderbird allocation through its agreements with other COMCD

member cities. These agreements are considered unsustainable and cannot be guaranteed, particularly without a reliable means to maintain lake levels irrespective of climate and political impacts. With an expanding population, increasing pressure will be placed on the City of Norman to conserve its existing water supplies, expand its water reclamation program, and explore new, alternative water supplies.

5.1.2 Addressing Water Management Challenges

The NUA Team will address the identified water management challenges with a project that is also aligned with the core objectives of the WaterSMART Applied Science grant under the Basin Studies program – as described in Table 2.

Table 2 Alignment with Program Objectives

WaterSMART Objective	NUA’s Project Objective
Water Supply Reliability	The proposed project will further the regional goal of a sustainable, shared water reservoir by constructing a cloud-based tool to allow for transparent, <i>smart</i> augmentation flow pumping to Lake Thunderbird. The NUA team will convene a panel of technical experts to review the proposed project’s findings and make recommendations on improvements to the lake forecasting tool and Monte-Carlo statistical risk evaluations that benefits all users and the greater region.
Management of Water Deliveries	The proposed water-balance model will be beneficial not only to the City of Norman and its customers, but the COMCD which manages water deliveries from the lake. A cloud-based water-level forecasting tool for the lake would provide access to vital information on water availability and forecasts of water demands that will be critical for COMCD in meeting all of its customers’ and cities’ needs.
Drought Management Activities	Effective management of a reservoir’s conservation pool is critical to the survival of any surface water body during periods of prolonged drought. The proposed forecasting tool for lake water-level will be designed to play an important role during these periods. For example, the weekly forecasts that the cloud-based model will develop for Lake Thunderbird will account for recent precipitation, stream in-flows, and projected evaporation rates to assist in developing its recommendation for pumped flows of augmentation water. Based on the success of early iterations of the model, future versions could also include water quality metrics that could inform the quantity of augmentation flow from the NUA’s facilities.
Conjunctive Use of Ground and Surface Water	In-line with its assistance with drought management, the proposed water-level forecasting tool will also be tested for its ability to assist in the conservation of the City of Norman’s groundwater supplies. Along with drought-resilience, augmentation flows from

	<p>the NUA IPR facility can be used to increase lake yield and reduce necessary groundwater use by NUA, thereby preserving groundwater volumes for use during drier periods in the region. A 2014 report released by the Oklahoma Water Resources Board (OWRB) and the US Geological Survey (USGS) identified that the expected population growth in the Norman region of 20% from 2020 to 2030 is a significant threat to the sustainability of the Garber-Wellington aquifer that supports the region. The City will require continued use of existing wells, improvements to out-of-service wells, and construction of new wells to meet its 2060 water supply needs. Groundwater level simulations conducted by OWRB and USGS in 2014 indicated, however, that a 2060 withdrawal rate of 2 acre-ft/acre/year by the City would not be feasible – if all other groundwater users are withdrawing their annual allocations. Therefore, the <i>smart</i> augmentation of Lake Thunderbird will be all the more imperative to secure Norman’s water-future.</p>
<p>Ability to Meet Endangered Species Requirements</p>	<p>With increased, consistent flow to Dave Blue Creek from the future lake augmentation project, it is expected that new aquatic habitats will form in the reuse-supported stream. This, in turn, may help boost the population of threatened aquatic organisms that once thrived in the watersheds of Central Oklahoma. One such species is the Arkansas River Shiner, a species of minnow that was once widely found in the river watersheds of the Arkansas, Cimarron, and Canadian River basins (Oklahoma Department of Wildlife Conservation, 2019). Federally listed as an endangered species in 1998, at the time of this classification the largest populations of the minnow were actually found in the panhandle of Texas (Canadian River Municipal Water Authority, 2005), with the fish considered expatriated from the majority of their habitats in Oklahoma. The increased flow to Dave Blue Creek could mitigate several of the issues that U.S. Fish and Wildlife believe contributed to the decline of the Arkansas River Shiner in Oklahoma: seasonal drought, riparian loss, and river channelization. Similarly, the Blackside Darter fish was once widely found in the creeks and tributaries of the Little River basin, including Lake Thunderbird (Oklahoma Department of Wildlife Conservation, 2019). Now listed by the State of Oklahoma as a threatened species, it is also possible that the increased flow in Dave Blue Creek will offer an opportunity for the fish to increase their population in the Little River Basin, particularly with the added stream-bank stabilization effects expected from sustained streamflow.</p>
<p>Other Improvements to Water Supply Reliability</p>	<p>The success of the City of Norman’s lake augmentation project rests on both the smart discharge of flow (time and duration) to</p>

	<p>provide a buffer for the conservation pool, but also the economics of producing the augmentation flow. Based on the preliminary design of treatment and pumping facilities for production and conveyance of flow from the Norman WRF, the initial expectation of annual operations costs, at full project maturity was >\$1.5M (per year). A stated goal of the proposed lake water-level forecasting tool is to significantly reduce the cost of augmentation operations each year, while maintaining a robust and resilient supply in Lake Thunderbird. Further discussion of this important project objective can be found in 5.1.3</p>
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5.1.3 Extent of Major Project Benefits

Ultimately the balance that must be struck with the City of Norman and the NUA’s planned lake augmentation project is between the need for expanded water allocations and the cost of producing and conveying the augmentation flow. The proposed project offers the significant potential to identify savings for the project with respect to both capital construction and annual operations. The initial preliminary design for the treatment and infrastructure improvements focused on a phasing plan that would see an initial 5 MGD of treatment and pumping capacity constructed, followed by an expansion to as much as 15 MGD. However, the results of the proposed project could see the reduction of the initial treatment and pumping capacities, and/or the development of a new phased construction plan for the new facilities at the Norman WRF based on statistical risk models and anticipated constructions durations. The proposed model forecasting and operational strategy evaluation exercise will be designed to also identify potential savings on the size and capacities (in MGD) of the required augmentation infrastructure improvements. In addition, a significant benchmark to be examined in Phase 3 of the proposed project will be the unit cost and total annual operating costs of the augmentation project identified in the preliminary design of facilities. Garver (a member of the NUA team) previously determined that at full build-out, with a maximum augmentation capacity of 15 MGD from the Norman WRF, the City could spend as much as \$2.75/1000-gal of augmentation flow to the lake. It will be a critical success factor of the Phase 3 work to prove that the augmentation flows from the NUA IPR facility could be optimized through lake-level forecasting, resulting in a much lower cost of annual augmentation that still adds the needed resiliency to the Lake Thunderbird water supply. This, in turn, would benefit other designated uses of the lake including local fishing and tourism industries.

