A Proposal, in cooperation with the City of Corpus Christi, Texas

Science Support for the Development of Web-Based Delivery of the Choke Canyon/Lake Corpus Christi Reservoir Status and Nueces Estuary Pass-Through Status Report, South Texas

Introduction

In the accordance with the 2001 Agreed Order, the City of Corpus Christi allows fresh water to "pass-through" the Choke Canyon Reservoir/Lake Corpus Christi reservoir system to the Nueces Estuary each month (Texas Commission on Environmental Quality, 2001; Steffan, 2023). The monthly "pass-through" requirement, or target, is dependent on several variables:

- Measured inflow into the reservoir system
- Percent capacity of the reservoir system
- Month of the year, per regulatory requirement
- Salinity level in Nueces Bay

At the direction of the City of Corpus Christi, the Nueces River Authority (NRA) currently hosts water resource data that the City collects through multiple reporting tools, including U.S. Geological Survey (USGS) stream gages, and displays the information on their webpage. None of the water resource data are collected by the NRA, nor is the NRA responsible for any of the equipment that is the ultimate source of this data.

Problem and Objective

The present Daily Reservoir and Pass-Through Status Report (Figure 1) provides important information on reservoir system and Nueces Delta inflow (Pass-Through) conditions. In order to optimize the collection, reporting, and hosting processes, the City coordinated with USGS in early 2024 to explore opportunities. Based on a series of conversations and meetings, the recommendation from the City was to secure a contract between the USGS and the City (i.e. USGS,

Joint Funding Agreement) to perform these functions, ultimately provide a hosting site with USGS oversight and science support to display the Daily Reservoir and Pass-Through Status Report.

Daily Reservoir and Pass-Thru Status Report
September 26, 2024

Reservoir Supply (AcFt): Stream Flow (AcFt): Evaporation (AcFt): Elevation (Ft): Rainfall (inches): Temperature (°F): Gage Height (Ft MSL)

RESERVOIR STATISTICS

Effective June 24, 2017, updated total reservor capacities for Choke Canyon Reservoir (2012 TWDB Volumetric Survey) and Lake Corpus Christi (2016 TWDB Volumetric Survey) are being reflected in the Daily Reservoir System and Pass-Thru Status Report

	Choke Canyon Reservoir			Lake Corpus Christi			CCR/LCC Combined		Lake Texana		
Date	Elevation	Volume	% Capacity	Elevation	Volume	% Capacity	Volume	% Capacity	Elevation	Volume	% Capacity
FULL	220.5	662,821	100%	94.0	256,339	100%	919,160	100%	44.0	161,085	100%
09/26/2024	189.2	127,143	19.2%	83.8	92,472	36.1%	219,615	23.9%	42.5	147,442	91.5%
09/25/2024	189.2	127,143	19.2%	83.8	92,472	36.1%	219,615	23.9%	42.4	146,555	91.0%
08/26/2024	189.8	132,972	20.1%	83.9	93,643	36.5%	226,615	24.7%	43.3	154,639	96.0%
09/26/2023	193.9	176,758	26.7%	87.4	140,670	54.9%	317,428	34.5%	38.8	116,515	72.3%

LAKE TEXANA WATER SUPPLY*

*** The split between Non-Interruptible and Interruptible amounts are updated monthly, usually the first working day of the month, so they reflect the total and remaining amounts as of the end of the previous month**

Date	Daily Intake	MTD	Non-Interuptible			Interruptible		
			August	YTD	Remaining	August	YTD	Remaining
09/25/2024	173	3,216	0	9,652	21,788	0	6,896	5,104

COLORADO RIVER WATER SUPPLY (CRWT)

Date	Daily Intake	MTD	YTD	Daily Flow	MTD Flow	Date	Time	Gage Height
09/25/2024	0	147	8,607	6,154	17,722	09/26/2024	7:15 AM	7.09

