



LOWER MINNESOTA RIVER WATERSHED DISTRICT

March 2025 Administrator report
From: Linda Loomis, Administrator
To: LMRWD Board of Managers

In addition to items on the meeting agenda, the following District projects and issues were addressed during the month:

Other Work

2025 Minnesota Water Resources Conference

The conference is scheduled for October 14-15 at the St. Paul RiverCentre. The LMRWD intends to present its work on calcareous fens. Given that this information will be shared at the Minnesota Groundwater Association Conference, it makes sense to also present it at the Water Resources Conference.

LMRWD Audits of LGU Permits

As part of the LMRWD permits program, municipalities can apply for LGU permits to authorize projects within the LMRWD's jurisdiction. To ensure compliance with LMRWD rules and standards, periodic audits are conducted. In 2025, the LMRWD plans to audit the cities of Burnsville and Carver, as well as the Metropolitan Airport Commission. A meeting was held on February 21, 2025, with the cities included in this year's audit to explain the audit process.

The audit will include a project review, program survey, and field inspection. The audits will be staggered, with Burnsville and Carver being audited in Q1 and the MAC in Q3.

FY 2022 Financial Audit

I remain hopeful that we are approaching the conclusion of the FY 2022 audit. We have supplied all the documents and information requested by the auditor. The auditor has now asked our accountant to make some journal entries and then provide updated documentation.

MPCA SRV 2025 Update

On February 28, the LMRWD received notice from the MPCA regarding its annual review of Soil Reference Values (SRVs). SRVs are risk-based screening values used to assess potential risks from exposure to contaminated soil, which is crucial for the LMRWD due to the management of dredge material. One new chemical, Perfluorodecanoic acid (PFDA), has been added to the SRV spreadsheet, and changes were made to the SRVs for 13 chemicals.

The list of new chemicals was compared to the results of dredge material testing conducted by the US Army Corps of Engineers (USACE). Only one of the new chemicals appeared in the test results, and its level was well below the SRV threshold. The SRVs were shared with the LMRWD's technical consultant and legal counsel. Based on the USACE's testing, we believe the LMRWD does not need to conduct additional sampling. The LMRWD will coordinate with the

USACE and monitor the SRVs to evaluate any potential risks associated with the beneficial re-use of dredge material.

In 2022, the LMRWD asked Barr Engineering to perform a critical review of SRVs. The Information provided to the Board of Managers at that time is attached for the Board's information.

TH 13 Update

MnDOT is hosting an open house on Tuesday, March 13, 2025, from 4:30 to 6:30 pm at the Savage Library, with a brief presentation scheduled for 5:00 pm. This is the second public meeting for this phase of the project; the first meeting was held on November 21, 2024, and the presentation can be viewed using this [link](#).

The LMRWD is concerned about the potential impact on access to the LMRWD Dredge site. For more information, you can visit the project website using this link:

<https://www.dot.state.mn.us/metro/projects/hwy13savageburnsville/index.html>

Peterson Wetland Bank

On February 24, 2025, the City of Eden Prairie released the first Annual Monitoring Report for the Peterson Farms Land Bank. The goal of this land bank is to restore the functions of a floodplain forest wetland system, encompassing 169.2 acres of floodplain forest, 4.4 acres of deep marsh wetland, and 38.5 acres of forested upland buffer on a 217-acre tract of land located in Eden Prairie, Chanhassen, and Shakopee, MN. Site preparation was completed in February 2024, and the initial release of credits occurred in July 2024.

The monitoring report is attached for the Board's information

Tracking pathogen transport in stormwater systems and understanding barriers, needs, and solutions through community knowledge and participation

The LMRWD has been invited to participate in a study aimed at advancing scientific understanding of pathogen contamination in stormwater runoff and its impact on Minnesota communities through community-responsive research partnerships. The study's goal is to enhance knowledge of the mechanisms influencing pathogen transfer and to co-create interventions with community members to inform their water management strategies.

Dr. Claudia Munoz-Zanzi, Associate Professor in the Division of Environmental Health Sciences at the University of Minnesota's School of Public Health, is applying for a grant to fund the project. The LMRWD has reached out to partners, including the City of Shakopee and Scott County SWCD, to assist with monitoring stormwater for pathogen contamination. One of the water bodies of concern is Eagle Creek, which is impaired due to fecal coliform.

Citizen Assisted Monitoring Program (CAMP)

The LMRWD was contacted by the Metropolitan Council regarding its interest in the CAMP program. A resident of the LMRWD applied to enroll in the program to monitor Dean Lake. While the LMRWD is keen to have its residents participate, it lacks the capacity to store samples until collection. Fortunately, the City of Shakopee agreed to share the cost of this enrollee and has the capacity to store samples, which must be kept frozen until collection. This will be the first CAMP volunteer for the LMRWD.

Watershed Plan Projects

LMRWD Water Resource Restoration Fund: The LMRWD received two applications for this grant; one from the City of Eden Prairie and one from the City of Shakopee. The applications are currently under review. Recommendations for awards will come before the Board at the April 16, 2025, Board of Manager meeting.

Eagle Creek Bank Restoration at Town & Country RV Facility: No new information to report on this project since the last update.

Fen Private Land Acquisition Study: This item is on the March 19, 2025, agenda.

Spring Creek: This project is essentially complete. The project site will be inspected in May 2025 to ensure vegetation has become established before signing off on the project as complete.

Project website: <https://lowermnriverwd.org/projects/spring-creek>

Gully Inventory and Assessment: There is no new information report on this project since the last update.

Project website: <https://lowermnriverwd.org/projects/mn-river-corridor-management-project>

Minnesota River Study Area #3: A report on this project is on the March 19, 2025, agenda.

Project website: <https://lowermnriverwd.org/projects/study-area-3-eden-prairie>

Minnesota River Floodplain Modeling: The model is complete and is under review by LMRWD partners; the MN DNR and US Army Corps of Engineers.

Vernon Avenue Dredge Material Management: A report on this project is on March 19, 2025 agenda.

Geomorphic Assessments (Trout Streams): There is no new information to report since the last update.

The following projects are projects that are planned by LMRWD partners. LMRWD partners are leading these projects, the LMRWD has agreed to contribute to the projects:

Seminary Fen Ravine Restoration Area C2: There is no new information to report on this project since the last update in December. Here is a link to the [feasibility report](#) Area C-2.

Project website: <https://www.legacy.mn.gov/projects/seminary-fen-ravine-c-2-restoration>

Shakopee Riverbank Stabilization: There is no new information to report since the last update.

Project website: <https://www.shakopeemn.gov/living-here/street-infrastructure-projects/minnesota-riverbank-stabilization>

Carver Levee: There is no new information to report since the last update.

Project website: <https://clients.bolton-menk.com/carverlevee/>

RTA Overlook Trail Stabilization: There is no new information to report since the last update. This project is funded under the 2024 LMRWD Watershed Restoration Program.

Project website: <https://www.edenprairie.org/city-government/departments/parks-and-recreation/parks-and-natural-resources/park-projects>

Upcoming meetings/events

Managers are invited to attend any of these meetings. Most are free of charge and if not the LMRWD will reimburse registration fees. Please contact LMRWD administrator if you have any questions.

- Minnesota Stormwater Seminar Series – [Extreme Weather Impacts Across the Water Sector](#); Thursday, March 27, 2025, 10:00 AM – 12:00 PM, in-person at St. Anthony Falls Laboratory Auditorium (2 Third Avenue SE, Minneapolis) or [on-line on Zoom](#)
- [Urban Trees and Climate Change Hazards/Risks workshop](#) – Thursday March 27, 2025, 1:30 pm to 3:30 pm, St. Anthony Falls Laboratory Auditorium (2 Third Avenue SE, Minneapolis)
- LMRWD CAC meeting – Tuesday, April 1, 6:00 PM to 8:00 PM – Ike’s Creek at US FWS Headquarters
- LMRWD Finance Committee meeting – Wednesday, April 2, 2025, 7:00 PM, Small meeting room Savage Library
- [Green Lands Blue Waters](#) – *How we come together for a More Diverse Midwest Ag Landscape* – April 7-9, 2025 University of Wisconsin – Madison
- LMRWD Personnel Committee meeting – Wednesday, April 9, 2025, 7:00 PM, location to be announced.
- Minnesota Stormwater Seminar Series - [Evaluation of Media Effectiveness for Removal of Phosphorus and Other Pollutants in an Active, High-Volume Stormwater Filtration BMP](#), Thursday, April 17, 2025.
- River Resource Forum -Tuesday, April 29, 2025, 9:00 AM to 4:30 PM, National Eagle Center, 134 Main St W. Wabasha, MN and virtual on [Webex](#)
- [2025 Salt Symposium](#) – Tuesday, August 5, 2025, [Live stream registration](#)

Technical Memorandum

To: Linda Loomis, Administrator
Lower Minnesota River Watershed District

From: Katy Thompson, PE, CFM
Hannah LeClaire, PE

Date: October 12, 2022

Re: Revised Soil Reference Values and the Dredge Material Management Plan

As outlined in the Lower Minnesota River Watershed District's (LMRWD's) workplan to the Board of Water and Soil Resources, the LMRWD will implement capital improvement projects and continue the operation and management (O&M) of the Cargill East River (MN—14.2 RMP) Dredge Material Site (Site) located on the Minnesota River in Savage, Minnesota (Figure 1). O&M activities include maintenance of the Site and management of the disposal of the dredged material.

The Minnesota Pollution Control Agency (MPCA) has been in the process of updating its Soil Reference Values (SRVs), which are used as a screening tool to evaluate potential human health risks from exposure to contaminated soil, since 2014 and has recently updated the values in 2021 and 2022. This document provides the history of the dredging activities on the Minnesota River, reviews the impacts of the new SRVs on the LMRWD's current dredged material management, and provides recommendations for updating the LMRWD's Dredged Material Management Plan (DMMP).