5.1.4 Value Added to Other Regional Projects

At the end of 2019, the City of Norman/NUA was notified of award for Title XVI grant assistance with a 2-year pilot study to test treatment technologies for the future lake augmentation project. In conjunction with the ongoing pilot study (testing scheduled to be completed in mid-year 2022), the requested additional support from the Bureau of Reclamation (under this FOA) will further increase the odds of success for the eventual reliable augmentation of Lake Thunderbird. The success of Lake Thunderbird augmentation has implications for similar projects in the State of OK and beyond. The preliminary engineering study, ongoing pilot study, and lake modeling efforts have all received, or will receive, significant scrutiny as the first of their kind under the 2018 Oklahoma Administrative Code updates for Sensitive Water Supply (SWS) augmentation projects.

The success of the City of Norman’s augmentation efforts will bode well for other, similar projects on the horizon, including projects utilizing reuse supplies, surface water transfers, and groundwater use.

5.2 Evaluation Criterion B – Need for Project and Applicability of Project Results

5.2.1 Project Need

The Norman Utilities Authority is seeking this funding support as the primary beneficiary of the proposed project. However, it is expected that benefits and products of the project will be shared with the COMCD – which manages the lake and its water supplies. The need for this project was first identified during the conceptual design of augmentation facilities, by Garver, NUA, and the COMCD, in 2015. However, the capabilities to build a water-level forecasting tool – with the potential for real-time data collection connectivity – were not readily available at the time. The proposed partnership with STREAMETRIC will give the City access to state-of-the-art exploratory data analysis and forecasting tools, with the potential for future expansion of model capabilities and function.

5.2.2 Benefits Now and in Future

The results of Phases 1-3 of the proposed work will generate key data that will inform the ultimate design and operation of the augmentation facilities at the Norman WRF. Proposed work under this FOA, following Phase 3, will collect a panel of technical experts in the field (with guidance from the NWRI) to evaluate the path-forward for real-time forecasting and model implementation. It is anticipated that this effort will assist the City in developing a system architecture that is a) feasible and cost-effective, b) provides long-term value to the NUA and the COMCD, and c) builds trust in COMCD’s other member cities in the future management of the augmentation program (by the NUA).

5.2.3 Potential Applications

While not all water management solutions are transferrable, there is the clear potential for the proposed work to provide a road-map for similar projects in the region and the West. It is expected that the dissemination of results from this project, via NWRI’s expert panel, industry conferences presentations, and webinars (for example), will spur other communities with similar water supply resiliency needs to explore a similar approach to reservoir augmentation – and augmentation flow management - from their WRFs or other fresh water sources and/or optimization of existing water supply sources.

5.3 Evaluation Criterion C – Project Implementation

An initial concept has been created by the core project team in order to define the scope of work and determine the required staff qualifications, experience, and credentials. In this concept, the technical challenge is to determine the most resource-efficient way to achieve a sustainable water level for lake Thunderbird. Additionally, the approach has been designed in such a way that it is translatable to solvable data science problems. Thus, every effort will be made during the 2-year project duration to develop a lake-level forecasting solution that has potential application for other USBR-managed reservoirs.

5.3.1 Approach

The Project Team (individual personnel are introduced in 5.3.4) will initially build on efforts previously made by the USBR's Area Office (Austin, TX) and USBR's Oklahoma City Field Office to develop a firm-yield model for Lake Thunderbird. The last significant modeling effort was completed by the Austin office in 2007 (see Figure 4 for an example). Phase 1 will begin with a concerted coordination effort with the USBR Area Office in Austin, led by Collins Balcombe, to build on existing historical data sets for Lake Thunderbird and recent efforts by Collins and Anna Hoag (also at USBR in Austin Area office) to re-evaluate the firm yield of Lake Thunderbird.

