

# Columbus Area Recharge Project



*2022 Annual Report*



PLATTE  
COUNTY  
NEBRASKA

Christopher's Cove  
Homeowners  
Association

**Project Description:** The project partners consisting of the Lower Loup Natural Resources District (LLNRD), Archers Daniel Midland (ADM), City of Columbus, Platte County and the Christopher’s Cove Homeowners Association worked collectively to develop and complete the Columbus Area Recharge Project. The project pipes water from the nearby Loup Tailrace Canal and discharges it into the Lost Creek channel near the city. The water impounds into the mostly dry creek and seeps into the ground, recharging the area’s groundwater. The project also discharges water from an auxiliary well, into Christopher Cove which is a nearby water body used by the project for groundwater recharge. The recharged water provided by the project offers more stable groundwater levels for public use, especially in dry years. The project was constructed beginning in 2021 and finishing in 2022.

**Project Operations:** The 2022 season project operations could be described as a project development and testing phase. Due to Covid-19 impacts and delays, the project construction was incomplete until late June 2022, after which project operations commenced. The LLNRD began system test pumping on June 21, 2022. During the initial days of testing the system was closely monitored and operated under direct observation to ensure performance and prevent possible undesirable site impacts.

Following initial testing, the surface water intake at the Loup Tailrace Canal and the auxiliary well west of Lost Creek near 8<sup>th</sup> Street were operated at varying durations and performance levels throughout the pumping season. The operations allowed the project team to verify design expectations and develop an Operations and Maintenance Plan based on actual project function. Throughout the testing the LLNRD monitored impacts from the recharge project and adjusted operations for varying conditions. The LLNRD monitors groundwater and surface water levels using the HydroVu web service which communicates with onsite sensors and displays real-time data.



*HydroVu Website – Realtime Well and Surface Water Monitoring*

The surface water intake site operated between June 21, 2022, and November 10, 2022, for a total of 2073.8 Hours (Approx. 86 days). The pumping was achieved throughout multiple periods where runtime varied from a few hours up to several weeks. The surface water intake is equipped with a variable speed pump which allows some flexibility with pumping volume. The pump output was tested from approximately 2200 GPM to 3500 GPM but was generally operated at approximately 2300 GPM.



*Surface Water Intake Structure*



*Surface Water Outlet Structure*

The auxiliary well site operated between July 21, 2022, and November 10, 2022, for a total of 1762.3 Hours (Approx. 73 days). The pumping was achieved throughout multiple periods where runtime varied from a few hours up to several weeks. The auxiliary well is a single speed pump with an output of approximately 560 GPM. The auxiliary well was not operated independently and was only operated in conjunction with the surface water intake.



*Auxiliary Well Structure*



*Auxiliary Well Outlet Location*

**Project Operational Cost:** The primary operational cost for the 2022 season consisted of Loup Power District electrical service and Loup Power District water delivery. The electrical service provided powered both the surface water intake and auxiliary well with a combined total of approximately 3836.1 hours of operating time at a cost of \$10,283. The water delivery was for water pumped at the surface water intake structure into the Lost Creek channel with a total of approximately 878 ac/ft of pumped water at a rate of \$10 per ac/ft for an approximate cost of \$8,780. There was significant personnel time required for operations which involved weekly and at times daily project site visits to monitor and operate the recharge system. The personnel time has not been included in the reported project operation cost for 2022.

**Project Financial Information:** Project funding was secured through multiple sources. The LLNRD was awarded a Water Sustainability Fund from the Nebraska Department of Natural Resources for \$1,224,000. The LLNRD was awarded a Water SMART Fund from the U.S. Bureau of Reclamation for \$750,000. The remaining funds are provided by a Columbus Recharge Project Coalition created in June 2018. A breakdown of coalition funding is provided in the following table.