Background

The U.S. Army Corps of Engineers (USACE) is required to maintain a nine-foot-deep by 100-foot-wide channel within the Minnesota River for barge navigation from its confluence with the Mississippi River to 14.7 miles upstream. While the USACE provides the needed channel dredging for navigation, the LMRWD serves as the local sponsor and is responsible for providing dredge material placement sites and disposal. In 2007, the LMRWD acquired land from Cargill, and in 2014, it entered into an

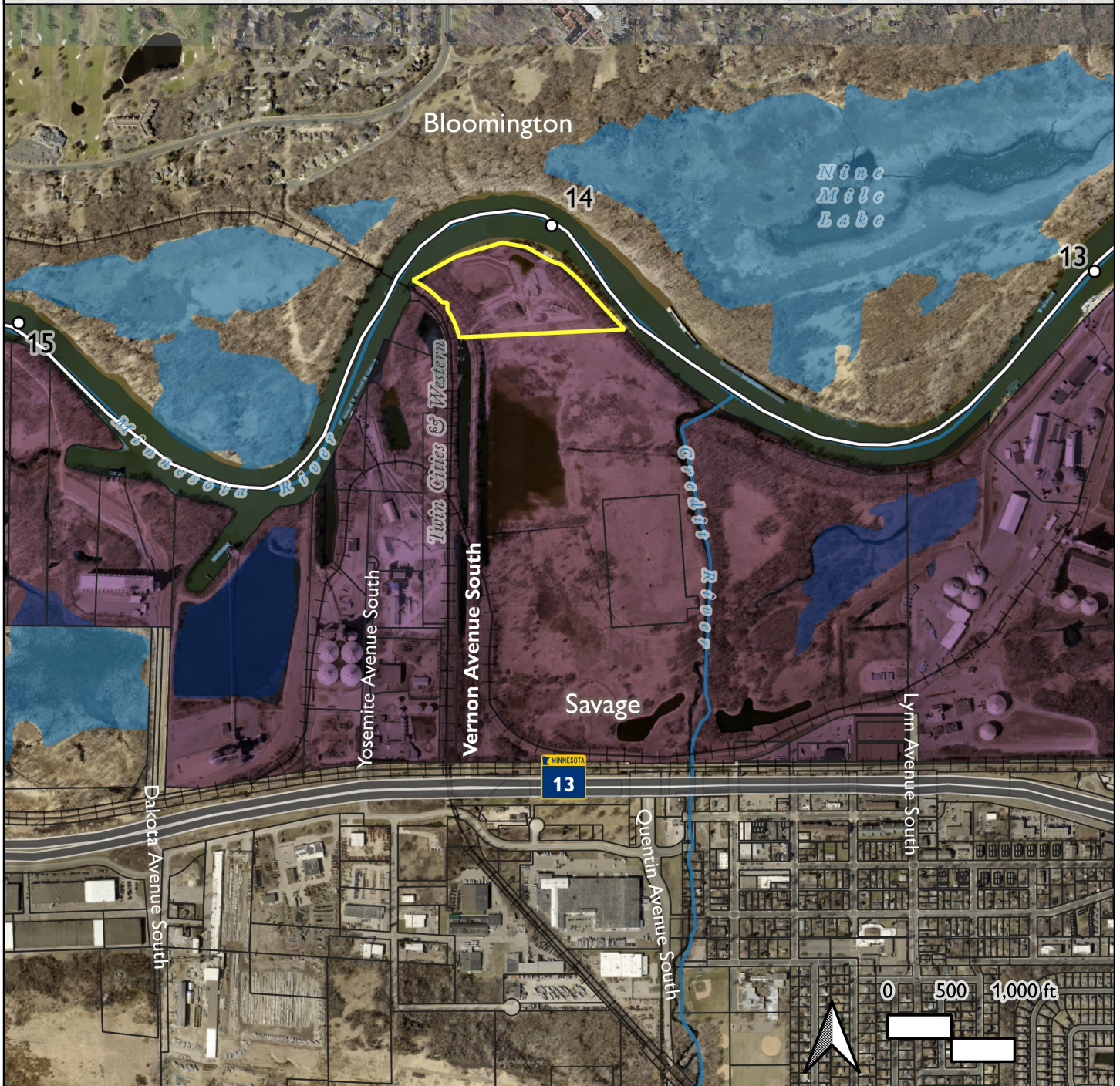
agreement with LS Marine, which also provides dredging services for the private slips at the nearby Ports of Savage, to operate the Site and identify end users for the USACE dredged material on the LMRWD's behalf. In 2020, the Site was improved to reconfigure the containment berms to segregate the sandy USACE dredged material and the more fine-grained and clayey private dredged material, which requires longer drying times. Since this most recent construction was completed, LS Marine has coordinated the placement and removal of approximately 24,000 cubic yards (CY) of USACE dredged material and 93,000 CY of private dredged materials.

LMRWD's role and responsibilities for dredged material are outlined in the District's *2018–2027 Watershed Management Plan* and its *Cargill East River (MN—14.2 RMP) Dredge Material Site Management Plan (DMMP)* adopted in January 2013. The DMMP included sediment analysis to determine the beneficial reuses available for the dredged material, considering contaminant-specific concentrations from the SRVs. In 2009, samples were screened against the SRVs and determined to be below the MPCA Dredge Material Level 1 values and suitable for residential fill uses around potentially sensitive populations, such as the very young, infirm, and elderly. Contamination below the Level 1 values is considered to represent little to no risk for human exposure (Table 1).

Table 1. 2009 Sediment Analysis and MPCA SRVs from the 2013 DMMP

	2009 Sample	Level 1 SRV (Residential)	Level 2 SRV (Industrial)
Arsenic (mg/kg dry)	2.3	9	20
Cadmium (mg/kg dry)	<0.52	25	200
Chromium Total (mg/kg dry)	5.5	87	650
Copper (mg/kg dry)	2.6	100	9,000
Lead (mg/kg dry)	3.4	300	700
Mercury (mg/kg dry)	<0.018	0.5	1.5
Nickel (mg/kg dry)	5.3	560	2,500
Selenium (mg/kg dry)	<1.0	160	1,300
Zinc (mg/kg dry)	15	8,700	75,000
Total PCBs (mg/kg dry)	<0.11	1.2	8.0

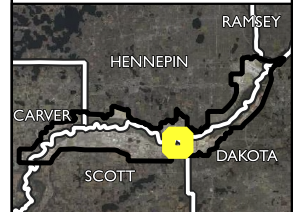
Figure 1: LMRWD Dredge Site Location Map



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- | | |
|--------------------|-------------------------------------|
| LMRWD Dredge Site | Major Highways |
| LMRWD Boundary | Railroads |
| River Mile Markers | Scott Co. Parcels |
| Public Waterways | Ports of Savage Industrial District |
| Public Waterbodies | County Boundaries |

LMRWD Location



In 2014, the MPCA developed two reference documents for managing dredged materials: *BMPs for the Management of Dredged Materials* and *Managing Dredged Materials in Minnesota*. These documents superseded the SRV values used in 2009 and provide clearer guidance on how and where dredged materials may be used depending on their chemical composition. In 2021 and 2022, *Managing Dredged Materials in Minnesota* was further updated and expanded to include 21 additional metals and chemicals, notably perfluoroalkyl and polyfluoroalkyl substances, commonly known as PFAS, which are an emerging contaminant of concern for groundwater.

A review of the USACE annual dredging summaries available online as part of its *Channel Maintenance Management Plan* (CMMP) provided the quantities of material dredged from each Minnesota River historic dredge cuts (or reaches) from 1970 through 2020 (Table 2, Figure 2). The estimated volumes to be dredged for 2022 are also included in Table 2. From the USACE data, we were able to determine the percentage of routine and nonroutine dredging activities contributing to the total quantity dredged, as well as the average accumulation rate, in terms of CY per year (yr).

Table 2. Summary of USACE Dredged Quantities, 1970–2022 (CMMP Table 14)

Reach	Number of Times Dredged	Last Date Dredged	Total Quantity Dredged (CY)	% of Routine Dredging Activities	Avg. Accumulation Rate (CY/yr)
MN-1	2	1993	32,234	89%	1,470
MN-2	1	1987	4,389	100%	-
MN-3A	1	1983	36,612	100%	-
MN-3B	2	1982	14,454	100%	1,610
MN-3C	37	2022	611,038	47%	11,980
MN-4	13	2022	39,370	51%	1,640
MN-5	20	2017	261,578	78%	5,940

Next we compared the USACE dredge records from 1999 to 2022 to the 27-year forecasted quantities from 1999 through 2025 in the 2013 DMMP (Table 3). Cells that exceed the forecasted quantities are highlighted in yellow, while cells that are less than for forecasted quantities are highlighted in green.