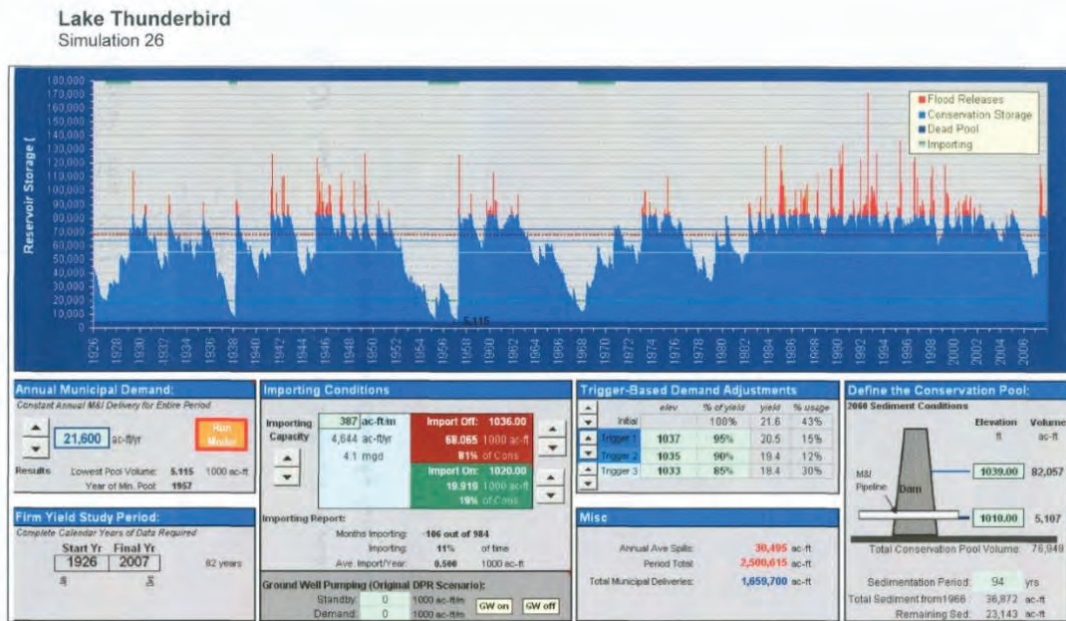


Figure 3 Example simulation run from the 2007 Lake Thunderbird firm-yield model

Phase 1 will yield the creation of two (2) cloud-accessible data sets for the NUA team to utilize for subsequent model calibration and validation efforts, and proof-of-concept testing all within the STREAMETRIC cloud-based application. The first data set will be for a 5+ year period (as defined to include natural cycles of 'wet' and 'dry' periods), and will be utilized for the model calibration effort. The second data set will be for a recent 12-month period in the lake (also selected for observed wet/average/dry cycles). This data will be tested for the 7- to 14-day model-forecasting capabilities for simulated lake augmentation (pumping duration and flow) directives, in response to previous trends in lake inflows and outflows. The Phase 3 model evaluates potential operational strategies to optimize capital phasing, operational costs, and drought-resilience. The model(s) developed in Phase 2 and 3, will prove useful in defining how the lake will respond to different 'forcing' conditions, such as future conditions accounting for changes to temperature and/or precipitation as a result of climate impacts. A conceptual model of the approach for Phase 3 is presented in Figure 5. A schedule for completion of Phase 1 -3 is presented Figure 6.

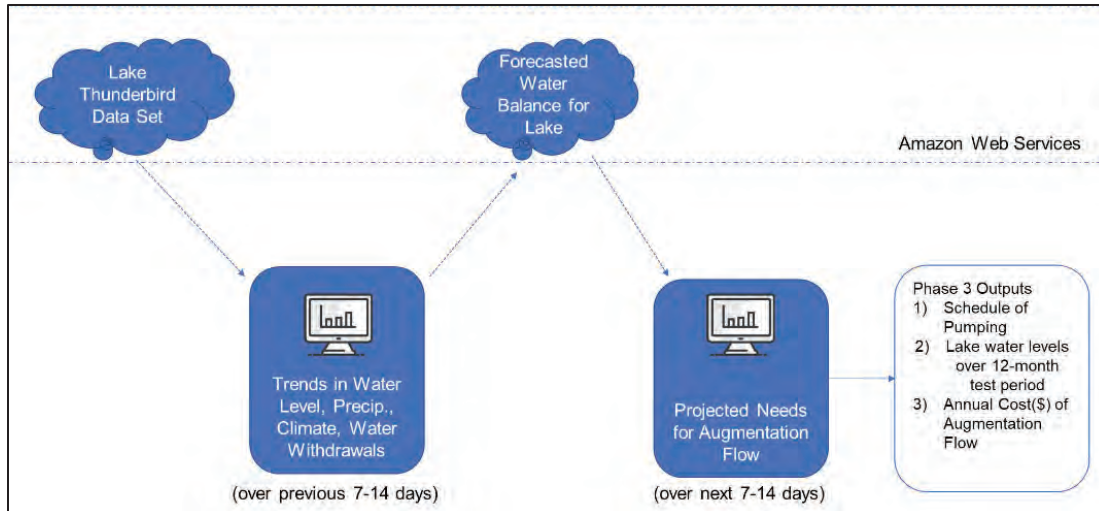


Figure 4 Concept for testing the validity of the cloud-based lake model for forecasting augmentation flows, augmentation costs, and sensitivity of lake to augmentation with 1-2 week granularity

5.3.2 Work Plan/Schedule

The proposed work begins with a data collection effort in January of 2022. Final reporting to the BOR will be completed by December of 2023. As shown in Table 3, all three (3) Phases, plus reporting requirements and expert panel reviews, can be completed in this 24-month window. With a diverse team working under the NUA, the NUA will hold bi-monthly meetings using Microsoft Teams to review project status, action items, and schedule with each team member. In addition, a full project team workshop will be scheduled to review findings after each phase (1-3) is complete. Due to the current uncertainty regarding COVID and pandemic-related restrictions, these workshops are also planned to be hosted via Teams. BOR Project Managers will have a standing invite to both bi-monthly and Phase-related workshops.

PHASE/Milestone(s)	2022												2023											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Q1			Q2			Q3			Q4			Q5			Q6			Q7			Q8		
PHASE 1																								
Data Collection	█	█	█	█																				
Data Formatting and Cloud Storage		█	█	█	█																			
Phase 1 Review Workshop (Virtual)						█																		
PHASE 2																								
Model Development						█	█	█	█	█	█	█	█	█										
Model Testing and Validation											█	█	█	█	█									
Phase 2 Review Workshop (Virtual)																█								
PHASE 3																								
Applying Model to Forecast Augmentation																	█	█	█	█	█			
Cost Model Updates for Forecasted Operation																		█	█	█	█	█		
REPORTING																								
Final Report to Applied Science																						█	█	█
NWRI Expert Panel Review																						█	█	
PROGRESS UPDATE MEETINGS (VIRTUAL)																								
Progress Update Meetings (Virtual)	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█

Figure 6 Anticipated Project Schedule

5.3.3 Products

Multiple products are expected from the proposed work, in digital, metadata, report, and publication formats. Table 4 lists each specific product anticipated.