WEATHER RELATED INFORMATION

	Choke Canyon Reservoir			Lake Corpus Christi			CCR/LCC Combined		
	09/25/2024	MTD	YTD	09/25/2024	MTD	YTD	09/25/2024	MTD	YTD
Air Temp	101			93					
Evaporation	246	5,229	45,358	177	4,224	49,119	423	9,453	94,477
Rainfall	0.00	0.89	21.65	0.00	2.3	24.14			

Stream Flows

Gauging Station		09/25/2024	MTD
NTRT	Nueces River at Three Rivers, Texas	7,358	16,982
NRTT	Nueces River at Tilden, Texas	24	7,115
FRTT	Frio River at Tilden, Texas	0	2
SMTT	San Miguel Creek at Tilden, Texas	0	0
ARWT	Atascosa River at Whitsett, Texas	4	1,197
CCR	Release from Choke Canyon Reservoir	58	1,439
NRMT	Nueces River at Mathis, Texas (La Fruta Bridge)	189	4,998
NCAT	Nueces River at Calallen, Texas	0	8
RBP	Rincon Bayou Pipeline	0	0
Reservoir InFlow			
Computed as:	(NTRT+FRTT+SMTT)-Release from Choke Canyon	7,301	15,544

ESTUARY INFLOWS AND PASSTHRU REQUIREMENTS

Target Passthru	Monthly Target	0			0
	Salinity Relief Credit	0	Effective		
Credit / -Deficit From Previous Month			Date Deficit Satisfied	09/01/2024	1,393
Return Flow Credit			Effective	09/01/2024	500
Required Passthru	Monthly Target	0			0
	Reservoir Inflow	15,544			
Estuary Inflows (NCAT + RBP)					8
Passthru Surplus / -Deficit					1,901

Figure 1. Example of present Daily Reservoir and Pass-Through Status Report

Approach

The U.S. Geological Survey (USGS) proposes to develop an updated Reservoir System and Pass-Through Status report that delivers information in a similar format as the present report. The basic sections of the report and daily sources of data needed for the report compilation are listed in the table below:

TABLE 1

Report Section	Data Source
Reservoir Statistics (elevation, volume, percent capacity)	USGS/City of Corpus Christi/Texas Water Development Board Reservoir Data
Lake Texana Water Supply	Lavaca-Navidad River Authority
Colorado River Water Supply	USGS Station 08162000 Colorado River at Wharton
Reservoir Weather Related Information	City of Corpus Christi (Dam Operations)
Streamflows	USGS stations
Estuary Inflows and Pass-Through Requirements	Computation based on USGS streamflow data and Rincon Bayou Pump discharge (Nueces River Authority).

Publicly available data used for the report from agencies other than the USGS (i.e. City of Corpus Christi, Lavaca-Navidad River Authority, Nueces River Authority, and the Texas Water Development Board) will be identified and the sources of data will be referenced.

Automated Data Processing

USGS has a technically adept team, including the USGS Integrated Hydrology and Data Science Branch (IHDS) team to verify access to the data sources listed in Table 1 and identify ways to automate the information to minimize the manual efforts that are currently employed today. Work by the USGS will include creating an automated processing script and oversight to:

- Retrieve the daily data from the City of Corpus Christi and USGS sources.
- Combine and process the data to generate a standards-compliant PDF matching the layout of the existing Pass-Through Report.
- Post the generated PDF to the replacement website, which will be hosted by the USGS Oklahoma-Texas Water Science Center (OTWSC) on its public web servers.

The automated process will ensure accurate and timely reporting of reservoir and pass-through information, minimizing manual effort and potential errors.

Website Development

A website will be created to match the data, functionality, and layout of the existing Nueces River Authority site: https://nueces-ra.org/lake-level-reports-2/. The initial website will duplicate the functionality of the Current Lake Levels, Lake Levels & Pass-Through Report, and Historical Pass-Through Reports sections. Historical data (daily reservoir data, and monthly Pass-Through Report PDFs from January 1999 to present) will be hosted online by the USGS.