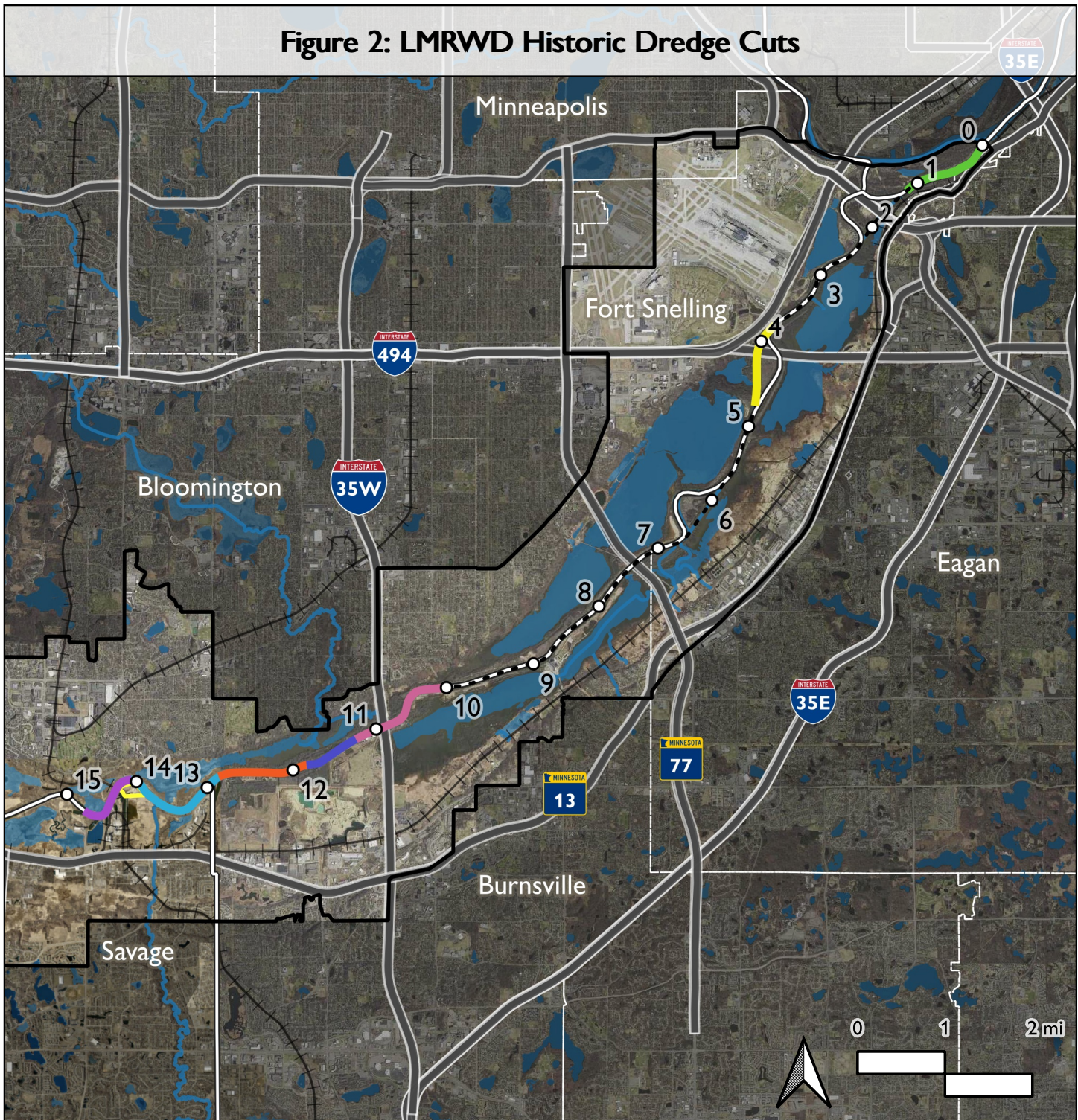
Table 3. DMMP 27-year Forecasted Dredging Quantities (1999–2025) versus USACE Dredge Records (1999–2022)

Reach	27-yr Forecasted Number of Dredge Events	27-yr Forecasted Dredged Quantity (CY)	27-yr Forecasted Accumulation Rate (CY/yr)	USACE Number of Dredge Events, 1999–2022	USACE Dredged Quantity, 1999–2022 (CY)	Avg. Accumulation Rate, 1999- 2022 (CY/yr)
MN-1	3	54,000	2,000	0	0	0
MN-2	3	27,000	1,000	0	0	0
MN-3	15	405,000	15,000	19	320,484	13,400
MN-4	3	237,600	8,800	12	35,872	1,500
MN-5	8	432,800	16,030	10	89,698	3,700
TOTAL	85	1,156,400	42,830	41	446,054	18,600

The overall analysis of the forecasted DMMP quantities and USACE dredge records shows that the total annual volume dredged has averaged around 18,600 CY, more than 24,000 CY less than the 2013 DMMP forecasted annual total of 42,830 CY. The two-year running average of the total annual dredged volume (Figure 3) appears to support this lower annual average since the 1990s. The dredged volumes by reach shown in Figure 3 also confirms that over the past 52 years, the most frequently dredged reaches of the Minnesota River were MN-3C, MN-4, and MN-5. Updates to the DMMP should include a review of all historic dredge cuts to update the forecasted quantities for the next 30-year period (2022–2052) and confirm the LMRWD Dredge Site will have adequate storage capacity into the future. This update should also include a review of the forecasted operating costs, especially if the forecasted annual dredge quantities are less than the 2013 DMMP estimates, as this may affect the potential beneficial uses and income generated from the sale of dredge spoils.

Figure 3 includes historic flood events for reference however a brief review of flood and drought records (Figure 4) does not appear to show a correlation between dredged volumes and episodic river events. The impact of weather extremes on dredging operations should be further investigated with any update to the DMMP so that the LMRWD can plan accordingly for the future.

Figure 2: LMRWD Historic Dredge Cuts



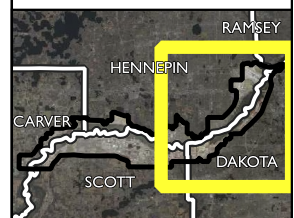
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USACE Historic Cuts

- MN-1: Mouth of MN River
- MN-2: 4Mile Cut-Off
- MN-3A: Above 35W Bridge
- MN-3B: Below Peterson's Bar
- MN-3C: Peterson's Bar
- MN-4: Cargill Slip
- MN-5: Above Savage RR Bridge

- - - Not Routinely Dredged
- River Mile Markers
- LMRWD Dredge Site
- LMRWD Boundary
- Public Waters
- Major Highways
- Railroads
- County Boundaries

LMRWD Location



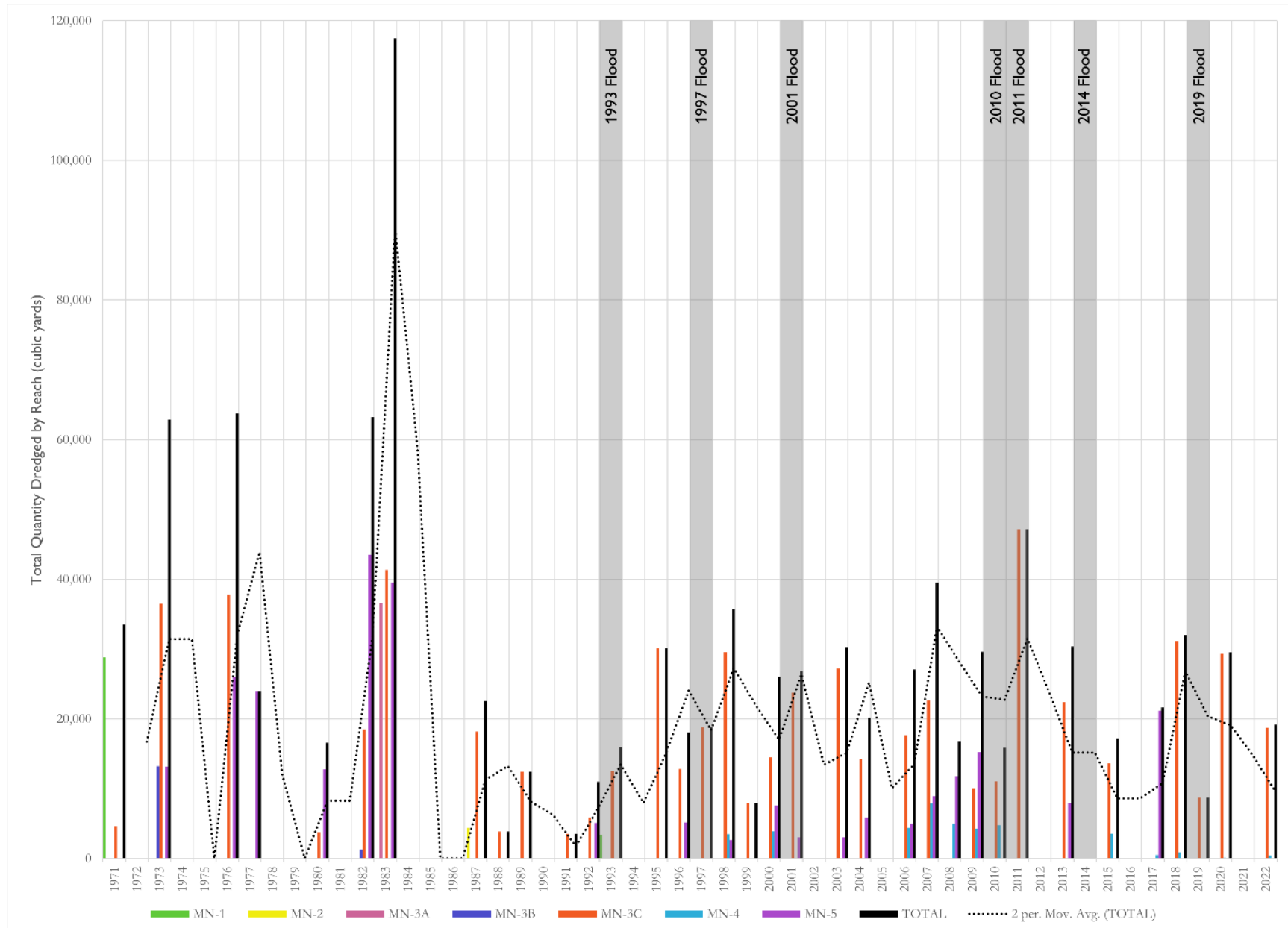


Figure 3. Annual Material Dredged per USACE Minnesota River Reach (USACE 2020); Black dashed line indicates the total dredged volume two-year running average.

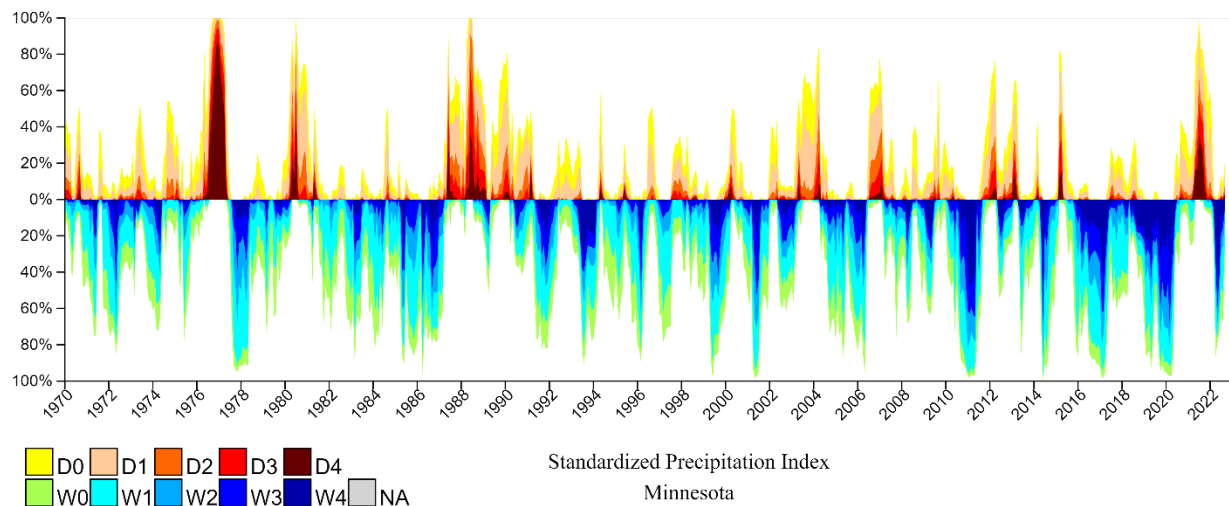


Figure 4. Standardized Precipitation Index from Drought.gov (D0–D4 indicate drought severity, whereas W0–W4 indicate wet conditions over a nine-month average).