Table 3 Anticipated Work Products

	Product	Format
1	Forecast Tool for Water Level in Lake (under current hydrodynamic conditions)	Cloud-Based (Digital)
2	Forecast Tool for Water Level in Lake (with new augmentation flow input to the Lake)	Cloud-Based (Digital)
3	Centralized, Multi-Parameter Lake Level Historical Data Set	Cloud-Based (Metadata)
4	Final Project Report to USBR Applied Science	Report
5	NWRI Panel Report and Publications	Publications

5.3.4 Project Team

The defined data science problem results in the need for expertise in data science and exploratory data analysis, preparation, and cleaning of data from different sources, as well as building, tuning, and deploying machine learning models. Project management will be key to ensure agreed timelines and milestones will be met and to manage the communication and interfaces with the other project participants.

5.3.4.1 Norman Utility Authority

The City of Norman will utilize a project manager from the NUA’s utilities division, Kenneth Giannone. As overall PM for this project, Mr. Giannone brings his 30 years of experience as the point of contact and will be responsible for day-to-day project team management.

Project Manager: Kenneth Giannone

Education/Experience:

- B.S. Civil & Environmental Engineering from Rutgers University; MBA from Rowan University
- 1997 to 2004 and 2006 to 2013: Senior Construction Engineer with American Water, Voorhees, NJ
- 2013 to 2020 Project Manager for Metro Area Projects (MAPS) Office and Civil Engineer III in the Utilities Department for the City of Oklahoma City, OK
- 2020 to present: Capital Projects Engineer for the Norman Utilities Authority



Skills:

- Delivery of large construction and engineering projects
- Potable Water Engineering and Operations
- Traditional and Alternative Delivery Methods

Supporting Mr. Giannone will be engineers from the NUA's engineering division, including utilities engineer, Nathan Madenwald and NUA's stormwater division leader Carrie Evenson, PhD. Dr. Evenson's team is currently collecting data on non-point flows into the Lake Thunderbird watershed which will be useful for the proposed work plan. Assisting Dr. Evenson from NUA Stormwater will be Michelle Loudenback.

5.3.4.2 Garver

Garver's Project Manager is Michael Watts, PhD. Dr. Watts will report to Mr. Giannone and coordinate with the other project investigators. Dr. Watts is a Water Technology Leader and a Senior Process Engineer with Garver since 2013.

Project Manager: Michael Watts

Education/Experience:

- Doctor of Philosophy in Civil & Environmental Engineering from Duke University
- B.S. and M.S. in Civil & Environmental Engineering from the University of South Carolina
- 2013 to 2015: Senior Process Engineer in Garver's Water Design Center.
- 2015 to present: Water Technology Leader on Garver's Water Technology Team focused on water supply, water treatment, and water reuse planning



Skills:

- Treatment optimization
- System modeling
- Capital and life-cycle cost analysis for water treatment infrastructure
- Water reuse program development

Working with Dr. Watts will be Evan Tromble, PhD in Garver's Denver office. Dr. Tromble is also a Water Technology Leader with Garver, and manages Garver's Water Infrastructure, Modeling and Analysis team.

Project Engineer: Evan Tromble

Education/Experience:

- Doctor of Philosophy in Civil Engineering – Water Resources from the University of Oklahoma
- B.S. in Civil Engineering from the Colorado School of Mines
- 2011 to 2015: Project Engineer on Garver's Oklahoma Water Team focused on water master planning and hydraulic modeling
- 2015 to 2017: Water Technology Leader on Garver's Water Technology team focused on water supply and water infrastructure planning
- 2017 to present: Garver's team lead for planning and modeling for water supply and water infrastructure projects



Skills:

- Water resources planning
- Hydraulic modeling
- Capital and life-cycle cost estimation for conveyance projects

5.3.4.3 STREAMETRIC

Project Manager: Alexander Ubl

Education/Experience:

- Master of Engineering in the field of mechanical engineering and business administration at the University of Applied Sciences Bingen, Germany
- 5+ years of professional experience in technical and business roles
- Since 2018: Co-Founder and leader of the STREAMETRIC providing AI technologies for the water and wastewater industry. Membrane manufacturing process optimization experience



Skills:

- Agile project management
- Product management for membrane products and AI-based software products
- Software UI/UX design and conception
- Team management

Data Science Project Lead: Fru Azeh

Education/Experience:

- Bachelor of Science, Biochemistry & Computational statistics, University of South Carolina
- 4+ years of professional experience as a data scientist
- 3 years of experience as a data scientist in process optimization of battery membrane manufacturing
- 1 year experience as the leading data scientist at STREAMETRIC
- Membrane performance forecast model, membrane biological reactor cleaning recommendation model development, operating costs optimization model for water treatment systems, automation of data reporting



Skills:

- Exploratory Data Analysis, Data preparation, cleaning wrangling, Data visualization, Machine Learning, deep learning, data mining, web scrapping
- Linear Regression, Regularized regression, MLR, Logistic Regression, Decision Trees, Random Forest, Support Vector Machines, Gradient Boosting, K-Nearest Neighbors, K[1]Means Clustering, Hierarchical Clustering, PCA, Deep Neural Networks, Convolutional Neural Networks NLP, Topic Modeling, Sentiment Analysis, Text Classification, tf-IDF, Information Extraction

5.3.4.4 National Water Research Institute

NWRI was established in 1991 to address water supply and quality issues facing our nation through cooperative research. In conjunction with our JPA members, NWRI promotes the protection, maintenance, and restoration of drinking water supplies as well as freshwater and marine environments. For specific information about other NWRI Independent Expert Advisory Panels, our research, or educational and outreach initiatives, visit www.nwri-usa.org.

NWRI Panels have advised public utilities, state and regional regulators, researchers, industry associations, and private enterprises for more than a quarter century. The Panels provide value by providing credible and independent subject matter experts who work collaboratively with clients and stakeholders to craft specific recommendations that address each program's most complex and relevant scientific, technical, and policy issues. Some of the world's most advanced water programs use our Panels to provide both early and long-term operational guidance.