Interlocal Cooperative Agreement Columbus Recharge Project Coalition			
Party	Construction and Engineering	20-year O&M Cost	Total
LLNRD	\$977,300	\$80,000	\$1,057,300
ADM	\$541,200	\$310,000	\$851,200
City of Columbus	\$36,700	\$18,100	\$54,800
Platte County	\$36,700	\$18,100	\$54,800
Christopher's Cove HOA	\$8,000	\$4,000	\$12,000

The project development, design and construction oversight were completed by HDR, Inc. and their subconsultants including Gilmore & Associates, Inc., The Flatwater Group and JEO Consulting Group, Inc. under a contract for approximately \$530,967. The project construction was completed by Rutjens Construction, Inc. and their subcontractors including Sargent Irrigation & Well Drilling, Electric Pump and West-E-Con Electric, Advanced Consulting Engineering Services and Mid-State Engineering & Testing under a contract for approximately \$2,772,206. Other miscellaneous cost associated with project design, construction or maintenance totaled approximately \$11,552.

**Project Groundwater Recharge:** The estimated groundwater recharge amounts are based on design expectations and data collected throughout the 2022 operating season. The calculations consider volume of water pumped, recharge area, potential recharge rates, evapotranspiration rates, and additional factors that may affect groundwater recharge. Some values used are design estimates because of testing and troubleshooting involved with newly installed site equipment and inconsistent data.

Pumping data for the Columbus Recharge Project since it began operation has been reviewed to estimate the amount of potential recharge. Because the operation included multiple starts/stops, and short term runs early, the analysis was limited to the approximately 7-week period when water was pumped at the surface water intake between July 21 and September 7th. Some assumptions and estimates were made because accurate information is unavailable for some of the data. Assumptions included:

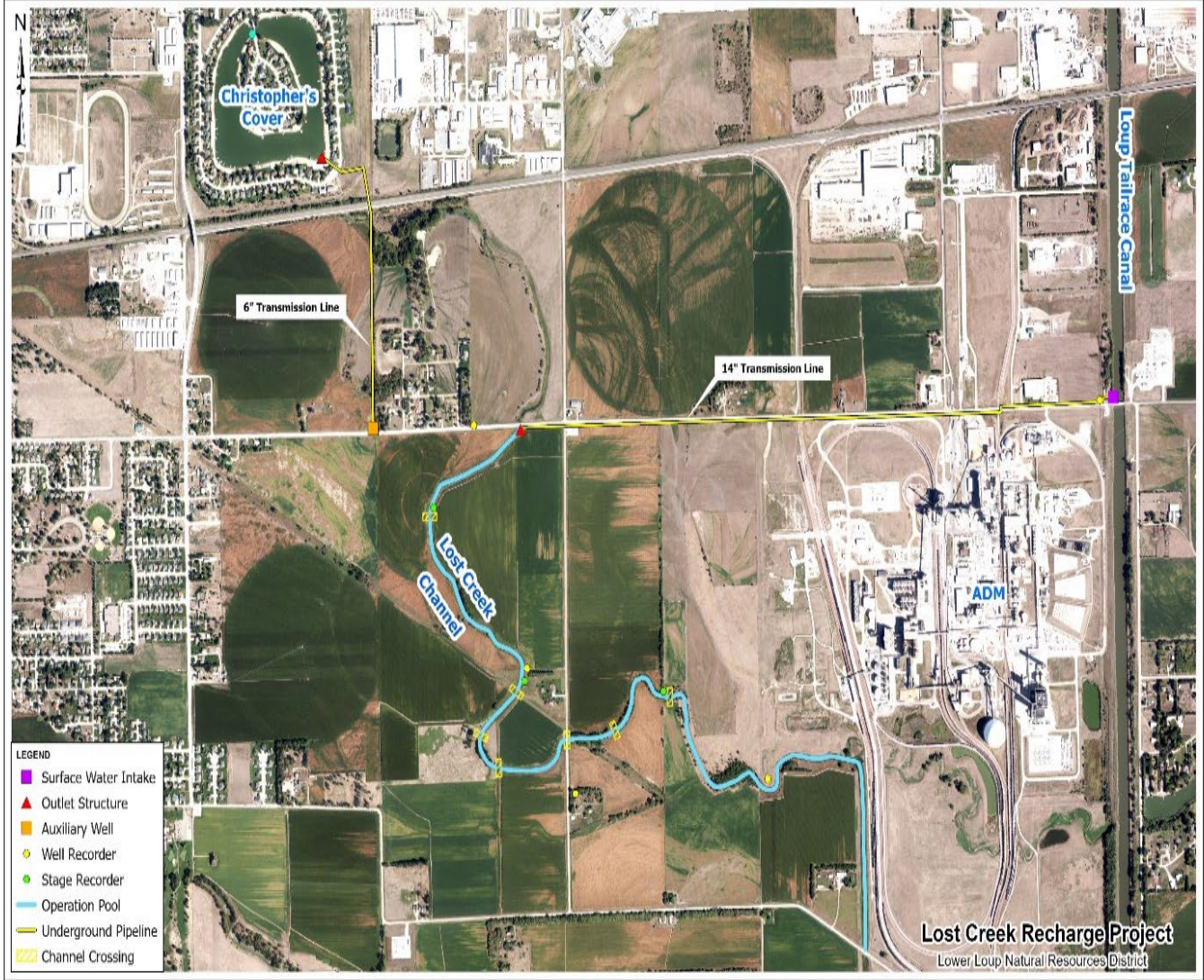
- The surface intake pump supplied 2,300 GPM for the duration of this time. This is the rated flow rate from the pump manufacturer, but until the surface intake flowmeter is operational this is the best estimate available.
- The leading edge of the water flow was estimated because of poor accessibility necessary to accurately determine locations.
- Evapotranspiration (ET) was assumed to be similar to Turf Grass. Daily ET values were collected from the Automated Weather Data Network (AWDN) for weekly intervals for July 1 - September 9 and the daily values ranged from 0.2 - 0.4 inches/day.
- The channel geometry was consistent from the inlet at 8th street to the crossing at the River Road. With a constant width and the distance to the leading edge of the flow, the inundated area was calculated and used to quantify the ET. The bottom of the channel was estimated to be 30 feet so a width of 60' was used to account for impact of slope vegetation on the ET.
- Only the portion of the channel through the leading edge was used to estimate ET.