Impacts to LMRWD Operations

The LMRWD authorized Barr Engineering Co (Barr) to review the latest SRV values and provide an assessment of the changes and impacts to LMRWD activities and operations (Attachment 1). Barr reviewed the historic sampling data from the USACE CMMP and LMLRWD DMMP and identified that the only chemical parameter that would have exceeded the 2022 MCPA Level 1 SRV was manganese. The manganese Level 1 SRV decreased from 3,600 mg/kg in 2009 to 730 in 2022, and the historic Minnesota River samples show manganese concentrations between 56.8 and 931 mg/kg. The highest concentration was found at River Mile (RM) 14.5 (MN-5, Figure 2), whereas the lowest was at RM 13.2 (MN-4, Figure 2). Barr concluded in their analysis that manganese concentrations in the Minnesota River “are consistent with naturally-occurring background levels in the soil and may be due to the geochemical composition of the sediments themselves.” Regardless, the lowered manganese SRV may limit the ability to sell dredged materials to the private market and could significantly increase the LMRWD’s operation costs if dredged material is required to be landfilled rather than sold. Future updates to the DMMP should validate the levels of manganese that could be expected to be found in the dredge spoils from each reach because the historic data shows MN-5 only exceeded the 2022 SRV the single time in 1999.

Though there does not appear to be an immediate requirement for the LMRWD Dredge Site to address PFAS, it could be a requirement in the future should PFAS be found in the dredge material. Barr preliminary identified potential sources of PFAS in the watershed, including airports, landfills, and wastewater treatment plants that may have

historically “used, discharged, emitted, and/or served as conduits for PFAS.” Barr noted that while there is no statewide value for PFAS in surface water, it is expected that there will be decreasing tolerance for PFAS in surface and groundwater in the future. Also, given the presence of PFAS found in Pool 2 of the Mississippi River, Barr anticipates that the new PFAS SRVs will eventually affect the dredge material management, which may further limit the ability to sell the dredged material.

Next Steps

The District DMMP was last updated in 2013 and focuses heavily on material placement options, beneficial uses, and estimated quantities through 2025. Given the changes in SRV values and river conditions, we recommend the DMMP be updated to plan for future management of the site, including contingency plans for if dredge materials exceed the manganese and PFAS criteria. The following are specific items that should be considered as part of the DMMP update:

1. Complete a sediment assessment to aid in forecasting the next 30-years of dredging requirements for the Minnesota River, considering changing climate and flow conditions as well as projected changes in barge traffic or dredging practices.
2. Collect sediment core samples at each of the Minnesota River dredge cuts to supplement the data last collected in 2009 and validate the ability to continue sales of dredged materials, if not already available from the USACE or LS Marine.
3. Review the MPCA PFAS Monitoring Plan and identify future improvements necessary for the LMRWD Dredge Site to prevent runoff and soil leaching of PFAS, should PFAS be found in dredged materials.
4. Meet with the USACE to discuss the Mississippi River Pool 2 dredged material management for PFAS and identify joint disposal opportunities should the Minnesota River dredge material exceed the SRVs for PFAS in the future.
5. Develop an adaptable framework for the next 30-years of dredge site management based on the results from items 1 and 2 above and including alternative options for disposal of dredged material should the sediments exceed current SRV thresholds.

Attachments

Attachment 1—Lower Minnesota River Watershed District Soil Criteria Review
Technical Memorandum by Barr Engineering, dated August 25, 2022

Technical Memorandum

To: Della Young, Young Environmental Consulting Group
From: Jenni Brekken
Subject: MPCA Soil Criteria Review for LMRWD
Date: August 25, 2022
Project: Lower Minnesota River Watershed District Soil Criteria Review
c: Karen Chandler

The Lower Minnesota River Watershed District (LMRWD) manages dredged sediments from the Minnesota River and from other ponds or surface waters. As part of this activity, an evaluation of the material is needed to determine the appropriate disposal or reuse of the materials based on Minnesota Best Management Practices (BMP) documents and other federal, state or local regulations. Assessment of chemical contamination in dredged sediments is part of the BMPs and impacts whether the material may be reused as fill, may have a restricted reuse, or requires landfill disposal. For this assessment, sediment chemical concentrations are compared to current Minnesota Pollution Control Agency (MPCA) Soil Reference Values (SRVs). The MPCA recently provided a substantive update to their methods for developing SRVs in 2021 and in May 2022 followed with an annual update to their SRVs (MPCA, 2021 and 2022a/b).

The MPCA also recently issued a per-and polyfluoroalkyl substances (PFAS) Monitoring Plan, outlining specific programs and facilities that will incorporate analysis for PFAS as part of the regulatory program. The MPCA's PFAS monitoring programs may also impact decisions regarding reuse of dredged sediments.

This memo describes how the SRVs are typically used in evaluating dredge materials, summarizes the recent SRV updates (in 2021 and 2022), and provides an assessment of how these changes may impact LMRWD activities or operations. In addition, Barr is providing a review of the MPCA PFAS Monitoring Plan including a discussion of whether PFAS analysis of sediments may be required and the potential impacts to LMRWD.

1 Soil Reference Values Overview

The SRVs are a screening tool used to evaluate potential human health risks from exposure to contaminated soils by comparing chemical concentrations in soil to the SRVs. They are derived using USEPA methodology for assessing human health risk and are based on conservative assumptions designed to be protective of the most vulnerable receptors and cover multiple soil exposure pathways, including inhalation of dust, ingestion, dermal contact and inhalation of vapors for both cancer and non-cancer risks. SRVs are developed using exposure assumptions based on different land use categories (e.g., the assumed duration and quantity of exposure to the soil is different for a residential use property versus

an industrial use property). Currently, the MPCA has published SRVs for two different land use categories: 1) residential/recreational (e.g., single family homes; multi-family housing; long-term care facilities, hospitals, churches, schools, sports fields, etc.) and 2) commercial/industrial (warehouses, offices, manufacturing facility, restaurants, hotels, etc.)

The MPCA has several programs where SRVs are applied, including brownfields, petroleum leak sites, closed landfills, superfund, management of dredged sediments, management of stormwater pond sediments, and for evaluating offsite reuse of excess fill from a development or construction project. For evaluating whether dredged sediments or soils are suitable for reuse on other sites, the residential/recreations SRVs (formerly referred to as "Tier 1" SRVs), are applied, which are lower and more conservative than commercial/industrial SRVs.

The SRVs are provided by the MPCA in an excel spreadsheet format (<https://www.pca.state.mn.us/document/c-r1-06xlsx>), which includes detailed background information on how each SRV is calculated and the final SRVs for each chemical. This spreadsheet is updated periodically by the MPCA and the revision year for each chemical is noted within the spreadsheet.

2 Applications of SRVs to LMRWD Projects

The following types of projects or activities undertaken by LMRWD may warrant evaluation of chemical concentrations in soils or sediments using MPCA SRVs:

- Stormwater management or flood mitigation projects involving excavation in areas with contaminated soils or sediments.
- Creek or riverbank erosion control or bank stabilization projects in areas with contaminated soils.
- Management of dredge material from the Minnesota River.

2.1 Soil Excavation Projects

For projects involving excavation of soils, if there is no known or suspected source of contamination, sampling and analysis of this excess soil is generally not needed. During the planning stages of an excavation project, an initial assessment can be considered to help determine whether an investigation and chemical analysis of the soils may be warranted. Depending on the site specifics, the initial assessment could involve a desktop review of the site history and uses such as review of MPCA's website What's in My Neighborhood (MPCA, 2022f) and any available historical aerial imagery. If a property transfer is occurring as part of the project, or if there are potential concerns for environmental releases, then more detailed study could be completed that would involve completion of a Phase I Environmental Site Assessment (ASTM, 2021) that includes broader records review, interviews, a site visit, and a preparation of a report.

If there is documented contamination or recognized environmental conditions indicating contamination is likely present in the soils, soil sampling and chemical analysis can be performed, and the results compared to SRVs. The list of chemical contaminants is selected based on the land use history and suspected type of hazardous substance or petroleum release. In the case where contamination is identified at concentrations above MPCA SRVs for a particular land use, plans for appropriately managing and/or disposing of soils

are needed. These projects may be performed under the MPCA's voluntary remediation (Brownfield) program oversight to obtain various MPCA liability assurances or technical review of reports and cleanup plans (MPCA, 2022c).

Offsite reuse of soil is guided by MPCA's Best Management Practices (BMP) for the Off-Site Reuse of Unregulated Fill (MPCA, 2012a) and the BMP for Off-Site Reuse of Regulated Fill (MPCA, 2012b). The classification of Unregulated Fill includes soils that meet MPCA Soil Leaching Values (SLVs; protective of contaminant leaching to groundwater), MPCA Residential SRVs, and are free of debris and other observations of contamination (MPCA, 2012a). Regulated Fill is defined as soil that has chemical concentrations above MPCA residential SRVs but below Industrial SRVs (among other characteristics). However, the BMP for Offsite Reuse of Regulated Fill (MPCA, 2012b) requires identification of a project site to receive the Regulated Fill and approval by local government and MPCA. Because of these restrictions, reuse of Regulated Fill under MPCA's BMP is rare. In most cases, excess soils with chemical concentrations above MPCA residential SRVs are typically disposed of at a landfill.