Kevin M. Hardy, Executive Director. Since April 2017, Mr. Hardy has worked with academics, utility executives, peers, and policymakers to continue developing regulations for potable reuse. He builds upon relationships with public and private agencies and facilitates NWRI's well-established expert Panel program to guide innovation in water resources practice and policy. Hardy holds bachelor's and master's degrees in from San Diego State University and a Juris Doctorate from the University of San Diego School of Law. He also is an alumnus of the Water Leadership Center at the University of North Carolina at Chapel Hill.



5.3.4.5 US Bureau of Reclamation

As previously discussed, the past work of the USBR's Austin Area Office, and the Regional Field Office in Oklahoma City, will play a vital role in kick-starting the data collection and model-building Phases. As such, the NUA has already reached out to staff at each office, including Collins Balcombe, Anna Hoag, and Nathan Kuhnert to discuss the availability and format of lake data, and the most recent updates to the firm-yield and conservation models for Lake Thunderbird.

5.4 Evaluation Criterion D - Dissemination of Results

In addition to participation in a Bureau of Reclamation-sponsored webinar to describe the project, results, and products – the NUA's project team will participate in a variety of dissemination and outreach efforts.

5.4.1 Garver's Award-Winning Webinar Series

Early in 2020, in response to the pandemic, Garver's Marketing and Communications teams developed a webinar series to provide education and outreach on diverse topics, from water treatment to water supply and resiliency. The response to the high-quality webinar series each month was an exponential growth in webinar attendance, and recognition from within the water industry. In 2021, Garver's *Wednesday Webinar Series* won the prestigious Watermark Award from the Water Environment Association of Texas, and the Texas-section of AWWA. The NUA will work with Garver to produce a webinar in this series (which will be a continued service from

the Garver organization to the water industry) that can be used to describe the project and how its developed tools can be implemented for other water reservoir augmentation projects.

5.4.2 Expert and Community Panels

The National Water Research Institute (NWRI) will assist with the project by leading a technical overview committee. The NWRI’s expert panel will meet to review the project, and evaluate the results against the objectives. Additional attention will be given to identifying practical approaches to forecasting model implementation with a recommendation for the path-forward to implement the cloud-based tool. The NWRI panel will convene for 1-2 meeting and produce a report for NWRI and its subscribers.

In addition, project updates will be shared with a citizens’ advisory council, representing each of the communities impacted by the future lake augmentation project. This advisory committee has already been developed for the NUA’s indirect potable reuse program and includes community leaders from all stakeholder communities (which rely on Lake Thunderbird for water supply). The first meeting of the advisory council occurred in August of 2020.

5.4.3 Peer-Reviewed Publication

Members of the NUA’s project team have, collectively, more than 15 peer reviewed publications in scientific journals. It is anticipated that at least one article can be submitted for publication in a peer-reviewed journal focused on the water industry, such as AWWA’s *Water Science*.

5.4.4 Conference Presentations

Staff at the NUA have successfully partnered with members of the project team to present at state and national conferences in recent years. It is anticipated that this project’s dissemination efforts will also include multiple presentations on the project, results, and developed tools at state, national, and regional conferences attended by water professionals.

6.0 Project Budget

6.1 Funding Plan and Letters of Funding Commitment

To complete the propose workplan a total of \$309,563 is needed. The non-Federal share of these funds will come from the applicant and three partners. Letters of commitment attached.

- Applicant: Norman Utilities Authority/City of Norman
- Garver, LLC
- STREAMETRIC
- National Water Research Institute

Table 4 Total Project Cost Table

FUNDING SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal Funding	\$154,781
Costs to be paid by the applicant	\$111,354
Value of third-party contributions	\$43,428
Total Project Cost	\$309,563

6.2 Budget Proposal

BUDGET ITEM DESCRIPTION	COMPUTATION		QUANTITY TYPE	TOTAL COST
	\$/UNIT	QUANTITY		
Salaries and Wages				
Kenneth Giannone	\$55	384	HR	\$21,010
Nathan Madenwald	\$58	96	HR	\$5,539
Michelle Loudenback	\$38	96	HR	\$3,634
Carrie Evenson	\$62	96	HR	\$5,991
Fringe Benefits				
Kenneth Giannone	(% of S&W)	24%	--	\$5,035
Nathan Madenwald	(% of S&W)	31%	--	\$1,692
Michelle Loudenback	(% of S&W)	40%	--	\$1,442
Carrie Evenson	(% of S&W)	23%	--	\$1,408
Travel				
N/A				
Equipment				
N/A				
Materials and Supplies				
N/A				
Contractual/Construction				
Garver	\$15,600	1	LS	\$15,600
Streametric	\$150,588	1	LS	\$150,588
National Water Research Institute	\$30,000	1	LS	\$30,000
Other				
N/A				
TOTAL DIRECT COSTS				\$241,941
Indirect Costs				
<i>De minimis rate</i>	10%	-	-	\$24,194
Third-Party Contributions (In-Kind)				
Garver	\$10,000	1	LS	\$10,000
Streametric	\$24,000	1	LS	\$24,000
National Water Research Institute	\$9,428	1	LS	\$9,428
TOTAL ESTIMATED PROJECT COSTS				\$309,563

6.3 Budget Narrative

6.3.1 Personnel - \$36,175 (Rounding)

Mr. Kenneth Giannone (Norman Utilities Authority) will serve as the Project Manager for all proposed project activities and oversight of the project team. In this capacity, Mr. Giannone is requesting a total of 384 hours over the 2 year period at his contractual hourly rate of \$55. All NUA staff are listed at pre-negotiated salary rates, with anticipated hours to be spent to complete the work plan. The additional three NUA team members responsible to assist with this project commit 96 hours each over the 2 year period as indicated on the Budget Proposal.

6.3.2 Fringe Benefits - \$9,578 (Rounding)

For NUA personnel, fringe benefits include compensation for vacation time, sick pay, holiday pay, employer payroll tax, medical, life & disability insurance, and retirement plan contributions. NUA calculates fringe benefits for its based a percentage of direct labor and benefit elections.