The auxiliary well pumped approximately 105 Acre-Feet of water into Christopher’s Cove from July 21<sup>st</sup> through September 7<sup>th</sup> while the surface water intake pump was operating. This volume equates to approximately 39 inches of water over the 32.5-acre lake. Lake levels during this time increased by 1 – 1.5 feet so it is evident that recharge was realized from the lake. The total recharge amount is also affected by lake surface water evaporation that occurs throughout the season. Until the operation of the system is finalized, including determining impacts of pumping into the Lost Creek channel on nearby wells and water levels, the auxiliary well will continue to be operated only when the surface intake is in operation.

Several test pumps of various durations were completed prior to beginning this long duration pumping so much of the upper end of the channel was saturated. The leading edge of the water reached the ADM property, approximately 10,250 feet of channel, by July 25th and to SE 9th Street (River Road) by July 27th. While the leading edge reached River Road by the 27th, the flow did not proceed past this point until August 30th so the entire channel was saturated between July 27th and August 30th. From August 30 through the end of pumping on September 7th flow was passing River Road so the value included in the table below is assumed to be high, but this cannot be verified with existing data.

Estimated Water Recharge Amounts		
Pumping Period	7/21/22 thru 8/30/2022	7/21/22 thru 9/7/2022
Total Pumping Time	40 days	48 days
Pumped Volume	407 ac/ft	488 ac/ft
Estimated ET	18.5 ac/ft	22.3 ac/ft
Estimated Recharge	388 ac/ft	466 ac/ft

**Project Maintenance:** The LLNRD performed Lost Creek channel maintenance throughout the 2022 season to promote groundwater recharge and to ensure that the channel could provide adequate storm water drainage. The channel was cleaned of debris and the channel bottom vegetation was controlled. The LLNRD will continue channel maintenance to maintain function and enhance groundwater recharge. The channel side slopes will be mowed, and undesirable vegetation will be controlled. The channel bottom will be disked or tilled to loosen the soil structure and promote water infiltration. Channel water level monitoring equipment locations will be modified to track levels more effectively in the downstream project portion of Lost Creek. The surface water intake flowmeter will be modified to allow accurate collection of water pumping rates and water pumped totals.



**Protecting Lives,  
Protecting Property,  
Protecting the Future.**