2.2 Stormwater Pond Dredging Projects

For management of sediments removed from stormwater ponds, work is guided by MPCA's BMP for Managing Stormwater Sediments (MPCA, 2017), typically independent of voluntary brownfield cleanup program review.

Similar to excavated soils, offsite reuse of sediments dredged from stormwater ponds (MPCA, 2017) is based on whether the sediment chemical concentrations meet MPCA's BMP for Unregulated Fill (MPCA, 2012a), which includes residential SRVs and SLVs. The stormwater pond sediment chemical parameter list for laboratory analysis includes analysis of polycyclic aromatic hydrocarbons (PAHs), arsenic and copper, and any other chemicals that would be expected to be present in the sediments based on a known release or site use (e.g., from industrial operations on the site). The same site assessment tools outlined in Section 2.1 could be used to evaluate historical site uses and potential for contamination. Stormwater pond sediments that do not meet Unregulated Fill guidelines are typically drained of free-liquids and disposed at a solid waste landfill.

2.3 River Dredge Material Management

The LMRWD manages Minnesota River sediments dredged by the US Army Corps of Engineers (USACE) to maintain the Minnesota River 9-foot navigation channel from the confluence of the Mississippi River to river mile 14.7 in Savage, Minnesota (LMRWD, 2013). The dredged sediments are stored at the Cargill East River site, located at river mile 14.2 in Shakopee, Minnesota (LMWRD Dredge Facility). The LMRWD Dredge Facility is estimated to potentially store about 190,000 CY of dredged material at one time. An estimated 25,000 CY of sandy material is dredged annually by the USACE and managed at the LMRWD Dredge Facility. The USACE dredged material is dewatered prior to being taken offsite for beneficial reuse. Approximately 18,000 CY of mainly fine grained silty and clay sediments dredged from private terminals in this stretch of the river are also dewatered and managed at the LMRWD Dredge Facility for a fee prior to being taken offsite within the year (Burns & McDonnell and Young Environmental, 2017).

As one of the LMRWD's main activities is to manage dredge materials from the Minnesota River, the remainder of this memo focuses on dredge material management.

3 Minnesota Dredge Material Management BMPs

The MPCA has two relevant guidance documents for managing dredge materials: 1) BMPs for the Management of Dredged Material (MPCA, 2014a) and 2) Managing Dredge Materials in Minnesota (MPCA, 2014b). The guidance indicates the following steps for determining the appropriate management method for dredged materials: perform grain size analysis, evaluate past industrial activities and sources of pollutants, and collect samples for analysis of pollutants likely to be present. If the grain size analysis indicates the material is predominantly sand (only 7 percent is finer than sand and passes the #200 sieve), the material is deemed by the guidance to be unlikely to contain contaminants and does not need chemical analysis. USACE dredge materials from the Minnesota River were previously reported to be predominantly sand (7 percent or less fines) with an average of 1 to 4% silt and clays (USACE, 2007), indicating the material and does not warrant chemical analysis based on the Minnesota BMP (MPCA, 2014a/b). The USACE also reported that materials from private dredging typically tested as having 30% silts and clays, which would warrant chemical analysis (USACE, 2007). Barr did not evaluate grain size data sets from the Minnesota River for this assessment, so we assume for the purposes of this memo that dredge materials are tested for chemical analyses as part of the LMRWD dredge material management plans.

Management of dredge materials originating from the Minnesota River downstream of River Mile 27 (which is approximately two miles upstream of the CSAH 101 crossing at Shakopee) requires a permit under the State Disposal System for disposal or reuse of dredged materials (MPCA, 2014b) if the quantity of dredged material is 3,000 cubic yards or more (MPCA, 2014b).

The Dredge Material BMP defines the following management categories for sediment based on chemical concentrations (MPCA, 2014b):

- Level 1 Dredged Material is suitable for reuse on residential or recreational properties and is characterized as being at or below analyte concentrations for all of the Tier 1 SRVs (a.k.a. Residential/Recreational SRVs).
- Level 2 Dredged Material is suitable for use or reuse on properties with an industrial use category and is characterized as being at or below analyte concentrations for Tier 2 SRVs (a.k.a. commercial/industrial SRVs).
- Level 3 Dredged Material is not suitable for use or reuse and is classified as having one or more analyte concentrations being greater than Tier 2 (commercial/industrial) SRVs.

Dredged material, if not excluded from additional analysis as determined using the grain size analysis described above, is to be analyzed for a baseline list of sediment parameters as well as other pollutants with a reasonable likelihood to be present in the dredged material based on an evaluation of past

industrial activities. The lists of baseline sediment parameters and additional sediment parameters for which the MPCA has established SRVs is shown on Table 1.

4 SRV Updates

The SRVs established in 2009 were applied for many years, with only minor updates or additions as information developed regarding toxicity for select, limited chemicals. In 2014, MPCA published draft revised methodology and SRVs for public comment. Several iterations of draft SRVs were provided and new SRVs and technical guidance were finalized and published in January 2021. Updates to the MPCA SRVs and associated technical guidance occurred in 2022

The changes in the SRVs, comparing 2009, 2021 and 2022 values are shown in Table 1 (residential/recreational SRVs) and Table 2 (commercial/industrial SRVs) for those chemicals on the sediment parameter lists for dredge materials (MPCA, 2014b). PFAS, while not on the sediment list, are also included, and discussed further below. In general, most of the residential SRVs decreased from 2009 to 2021 due to changes in toxicity information, assumptions and default values used for the risk-based calculations of these screening levels. Fewer SRVs decreased for the industrial/commercial land use, and some, including naphthalene, benzo(a)pyrene equivalents and copper increased significantly from 2009 to 2022. Between 2021 and 2022, fewer SRVs changed, but those that did decreased.

Notable changes to the SRVs and technical guidance in 2021 and 2022 include the following:

- Prior to 2021, individual SRVs were published for these four land use scenarios: residential, recreational, industrial, and short-term worker. In 2020, the categories were reduced to two: residential/recreational and commercial/industrial. The MPCA updated their SRVs and technical guidance again in 2022 and has indicated they plan to provide annual updates to the SRVs.
- Calculation of some SRVs based on the risk-based equations resulted in very low values, below either naturally-occurring levels (e.g. arsenic) or typical urban anthropogenic background levels (e.g. benzo(a)pyrene) in soil. For these chemicals, the SRVs were set at the background levels, as MPCA has recognized that cleaning up soil to levels below background concentrations is not feasible or practicable. It should be noted that some background concentrations in soil are also higher than SLVs (especially for metals); use of SLVs to assess contaminant levels should also consider background concentrations in decision-making.
- Previous SRVs accounted for both acute (short term) and chronic (long term) exposures. The 2021 revision separated acute from chronic SRVs for the residential exposure scenario for chemicals with acute toxicity risk. For the sediment parameter list, these include arsenic, barium, cadmium, copper, cyanide and nickel. It should be noted that the acute SRVs for barium and copper are more than an order of magnitude lower than the chronic SRVs.
- The technical guidance for assessing risk from carcinogenic PAHs (cPAHs) is assessed by calculating a toxic equivalency to benzo(a)pyrene. There are different cPAH parameter lists published for sediments than there are for soils, but after the 2021 update, both the MPCA soil and sediment guidance documents indicate the benzo(a)pyrene equivalents are to be calculated

using Kaplan Meier statistical methods. When analyzing for PAHs, the correct parameter list, and an understanding of the methods for calculating the cPAH equivalents are required.

5 Impact of Changes in SRVs to Management of Dredge Material

To assist in predicting how changes in the SRVs may impact LMRWD management of dredge material, data from the Minnesota River sediments collected between 1978 and 2007 as reported in the Dredge Material Site Management Plan (LMRWD, 2013) was compared to 2022 MPCA Residential/Recreational SRVs and SLVs to assess whether it meets MPCA Unregulated Fill guidelines (MPCA, 2012) and Level 1 category for dredged material management (MPCA, 2014b). The results are shown on Table 3.

The only parameter above SLVs or the Residential/Recreational SRV was manganese. The manganese Residential SRV decreased from 3,600 mg/kg in 2009 to 730 mg/kg in 2022. Nearly all manganese results were also above the SLV of 130 mg/kg. The manganese concentrations in the Minnesota River sediments are consistent with naturally-occurring background levels in soil (USGS, 2013), and may be partially attributed to the geochemical composition of the sediments or a result of inputs to the river through runoff from soils. While The MPCA recognizes that some naturally-occurring levels of metals in soils are above SRVs or SLVs, the presence of chemical concentrations above these Unregulated Fill screening levels may limit the ability to sell the dredged materials in the private market for beneficial reuse.

A comparison of more recent USACE sediment data, if available, would be useful for assessing the potential for cost impacts to LMWRD for managing dredge material and evaluating if it is suitable for beneficial reuse.

The MPCA has indicated they intend to update the SRVs on an annual basis, so LMRWD should consider potential changes to SRVs in the long term management plan for dredged materials. If sediments are sampled and analyzed for chemical analysis, the data should be compared to the most recent SRVs in determining beneficial reuse. If the material is stored on the site for more than a year, re-evaluation of the sediment data using updated SRVs may be warranted prior to removing the material from the site for offsite reuse. It should be anticipated that projects receiving the dredged soil for reuse will be making comparisons to current SRVs.

Barr is not aware of MPCA revisiting past soil management and reuse decisions at off-site locations based on then-current SRVs/SLVs, but as MPCA continues to adjust their values, there is some risk that past reuse of sediments at off-site locations may come under new scrutiny in the future if testing is conducted as part of a construction or remediation project.

6 PFAS Monitoring Plan

On March 22, 2022, the MPCA published the final version of its PFAS Monitoring Plan (MPCA, 2022). The plan addresses issues identified in Minnesota's PFAS Blueprint (MPCA, 2021), released in February 2021, and responds to public comments submitted to the MPCA. Given the wide-spread use of PFAS over the past 70 years and their persistence, they are considered ubiquitous in the environment. Therefore, to

address PFAS broadly and consistently the MPCA is taking a statewide and coordinated approach across their permitting and cleanup programs as document in their PFAS Monitoring Plan.