6.3.3 Travel – None

6.3.4 Equipment - None

6.3.5 Materials and Supplies - None

6.3.6 Contractual/Construction Over the 24 months - \$196,188

GARVER - A lump sum fee of \$15,600 for Garver (Dr. Michael Watts and Dr. Evan Tromble) to provide engineering cost analysis, project management and project meetings, and technical review services. All costs associated with Garver's participation are direct costs of labor, and non-labor expenses.

STREAMETRIC - A lump sum fee of \$150,588 for STREAMETRIC (Fru Azeh and Alexander Ubl) of direct and indirect labor costs for data science, software development and project management activities. STREAMETRIC plans to deliver data science and project management. Costs for cloud infrastructure, and external data sources (weather data APIs), are part of the requested budget. To ensure a targeted usage of labor resources STREAMETRIC will work in an iterative process: concept design, build minimalistic prototype, user feedback, repeat. This approach allows to consider feedback from the Advisory Committee in early stages as they work towards the final cloud-based software solution. Therefore, the risk is minimized that functionalities must be re-worked after they are already developed, which is a typical risk in software-related projects.

National Water Research Institute (NWRI) - A lump sum fee of \$30,000 for the NWRI for work associated with the research study, review, and recommendations. These funds will support direct cost of labor for NWRI staff for project management, panel report development, and communications & outreach activities. Their contribution will form an essential component of the project's data dissemination and public outreach efforts.

6.3.7 Indirect Costs – De minimis rate 10% - \$24,194

As no previously negotiated, Federally-approved indirect rate cost exists, the NUA will apply the de minimis indirect rate of 10% of total direct costs.

6.3.8 Third-Party Contributions (In-Kind) - \$43,428

Garver will provide a total in-kind contribution, as unbilled labor, of \$10,000 for the proposed project period. This in-kind contribution will be tracked as unbilled hours in Garver's time-tracking software utilized by both Dr. Michael Watts and Dr. Evan Tromble.

STREAMETRIC will provide its existing cloud-based data management platform and technologies to support the project. The development and expansion of the platform is usually monetized by licensing it to our customers as part of our software-as-a-service package. For this project, the license costs of \$24,000 is waived for using their platform for the duration of the project as their in-kind contribution.

NWRI will provide an in-kind cost contribution of \$9,428 as cost-share for the completion of their post-Phase 3 efforts. This in-kind donation will be in the form of shared costs for organizing and hosting the expert panel meetings.

7.0 Environmental and Cultural Compliance

Not applicable for the proposed work plan

8.0 Required Permits or Approvals

Not applicable for the proposed work plan

9.0 Letters of Support (attachments)

- NUA – Funding Commitment
- COMCD – Letter of Approval
- STREAMETRIC – Letter of Commitment – In-Kind
- Garver – Letter of Commitment – In-Kind
- NWRI – Letter of Commitment – In-Kind


10.0 Official Resolution - R-2021-119 (attachment)

A Draft Official Resolution is attached and is scheduled for the April 27, 2021. Executed Official Resolution will be submitted no later than April 30, 2021.

11.0 Unique Entity Identifier and System for Award management

Current Registration with SAM.gov

Your search for Norman Utilities Authority* returned the following results...

Entity	CITY OF NORMAN	Status: Active 
DUNS: 832238146	CAGE Code: 5RSS4	View Details
Has Active Exclusion?: No	DoDAAC:	
Expiration Date: 08/25/2021	Debt Subject to Offset?: No	
Purpose of Registration: Federal Assistance Awards Only		



The City of **NORMAN**

201 West Gray C • P.O. Box 370
Norman, Oklahoma 73069 • 73070

DIRECTOR OF UTILITIES
Phone: 405-366-5443
Fax: 405-366-5447

April 21, 2021

Ms. Avra Morgan
Bureau of Reclamation
Water Resources and Planning Division
PO Box 25007, MS 86-69200
Denver, CO 80225

Re: Lake Thunderbird Predictive Level Optimization Tool (PLOT)

Dear Ms. Morgan,

On behalf of the Norman Utilities Authority (NUA), I am pleased to submit this letter of funding commitment for the WaterSMART – Applied Science Grant for Fiscal Year 2021 funding application. Our project is the Lake Thunderbird Predictive Level Optimization Tool (PLOT) which will develop the foundation needed for a new water-balance tool which will play a critical role in managing the planned lake augmentation system. We expect to utilize this tool in the future to manage the timing and duration of pumping for lake augmentation. We believe this tool will prove useful not only to our organization but also to COMCD, the BOR and other lake managers in our region and beyond.

Our total project cost is \$309,563. We value our cost share, in cash contributions and in-kind services, to the project at \$154,782 (over the 2-year duration of the project). Upon successful award from the Bureau of Reclamation, NUA and our staff will work with our partners to ensure our project goals are achieved and all grant contract terms are met.

We look forward to the success of this project, the critical impact it will have in our community, and the possible future use of the tool by others. If there are any additional questions we can answer regarding our funding commitment, feel free to contact me directly.

Sincerely,

Chris Mattingly
Utilities Director



12500 ALAMEDA NORMAN, OKLAHOMA 73026
(405) 329-5228

April 20, 2021

Bureau of Reclamation
Water Resources and Planning Division
Attn: Avra Morgan
PO Box 25007, MS 86-69200
Denver, CO 80225

Application Review Committee Members:

The Central Oklahoma Master Conservancy District (COMCD) manages—through a contract with the Bureau of Reclamation—the operation and maintenance of water supply delivery from the Norman Project. Our core mission is to provide a reliable water supply to our three member municipalities of Norman, Midwest City and Del City. As such, lake level management during times of drought or for potential augmentation of supply is a critical component of helping to ensure that reliability.

We are aware that the City of Norman is making an application for funding under the Bureau of Reclamation's WaterSMART: Applied Science Grant to develop a lake water-level forecasting tool for future use. We also are aware that the City of Norman is currently conducting a pilot study to better understand the potential of indirect potable reuse discharge into Lake Thunderbird for supply augmentation. Further, it is our understanding that the lake water-level forecasting tool proposed here would be to help inform the timing, duration and volume of any IPR discharge.