The website will be hosted on webapps.usgs.gov, a public webserver maintained by the OTWSC, will follow all USGS Visual Identity System (VIS) design rules for web applications, and be fully compliant with USGS web standards.

After the launch of the replacement website, the USGS will identify and propose potential improvements to the website and Pass-Through Report. These improvements may include layout adjustments, modification to reported data formats, and enhancements to the user interface based on feedback from stakeholders. Wireframe designs for alternate layouts and data presentation options will be developed. These wireframes will help explore ways to enhance the user experience and serve as a foundation for potential future improvements to the website.

The project will include drafting requirements and capabilities for a potential map-based display. This map component aims to enhance visualization by displaying current reservoir, streamflow, and water-quality conditions within the study area. These requirements will provide a roadmap for integrating map-based features in future development phases.

The proposed budget covers hosting through fiscal year (FY) 2027. Continued hosting beyond FY27 will require a new agreement and scope for future funding.

Relevance and Benefits

This project would provide information and tools to benefit the USGS, City of Corpus Christi, Nueces Estuary stakeholders, and general public with interest in the region and its natural resources Implementation of the scope of services associated with this proposal will provide critical water-supply information in a timely manner utilizing automation to reduce the manual efforts. The data will be hosted on the USGS website, a premiere federal agency that has a reputation for applying science and data driven solutions.

The "U.S. Geological Survey 21st-Century Science Strategy 2020–2030 (USGS, 2021)" describes many of the current earth science challenges the nation is facing along with the USGS's approach in addressing these complex science issues. The USGS water resource mission is science based and nonregulatory. That mission includes science support with other agencies (federal, state, and local), water managers, and the public. In particular, this proposal aligns with three of the challenges/opportunities discussed in the most recent (2021) USGS science strategy report: 1) the need for information delivery at time frames and in forms relevant to decision makers, 2) the synthesis of hydrologic (Earth) data to provide an understanding of flow, estuary salinity (biological), and 3) the need for technological innovation through the modernization and automation of the reservoir pass-through reporting website. Finally, the proposal will emphasize a partnership with local agencies and the public through communication of data in real-time through a publicly accessible website.

Timeline and Budget

A proposed timeline for the various project tasks is shown below. The first year (FY 25) will require a larger financial commitment to establish the new processes, which is proposed to be $90,100. The costs to implement the program for fiscal years 26 and 27 (FY26 and FY27) are estimated to be $14,400 and $15,100 respectively.

Project Timeline						
Task	FY25 *Month 1*	FY25 *Month 2*	FY25 *Month 3*	FY25 *Remaining*	FY26	FY27
Automated Data Processing						
Develop Website for posting Reservoir System and Pass-Through Information.						
Develop wireframes for potential website and pass-Through report modifications, and draft requirements for a potential map-based data display.						
Website and PDF Report Hosting; Daily Reporting						
Project Budget						
Funding per fiscal year (FY)	$ 90,100				$ 14,400	$ 15,100
Total project cost (FY25 – FY27)	$ 119,600					

References

Nueces River Authority, 2024, Lake Levels and Passthru Report, https://nueces-ra.org/lake-level-reports-2/

Steffan, Devon, 2023, Nueces Delta Environmental Monitoring Project: Coastal Bend Bays and Estuaries Program Publication CBBEP-179, 14 p., https://www.cbbep.org/manager/wp-content/uploads/Nueces-Delta-Environmental-Monitoring-Project.pdf

Texas Commission on Environmental Quality, 2001. Agreed Order amending the operational procedures and continuing an Advisory Council pertaining to Special Condition 5.B., Certificate of Adjudication No. 21-3214; Docket No. 2001-0230-WR, City of Corpus Christi, et al.

U.S. Geological Survey, 2021, U.S. Geological Survey 21st-Century Science Strategy 2020–2030: U.S. Geological Survey Circular 1476, 20 p., https://pubs.usgs.gov/publication/cir1476