In general, the MPCA's approach has been to initiate sampling across select industries and sites, and then develop future efforts based on the results. Looking ahead, MPCA's approach is expected to expand PFAS sampling over time and will result in an evolving regulatory approach as more information is developed.

The plan addresses monitoring requirements under five different MPCA programs:

- Air Program. Selected permitted facilities via emissions inventory reporting and stack testing;
- Wastewater Program. Subset of municipal wastewater treatment plants and industrial facilities via influent monitoring;
- Solid Waste/Hazardous Waste Program. Selected facilities via leachate or groundwater sampling;
- Industrial Stormwater Program. Selected airports, chrome plating facilities, and automotive shredding facilities via stormwater sampling; and
- Remediation Program: Phased program with additional specific guidance forthcoming.

The MPCA relied on a set of North American Industry Classification System (NAICS) codes to identify facilities that are likely to have used, emitted or discharged PFAS. The monitoring plan ultimately listed over 400 specific facilities in the "initial" phase of monitoring, including 169 manufacturing/industrial facilities, 8 regional airports, 145 landfills/solid waste management facilities, and 91 municipal wastewater treatment plants. The plan notes a differentiation between facilities that may be a source of PFAS (e.g. industrial facilities that used PFAS) and facilities that are likely "conduits" for PFAS into the environment (e.g., waste management, recycling, etc.)

The MPCA's stated intention is to have the monitoring plan "avoid duplication" for a specific facility (e.g., sampling under multiple MPCA programs or for multiple media). However, the plan clearly states that sampling of other media, under additional programs may be required after the initial phase (e.g., results of stack testing may lead to a request for industrial stormwater sampling). The identified facilities began receiving MPCA letters requesting sampling in mid-2022. While dredge material or sediment sampling for PFAS is not explicitly mentioned in the PFAS Monitoring Plan, such activities may potentially follow findings of PFAS impacts in stormwater or wastewater discharges to the Minnesota River.

The MPCA's PFAS Monitoring Plan leverages existing program and permit structures to require PFAS sampling at facilities. Although there does not appear to be an immediate requirement for LMRWD facilities to sample or address PFAS in the MPCA PFAS Monitoring Plan, this may be a future requirement if, for example, PFAS sources are found to be located near USACE or private dredge sites in the LMRWD. Although Barr has not completed an exhaustive review, the following facilities within the watershed are types of facilities that are likely to have used, discharged, emitted, and/or 'served as conduits' for PFAS: Blue Lake Wastewater Treatment Plant, Seneca Wastewater Treatment Plant, Flying Cloud Airport, Minneapolis/St. Paul International Airport, and numerous dumps and landfills (operating or historical).

Note as precedent, that the MPCA has investigated, and found, PFAS impacts in sediments in the Mississippi River (MPCA, 2013). Additionally, MPCA has listed 25 bodies of water in the state on its impaired waters list due to impacts from PFAS (MPCA, 2022e). While there is currently no statewide value for PFAS chemicals in surface water, MPCA has developed a site-specific water quality criteria (SSWQC) for perfluorooctane sulfonic acid (PFOS) protective of fish consumption in an area around Lake Elmo, Bde Maka Ska, and Pool 2 of the Mississippi River. Specifically, the SSWQC is 0.05 parts per trillion (ppt) PFOS, which is below current laboratory quantitative limits. (<https://www.pca.state.mn.us/waste/water-quality-criteria-development-pfas>). MPCA has acknowledged that such low values (derived from risk-based calculations and modeling) may be challenging to measure and attain in practice, but MPCA has also indicated that permit conditions for facilities that directly discharge to these impaired waterbodies are being evaluated for additional requirements where necessary.

Current SRVs for PFAS are shown on Tables 1 and 2, but future SRV updates are expected to result in lower SRVs for PFAS given evolving understanding of PFAS toxicity and other regulatory trends in other PFAS screening levels.

Another recent development for monitoring PFAS is the emerging concept of world-wide background concentrations of PFAS which is being monitored in rainfall and surface soils across widely distributed areas and land uses. As this concept advances, it may be another factor in distinguishing PFAS sources from specific industries verses baseline or background concentrations that are more ubiquitous. We are not aware that MPCA has developed a current position on this concept, but Barr believes it will emerge as a topic of interest as more PFAS data is collected across the state and beyond.

Given the airports, wastewater treatment plants and solid waste disposal and recycling facilities in the watershed, there is potential for PFAS to have been discharged to the Minnesota River through overland stormwater flow or direct discharges. The PFAS identified in the Mississippi River sediments is also indicative of potential PFAS presence upstream in the Minnesota River sediments. Given the general decreasing trends in PFAS regulatory criteria and screening levels, and the increase in monitoring across various Minnesota programs, it is likely that sampling of Minnesota River sediments for PFAS analysis may follow other monitoring programs. Due to the ubiquitous nature of PFAS and the persistence of these compounds in the environment, sampling of Minnesota River sediments may identify PFAS, and given the general decreasing trend in PFAS criteria, options for beneficial reuse of dredged materials may become more limited due to difficulty in meeting the increasingly lower PFAS SRVs. Presence of PFAS in dredged materials stored at the LMWRD Dredge Facility may also require controls to address runoff from stockpiles and leachate to the surrounding soil and groundwater and river.

Attachments:

Table 1 – Summary of MPCA Residential/Recreational Soil Reference Value Changes, 2009 – 2022, Sediment Parameter List and PFAS

Table 2 – Summary of MPCA Commercial/Industrial Soil Reference Value Changes, 2009 – 2022, Sediment Parameter List and PFAS

Table 3 – Minnesota River Sediment Chemical Data

7 References

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Date: August 25, 2022
Page: 10

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Table 1
Summary of MPCA Residential/Recreational Soil Reference Value Revisions, 2009 - 2022
Sediment Parameter List and PFAS

Chemical	Baseline Sediment Parameter List	Additional Sediment Parameter List	CAS No.	Most Recent SRV Revision Year	2021 Res/Rec Acute SRV* (mg/kg)	2022 Res/Rec Acute SRV (mg/kg)	Comparison Acute SRVs: 2022 to 2021 (% change)	2009 Residential SRV (mg/kg)	2021 Res/Rec Chronic SRV (mg/kg)	2022 Res/Rec Chronic SRV (mg/kg)	Comparison: Chronic SRVs 2022 to 2009 (% change)	Comparison: Chronic SRVs 2022 to 2021 (% change)
Inorganics												
Arsenic	X		7440-38-2	2016	9	9	0%	9	9	9	0%	0%
Barium		X	7440-39-3	2022	250	260	4%	1100	3000	3100	182%	3%
Cadmium	X		7440-43-9	2016	8.8	9.1	3%	25	1.6	1.6	-94%	0%
Chromium III	X		16065-83-1	2016				44000	23000	23000	-48%	0%
Chromium VI	X		18540-29-9	2022				87	11	2.3	-97%	-79%
Copper	X		7440-50-8	2016	110	120	9%	100	2200	2200	2100%	0%
Cyanide		X	57-12-5	2016	7.1	7.3	3%	60	13	13	-78%	0%
Lead	X		7439-92-1	2022				300	300	200	-33%	-33%
Manganese		X	7439-96-5	2022				3600	2100	730	-80%	-65%
Mercury (inorganic)	X		7439-97-6	2022				0.5	3.1	2.7	440%	-13%
Nickel	X		various	2016	250	260	4%	560	170	170	-70%	0%
Selenium	X		7782-49-2	2022				160	77	78	-51%	1%
Zinc (except zinc phosphide)	X		7440-66-6	2022				8700	4600	4700	-46%	2%
Per- and Polyfluoroalkyl Substances												
Perfluorobutanesulfonic acid (PFBS)			375-73-5	2022						1.1		
Perfluorobutanoic acid (PFBA)			375-22-4	2022				77		49	-36%	
Perfluorooctanesulfonic acid (PFOS)			1763-23-1	2019				2.1	0.041	0.041	-98%	0%
Perfluorooctanoic acid (PFOA)			335-67-1	2019				2.1	0.24	0.24	-89%	0%
Perfluorohexanesulfonic acid (PFHxS)			355-46-4	2019					0.13	0.13		0%
Perfluorohexanoic acid (PFHxA)			307-24-4	2022						1.9		
Polycyclic Aromatic Hydrocarbons												
Acenaphthene		X	83-32-9	2022				1200	450	460	-62%	2%
Anthracene		X	120-12-7	2021				7880	2800	2800	-64%	0%
Benzo[a]pyrene (BaP equivalents)		X	50-32-8	2019				2	2	2	0%	0%
Fluorene		X	86-73-7	2021				850	390	390	-54%	0%
Naphthalene		X	91-20-3	2016				81	81	710%	0%	
Pyrene		X	129-00-0	2021				890	220	220	-75%	0%
Quinoline		X	91-22-5	2016				4	1.4	1.4	-65%	0%
Polychlorinated Biphenyls												
PCBs (Polychlorinated Biphenyls)	X		1336-36-3	2022				1.2	0.81	0.82	-32%	1%
Pesticides												
Aldrin		X	309-00-2	2016				1	0.45	0.45	-55%	0%
Chlordane		X	12789-03-6	2022				13	9.5	9.6	-26%	1%
4,4-DDD (Dichlorodiphenyldichloroethane)		X	72-54-8	2016				56	19	19	-66%	0%
4,4-DDE		X	72-55-9	2022				40	22	23	-43%	5%
4,4-DDT		X	50-29-3	2022				15	7.3	7.4	-51%	1%
Dieldrin		X	60-57-1	2016				0.8	0.11	0.11	-86%	0%
Endrin		X	72-20-8	2016				8	4	4	-50%	0%
Heptachlor		X	76-44-8	2016				2	1.6	1.6	-20%	0%
gamma-Hexachlorocyclohexane (gamma-BHC, Lindane)		X	58-89-9	2022				9	4.3	0.15	-98%	-97%
Toxaphene		X	8001-35-2	2022				13	4.1	1.2	-91%	-71%
Dioxins and Furans												
TCDD (2,3,7,8-) (2,3,7,8 TCDD equivalents, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)		X	1746-01-6	2021				0.00002	0.000007	0.000007	-65%	0%

* Acute SRV = Acute SRVs are published for select parameters. No Acute SRVs were established in 2009.