COMCD has a vested interest in the outcomes of the proposed work as it will yield valuable information for us, as discussed above. Therefore, COMCD supports the City of Norman's application. We will coordinate with the project team on access to our available historical data, as needed, and participate in project update and review meetings. It should be noted, however, that our support of this project should not be construed as endorsement or approval of future IPR discharge to the lake. That ultimate decision will be made with input from our member cities, other stakeholders and approval by our District Board.

Sincerely,

Kyle Arthur
Manager
Central Oklahoma Master Conservancy District



1016 24th Avenue NW
Norman, OK 73069

TEL 405.329.2555
FAX 405.329.3555

www.GarverUSA.com

April 20, 2021

Ms. Avra Morgan
Bureau of Reclamation
Water Resources and Planning Division
PO Box 25007, MS 86-69200
Denver, CO 80225

Re: BOR WaterSMART – Applied Science Grant for Fiscal Year 2021
Project: Lake Thunderbird Predictive Level Optimization Tool (PLOT)

Dear Ms. Morgan,

Garver is pleased to partner with the Norman Utility Authority as they seek to develop the Predictive Level Optimization tool for Lake Thunderbird.

As a local partner, Garver fully supports the efforts of our neighboring utilities to see a successful water-balance tool to assist with managing the planned lake augmentation system for Lake Thunderbird. We are offering some of our employee's invested time and effort in the development of this tool as an in-kind contribution to the project (valued at \$10,000). Please let me know if we can provide any additional information to support this vital research effort.

Sincerely,

Randy McIntyre
Vice President

i2M LLC
1053 E. Whitaker Mill Rd.
Suite 155
Raleigh, NC 27604 USA

Bureau of Reclamation
Water Resources and Planning Division
Attn: Avra Morgan
PO Box 25007, MS 86-69200
Denver, CO 80225

April 20, 2021

Letter of Intent STREAMETRIC – level forecasting project Lake Thunderbird

Application Review Committee Members,

STREAMETRIC, by i2M LLC, is a software and data science provider to the water industry. One of our capabilities is the development and deployment of specialized artificial-intelligence-based forecasts that are used to predict critical conditions.

Hereby, we state our intent to develop a lake water-level forecasting web-based application to support the City of Norman as part of a project funded by the Bureau of Reclamation. STREAMETRICs proposed work and budget are described in the proposal provided by the Norman Utilities Authority (NUA) to the Bureau of Reclamation on April 21st, 2021. Furthermore, STREAMETRIC intends to provide its existing cloud-based data management platform and technologies to support the project.

Sincerely,



Alexander Ubl
Venture Leader – CEO STREAMETRIC



Stu Miller
President and General Manager, i2M LLC



April 20, 2021

Bureau of Reclamation
Water Resources and Planning Division
Attn: Avra Morgan
PO Box 25007, MS 86-69200
Denver, CO 80225

RE: COMCD Approval of use of Lake Thunderbird

Application Review Committee Members,

Since 1991, the National Water Research Institute (NWRI) has helped communities around the United States create new sources of water. We are aware that the City of Norman is making an application for funding under the Bureau of Reclamation, WaterSMART: Applied Science Grant to develop a Lake water-level forecasting tool for future use.

NWRI has a continuing interest in the outcomes of the proposed work, as it will yield valuable information for us in the areas of:

- Advances in understanding of limnologic dynamics related to water quality; and,
- Information science driven water resources management.

NWRI will assemble an independent panel comprised of limnologists, water quality, and water treatment experts to provide third-party review, and where appropriate, verification of the project team's methods and conclusions. In addition, the panel will provide its own findings and recommendations on potential applications of the tools developed in this initial phase and next steps in research and development at Lake Thunderbird. We will coordinate our efforts at the direction of the Project Lead.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Kevin M. Hardy', is written over a light blue rectangular background.

Kevin M. Hardy
Executive Director

Kevin M. Hardy • Executive Director • khardy@nwri-usa.org • www.nwri-usa.org

JPA MEMBERS: Inland Empire Utilities Agency • Irvine Ranch Water District • Los Angeles Department of Water and Power • Orange County Sanitation District • Orange County Water District • West Basin Municipal Water District

R-2021-119

A RESOLUTION OF THE NORMAN UTILITIES
AUTHORITY AUTHORIZING THE CHAIRMAN TO
SUBMIT A WATERSMART: APPLIED SCIENCE GRANT
APPLICATION TO THE BUREAU OF RECLAMATION.

1. WHEREAS, the United States Bureau of Reclamation (BOR) has a funding program entitled “WaterSMART: Applied Science Grants ” and pursuant to this program, the BOR makes funds available for development or improvement of hydrological information, water management tools, modeling and forecasting capabilities,
2. WHEREAS, the NUA wishes to apply for Applied Science funds to cover a portion of the cost of the Lake Thunderbird Predictive Level Optimization Tool (PLOT) project by the deadline of April 21, 2021, and
3. WHEREAS, the BOR has directed applicants to include in the application an official resolution adopted by the applicant’s board of directors or governing body and permitted submission up to 30 days after the application deadline of April 21, 2021. The official resolution verifies 1) the identity of the official with legal authority to enter into an agreement; 2) the board of directors, governing body, or appropriate official who has reviewed and supports the application submitted; 3) the capability of the applicant to provide the amount of funding and/or in-kind contributions specified in the funding plan; and 4) that the application will work with the BOR to meet established deadlines for entering into a grant or cooperative agreement.

NOW, THEREFORE, BE IT RESOLVED BY THE NORMAN UTILITIES AUTHORITY:

SECTION 1. The NUA hereby finds that it is in the City of Norman’s and public’s interest in health, safety and welfare of the community to file the Financial Assistance Application with the BOR to seek funds made available under the WaterSMART: Applied Science Grant and the NUA to enter into a cooperative agreement with the BOR to seek such available funds.