X = Baseline and Additional Sediment Parameter Lists from Managing Dredge Materials in the State of Minnesota. wq-gen2-01. April, 2014. <https://www.pca.state.mn.us/sites/default/files/wq-gen2-01.pdf>

See the MPCA SRV spreadsheet for a complete list of SRVs and detailed footnotes. <https://www.pca.state.mn.us/sites/default/files/c-r1-06.xlsx>

Table 2
Summary of MPCA Commercial/Industrial Soil Reference Value Revisions, 2009 - 2022
Sediment Parameter List and PFAS

Chemical	CAS No.	SRV Revision Year	Baseline Sediment Parameter List	Additional Sediment Parameter List	2009 Industrial SRV (mg/kg)	2021 Com/Ind Chronic SRV (mg/kg)	2022 Com/Ind Chronic SRV (mg/kg)	Comparison of 2022 SRV to 2009 SRV (% change)	Comparison of 2022 SRV to 2021 SRV (% change)
Inorganics									
Arsenic	7440-38-2	2016	X		20	9	9	-55%	0%
Barium	7440-39-3	2021		X	18000	41000	41000	128%	0%
Cadmium	7440-43-9	2016	X		200	23	23	-89%	0%
Chromium III	16065-83-1	2016	X		100000	100000	100000	0%	0%
Chromium VI	18540-29-9	2021	X		650	62	62	-90%	0%
Copper	7440-50-8	2016	X		9000	33000	33000	267%	0%
Cyanide	57-12-5	2016		X	5000	190	190	-96%	0%
Lead	7439-92-1	2022	X		700	700	460	-34%	-34%
Manganese	7439-96-5	2022		X	8100	26000	10000	23%	-62%
Mercury (inorganic)	7439-97-6	2016	X		1.5	3.1	3.1	107%	0%
Nickel	various	2016	X		2500	2600	2600	4%	0%
Selenium	7782-49-2	2016	X		1300	1200	1200	-8%	0%
Zinc (except zinc phosphide)	7440-66-6	2016	X		75000	70000	70000	-7%	0%
Per- and Polyfluoroalkyl Substances									
Perfluorobutanesulfonic acid (PFBS)	375-73-5	2022				77	15		-81%
Perfluorobutanoic acid (PFBA)	375-22-4	2022			500	280	250	-50%	-11%
Perfluorooctanesulfonic acid (PFOS)	1763-23-1	2022			14	0.56	0.54	-96%	-4%
Perfluorooctanoic acid (PFOA)	335-67-1	2022			13	3.2	3	-77%	-6%
Perfluorohexanesulfonic acid (PFHxS)	355-46-4	2022				1.7	1.6		-6%
Perfluorohexanoic acid (PFHxA)	307-24-4	2022					24		
Polycyclic Aromatic Hydrocarbons									
Acenaphthene	83-32-9	2021		X	5260	6800	6800	29%	0%
Anthracene	120-12-7	2021		X	45400	42000	42000	-7%	0%
Benzo[a]pyrene (BaP equivalents)	50-32-8	2019		X	3	23	23	667%	0%
Fluorene	86-73-7	2021		X	4120	5800	5800	41%	0%
Naphthalene	91-20-3	2021		X	28	280	280	900%	0%
Pyrene	129-00-0	2021		X	5800	3200	3200	-45%	0%
Quinoline	91-22-5	2016		X	7	7.8	7.8	11%	0%
PCBs (Polychlorinated Biphenyls)	1336-36-3	2016	X		8	10	10	25%	0%
Pesticides									
Aldrin	309-00-2	2021		X	2	2.6	2.6	30%	0%
Carbazole	86-74-8	2016		X	1310	1300	1300	-1%	0%
4,4-DDD (Dichlorodiphenyldichloroethane)	72-54-8	2016		X	125	100	100	-20%	0%
4,4-DDE	72-55-9	2021		X	80	130	130	63%	0%
4,4-DDT	50-29-3	2021		X	88	87	87	-1%	0%
Dieldrin	60-57-1	2016		X	2	1.5	1.5	-25%	0%
Endrin	72-20-8	2016		X	56	54	54	-4%	0%
Heptachlor	76-44-8	2021		X	3.5	8.9	8.9	154%	0%
gamma-Hexachlorocyclohexane (gamma-BHC, Lindane)	58-89-9	2022		X	15	25	2.1	-86%	-92%
Toxaphene	8001-35-2	2022		X		23	16		-30%
Dioxins and Furans									
TCDD (2,3,7,8-) (2,3,7,8 TCDD equivalents, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)	1746-01-6	2021		X	0.000035	0.000028	0.000028	-20%	0%

X = Baseline and Additional Sediment Parameter Lists from Managing Dredge Materials in the State of Minnesota. wq-gen2-01. April, 2014. <https://www.pca.state.mn.us/sites/default/files/wq-gen2-01.pdf>
See the MPCA SRV spreadsheet for a complete list of SRVs and detailed footnotes. <https://www.pca.state.mn.us/sites/default/files/c-r1-06.xlsx>

Table 2 Minnesota River Sediment Chemical Data* Lower Minnesota River Watershed District													
			Record #			78507	402	301	302	303	78506	401	404
			River Mile			14.7	14.6	14.52	14.51	14.5	14.5	14.4	13.4
			Location			Above Savage RR Bridge	Above Savage RR Bridge	Above Savage RR Bridge	Above Savage RR Bridge	Above Savage RR Bridge	Above Savage RR Bridge	Above Savage RR Bridge	AB & BLW CARGILL
			Year			1999	1989	1982	1982	1978	1999	1989	1989
			MN Soil Leaching Values (June 2013)	MN Acute Residential/ Recreational SRVs (April 2022)	MN Chronic Residential SRVs (April 2022)								
Criteria Exceedance Key			Bold	No Exceedances	Shaded								
CHC's	ug/kg	a-BHC			700	< 0.08	< 0.01				< 0.08	< 0.08	< 0.07
	ug/kg	b-BHC			2500	< 0.08	< 0.2				< 0.08	< 0.16	< 0.15
	ug/kg	BHC				< 0.08	< 0.3				< 0.08	< 0.24	< 0.22
	ug/kg	2,4'-DDD											
	ug/kg	2,4'-DDE											
	ug/kg	2,4'-DDT											
	ug/kg	g-BHC (lindane)			150	< 0.08	< 0.13				< 0.08	< 0.11	< 0.1
	ug/kg	Heptachlor			1600	< 0.10	< 0.1				< 0.10	< 0.08	< 0.07
	ug/kg	Anthracene	1300000		2800000								
	ug/kg	Aldrin			450		< 0.13					< 0.11	< 0.1
	ug/kg	Acenaphthene	81000		460000								
	ug/kg	Acenaphthylene											
	ug/kg	Benz(a)anthracene											
	ug/kg	Benzo(a)pyrene	1400		2000								
	ug/kg	Heptachlorepoide			280	< 0.12	< 0.17				< 0.12	< 0.13	< 0.12
	ug/kg	Benzo(g,h,i)perylene											
	ug/kg	Benzo(b)fluoranthene											
	ug/kg	Benzo(k)fluoranthene											
	ug/kg	Endosulfan I					< 0.17					< 0.13	< 0.12
	ug/kg	Dieldrin			110	< 0.04	< 0.17	< 0.1	< 0.1	< 1	< 0.04	< 0.13	< 0.12
	ug/kg	4,4'-DDE			23000	< 0.04	< 0.13	< 0.1	< 0.1		< 0.04	< 0.11	< 0.1
	ug/kg	Endrin			4000	< 0.06	< 0.3	< 0.1	< 0.1	< 1	< 0.06	< 0.24	< 0.22
	ug/kg	Endosulfan II					< 0.33					< 0.26	< 0.25
	ug/kg	4,4'-DDD			19000	< 0.06	< 0.36	< 0.1	< 0.1		< 0.06	< 0.29	< 0.27
	ug/kg	Endrinaldehyde					< 0.36					< 0.29	< 0.27
	ug/kg	Endosulfan sulfate					< 0.36					< 0.29	< 0.27
	ug/kg	4,4'-DDT			7400	< 0.18	< 0.43	< 0.1	< 0.1	< 4	< 0.18	< 0.34	< 0.32
	ug/kg	Methoxychlor					< 0.73					< 0.58	< 0.55
	ug/kg	Endrinetone					< 0.36					< 0.29	< 0.27
	ug/kg	alpha-Chlordane			9600								
	ug/kg	Chlorodane			9600	< 0.20	< 1.98	< 1	< 1		< 0.20	< 1.58	< 1.49
	ug/kg	gamma-Chlordane			9600								
	ug/kg	Oxychlordane				< 0.20					< 0.20		
	ug/kg	Fluoranthene	670000		210000								
	ug/kg	Toxaphene			1200		< 1.98					< 1.58	< 1.49
	ug/kg	Hexachlorobenzene			220								
	ug/kg	Pyrene	440000		220000								
METALS	mg/kg	Ag (silver)	7.9		78								
	mg/kg	Al (aluminum)			19000								
	mg/kg	As (arsenic)	5.8	9	9	1.30	< 1.2	1.6	2.2	2.54	1.81	< 1.2	1.6
	mg/kg	B (boron)	62		3100								
	mg/kg	Ba (barium)	1700	260	3100								
	mg/kg	Be (beryllium)	2.7		31								
	mg/kg	Cd (cadmium)	8.8	9.1	1.6	< 0.03	< 1.3	< 0.2	< 0.19	1.18	< 0.03	< 1.3	< 1.3
	mg/kg	Cr (chromium)	36		23000	3.25	3.8	3.9	4.2	28.7	3.82	4.3	5
	mg/kg	Cu (copper)	700	120	2200	1.72	8.7	2.9	3.3	12	2.04	13.3	4.8
	mg/kg	Fe (iron)			29000			4300	5500	10700			
	mg/kg	Hg (mercury)	3.3		2.7	0.0065	< 0.01	0.015	0.0165	0.031	0.0069	< 0.01	< 0.01
	mg/kg	Mg (magnesium)											
	mg/kg	Mn (manganese)	130		730	143	254			419	931	263	232
	mg/kg	Mo (molybdenum)	16		78								
	mg/kg	Ni (nickel)	180	260	170	6.14	7.5	7	7	16.7	8.27	< 6.4	7
	mg/kg	Pb (lead)	2700		200	5.0	4.4	4	4.4	44	6.3	4.6	3.6
	mg/kg	Sb (antimony)	5.4		6.3								
	mg/kg	Se (selenium)	2.6		78		< 0.92					< 0.93	< 0.93
	mg/kg	Sn (tin)	20000		4700								
	mg/kg	Sr (strontium)	2800		6700								
	mg/kg	Ti (titanium)			40000								
	mg/kg	Zn (zinc)	3000		4700	9.47					12.3		
	mg/kg	V (vanadium)	4		62								
	mg/kg	Chromium, Hexavalent	36		2.3								
PCB's	ug/kg	Aroclor-1016				< 0.24	< 1.98				< 0.24	< 1.58	< 1.49
	ug/kg	Aroclor-1221				< 0.28	< 1.98				< 0.28	< 1.58	< 1.49
	ug/kg	Aroclor-1232				< 0.26	< 1.98				< 0.26	< 1.58	< 1.49
	ug/kg	Aroclor-1242				< 0.32	< 1.98				< 0.32	< 1.58	< 1.49
	ug/kg	Aroclor-1248				< 0.22	< 1.98				< 0.22	< 1.58	< 1.49
	ug/kg	Aroclor-1254				< 0.34	< 4.13				< 0.34	< 3.3	< 3.1
	ug/kg	Aroclor-1260				< 0.32	< 4.13				< 0.32	< 3.3	< 3.1
	ug/kg	Total PCB's	130		820								
PARTICLE SIZE %FINER	SAND	coarse	3 in							100			
			1 1/2					100	100	100			
			3/4					100	100	100			
			3/8					100	100	100			
			4			100.0	100	100	100	100	99.9456	100	
			8				100	100					
			10			99.8				98	99.7595	99.9211	
		medium	16			99.5	100	100		94	99.3005	99.3583	
			20										
			30		100	98.5	100	100		88	93.9681	92.8675	
			40		98		100	99					
			50			98.5	98	96			93.9681	92.8675	
			60		80					48			
			70				87	79					
	fine	80			84.8					83.0929	68.9342		
		100		16	13.5	58	50		10	10.3533	14.5539		
		140		7	8.5				50	6.36015858	9.9257696		
		200		2	4.8	31	36	34	2	4.39382985	7.18111026		
		270		1	4.5	25	32		1	2.93210559	5.17041208		
	SILT	clay	0.20 mm			3.5	11	19			2.14905649	3.62252512	
			0.05 mm			2.1	5	8	21		1	2.09050416	
			Total Organic Carbon										
Total Organic Carb					0.04	0.4				0.03	0.91	1.13	
Chem Oxy Demand							10000	10580	19700				
Kjedahl Nitrogen							440	520	740				
MISC	mg/kg	Phosphorus (as P)				290	230	561					
	mg/kg	Oil and Grease											
	mg/kg	Cyanide, Total	20	7.3	13	< 0.20				< 0.20			
	mg/kg	Ammonia											
	mg/kg	Ammonia Elutriate											
	%	Moisture				0.2				0.2			
	%	Total Solids				99.8				99.8			
	gVS/gTS	Total Volatile Solids											
	%	Volatile Solids				0.41				0.54			
	mg/kg	Phenolics, Total											