SECTION 2. The NUA understands and supports the application that will be submitted and finds:

- (a) The NUA has legal authority to enter into an agreement with BOR to receive a grant; and
- (b) The NUA is able to provide the minimum 50% non-federal cost share specified in the funding plan for this application.

SECTION 3. The NUA hereby authorizes and directs the City Manager or his designee, the Director of Utilities to:

- (a) file and sign, for and on behalf of the NUA, a Financial Assistance Application for a financing agreement from BOR for the Lake Thunderbird Predictive Level Optimization Tool (PLOT) project;
- (b) provide the assurances, certifications, and commitments required for the Financial Assistance Application including executing a financial assistance agreement from the BOR and any amendments or changes thereto; and
- (c) represent the NUA in carrying out the NUA's responsibilities under the financing agreement, including certifying disbursement requests on behalf of the NUA and compliance with applicable state and federal laws.

SECTION 4. The NUA will work with BOR to meet established deadlines required for entering into a cooperative agreement to obtain the aforementioned grant funding.

PASSED AND ADOPTED this _____ day of April, 2021.

Breea Clark, Chairman

ATTEST:

Brenda Hall, Secretary



The City of **NORMAN**

201 West Gray C • P.O. Box 370
Norman, Oklahoma 73069 • 73070

DIRECTOR OF UTILITIES
Phone: 405-366-5443
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Alexander Ubl
Venture Leader – CEO STREAMETRIC



Stu Miller
President and General Manager, i2M LLC



April 20, 2021

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Kevin M. Hardy
Executive Director

Kevin M. Hardy • Executive Director • khardy@nwri-usa.org • www.nwri-usa.org

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R-2021-119

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SUBMIT A WATERSMART: APPLIED SCIENCE GRANT
APPLICATION TO THE BUREAU OF RECLAMATION.

1. WHEREAS, the United States Bureau of Reclamation (BOR) has a funding program entitled “WaterSMART: Applied Science Grants ” and pursuant to this program, the BOR makes funds available for development or improvement of hydrological information, water management tools, modeling and forecasting capabilities,
2. WHEREAS, the NUA wishes to apply for Applied Science funds to cover a portion of the cost of the Lake Thunderbird Predictive Level Optimization Tool (PLOT) project by the deadline of April 21, 2021, and
3. WHEREAS, the BOR has directed applicants to include in the application an official resolution adopted by the applicant’s board of directors or governing body and permitted submission up to 30 days after the application deadline of April 21, 2021. The official resolution verifies 1) the identity of the official with legal authority to enter into an agreement; 2) the board of directors, governing body, or appropriate official who has reviewed and supports the application submitted; 3) the capability of the applicant to provide the amount of funding and/or in-kind contributions specified in the funding plan; and 4) that the application will work with the BOR to meet established deadlines for entering into a grant or cooperative agreement.

NOW, THEREFORE, BE IT RESOLVED BY THE NORMAN UTILITIES AUTHORITY:

SECTION 1. The NUA hereby finds that it is in the City of Norman’s and public’s interest in health, safety and welfare of the community to file the Financial Assistance Application with the BOR to seek funds made available under the WaterSMART: Applied Science Grant and the NUA to enter into a cooperative agreement with the BOR to seek such available funds.

SECTION 2. The NUA understands and supports the application that will be submitted and finds:

- (a) The NUA has legal authority to enter into an agreement with BOR to receive a grant; and
- (b) The NUA is able to provide the minimum 50% non-federal cost share specified in the funding plan for this application.

SECTION 3. The NUA hereby authorizes and directs the City Manager or his designee, the Director of Utilities to:

- (a) file and sign, for and on behalf of the NUA, a Financial Assistance Application for a financing agreement from BOR for the Lake Thunderbird Predictive Level Optimization Tool (PLOT) project;
- (b) provide the assurances, certifications, and commitments required for the Financial Assistance Application including executing a financial assistance agreement from the BOR and any amendments or changes thereto; and
- (c) represent the NUA in carrying out the NUA's responsibilities under the financing agreement, including certifying disbursement requests on behalf of the NUA and compliance with applicable state and federal laws.

SECTION 4. The NUA will work with BOR to meet established deadlines required for entering into a cooperative agreement to obtain the aforementioned grant funding.

PASSED AND ADOPTED this _____ day of April, 2021.

Breea Clark, Chairman

ATTEST:

Brenda Hall, Secretary

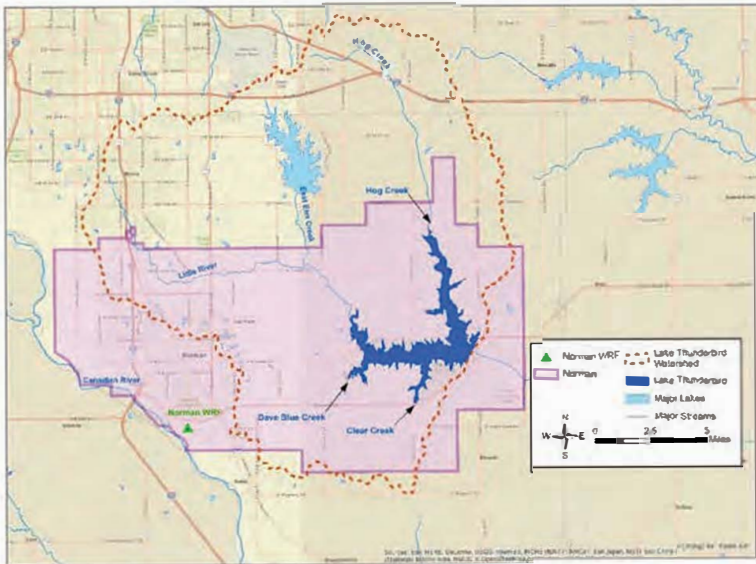


Figure 2 Map the Lake Thunderbird Watershed in Central OK.