* Data table reproduced from Cargill East River (MN – 14.2 RMP) Dredge Material Site Management Plan, Lower Minnesota River Watershed District, Appendix A: Chemical Analyses Data for the Minnesota River.

Table 3 Minnesota River Sediment Chemical Data* Lower Minnesota River Watershed District												
				Record #	304	305	403		78505	306	405	78504
				River Mile	13.21	13.2	13.2	12.9	12.5&12.6	12.5	12.4	12.3
				Location	AB & BLW CARGILL	AB & BLW CARGILL	AB & BLW CARGILL	Cargill	Cargill Slip	AB&BW PETERSON BAR	AB&BW PETERSON BAR	Peterson's Bar
				Year	1979	1979	1989	10/17/2007	1999	1980	1989	1999
				MN Soil Leaching Values (June 2013)	MN Acute Residential/ Recreational SRVs (April 2022)	MN Chronic Residential SRVs (April 2022)						
Criteria Exceedance Key				Bold	No Exceedances	Shaded						
CHC's	ug/kg		a-BHC			700		< 0.11	< 0.08		< 0.07	< 0.08
	ug/kg		b-BHC			2500		< 0.21	< 0.08		< 0.14	< 0.08
	ug/kg		BHC					< 0.32	< 0.08		< 0.22	< 0.08
	ug/kg		2,4'-DDD					< 4				
	ug/kg		2,4'-DDE					< 4				
	ug/kg		2,4'-DDT					< 4				
	ug/kg		g-BHC (lindane)			150		< 0.14	< 0.08		< 0.1	< 0.08
	ug/kg		Heptachlor			1600		< 0.11	< 0.10		< 0.07	< 0.10
	ug/kg		Anthracene	1300000		2800000		< 0.79				
	ug/kg		Aldrin			450		< 0.14			< 0.1	
	ug/kg		Acenaphthene	81000		460000		< 0.71				
	ug/kg		Acenaphthylene					< 1.0				
	ug/kg		Benz(a)anthracene					1.8				
	ug/kg		Benzo(a)pyrene	1400		2000		1.7				
	ug/kg		Heptachlorepoxide			280		< 0.18	< 0.12		< 0.12	< 0.12
	ug/kg		Benzo(g,h,i)perylene					1.6				
	ug/kg		Benzo(b)fluoranthene					3.1				
	ug/kg		Benzo(k)fluoranthene					0.94				
	ug/kg		Endosulfan I					< 0.18			< 0.12	
	ug/kg		Dieldrin			110	0	< 0.18	< 3.2	< 0.04	0	< 0.12
	ug/kg		4,4'-DDE			23000	0	< 0.14	< 3.5	< 0.04	0	< 0.1
	ug/kg		Endrin			4000	0	< 0.32	< 0.06	< 0.06	0	< 0.22
	ug/kg		Endosulfan II					< 0.35			< 0.24	
	ug/kg		4,4'-DDD			19000	0	< 0.39	< 3.7	< 0.06	0	< 0.26
	ug/kg		Endrinaldehyde					< 0.39			< 0.26	
	ug/kg		Endosulfan sulfate					< 0.39			< 0.26	
	ug/kg		4,4'-DDT			7400	0	< 0.46	< 4.2	< 0.18	0	< 4.8
	ug/kg		Methoxychlor					< 0.77			< 0.53	
	ug/kg		Endrinketone					< 0.39			< 0.26	
	ug/kg		alpha-Chlordane			9600			< 1.7			
	ug/kg		Chlorodane			9600	0	< 2.11	< 0.20	0	< 1.44	< 0.20
	ug/kg		gamma-Chlordane			9600			< 1.6			
	ug/kg		Oxychlordane						< 0.20			< 0.20
	ug/kg		Fluoranthene	670000		210000		5				
	ug/kg		Toxaphene			1200		< 2.11			< 1.44	
	ug/kg		Hexachlorobenzene			220		< 2				
	ug/kg		Pyrene	440000		220000		4.3				
METALS	mg/kg		Ag (silver)	7.9		78						
	mg/kg		Al (aluminum)			19000						
	mg/kg		As (arsenic)	5.8	9	9	0	2.7	0.97	1.89	0	1.8
	mg/kg		B (boron)	62		3100						
	mg/kg		Ba (barium)	1700	260	3100	40	80		40		
	mg/kg		Be (beryllium)	2.7		31						
	mg/kg		Cd (cadmium)	8.8	9.1	1.6	< 10	< 10	< 1.6	< 1.0	< 10	< 1.2
	mg/kg		Cr (chromium)	36		23000	< 10	< 10	8.1	4.7	3.81	20
	mg/kg		Cu (copper)	700	120	2200	< 10	< 10	15	1.9	2.18	< 10
	mg/kg		Fe (iron)			29000	3800	9700			2600	
	mg/kg		Hg (mercury)	3.3		2.7	0	0	< 0.02	< 0.10	0.0052	0
	mg/kg		Mg (magnesium)								< 0.01	< 0.0048
	mg/kg		Mn (manganese)	130		730	160	720	56.8	218	242	170
	mg/kg		Mo (molybdenum)	16		78					163	154
	mg/kg		Ni (nickel)	180	260	170	< 10	20	9.4	< 0.10	7.92	< 10
	mg/kg		Pb (lead)	2700		200	< 10	20	5.8	2.5	6.3	< 10
	mg/kg		Sb (antimony)	5.4		6.3					3	4.7
	mg/kg		Se (selenium)	2.6		78		< 1.2			< 0.89	
	mg/kg		Sn (tin)	20000		4700						
	mg/kg		Sr (strontium)	2800		6700						
	mg/kg		Ti (titanium)			40000						
	mg/kg		Zn (zinc)	3000		4700			12.1	11.1		8.12
	mg/kg		V (vanadium)	4		62						
	mg/kg		Chromium, Hexavalent	36		2.3			< 5.9			
PCB's	ug/kg		Aroclor-1016					< 2.11	< 50	< 0.24	< 1.44	< 0.24
	ug/kg		Aroclor-1221					< 2.11	< 50	< 0.28	< 1.44	< 0.28
	ug/kg		Aroclor-1232					< 2.11	< 50	< 0.26	< 1.44	< 0.26
	ug/kg		Aroclor-1242					< 2.11	< 50	< 0.32	< 1.44	< 0.32
	ug/kg		Aroclor-1248					< 2.11	< 40	< 0.22	< 1.44	< 0.22
	ug/kg		Aroclor-1254					< 4.4	< 50	< 0.34	< 3	< 0.34
	ug/kg		Aroclor-1260					< 4.4	< 40	< 0.32	< 3	< 0.32
	ug/kg		Total PCB's	130		820						
PARTICLE SIZE %FINER	SAND	coarse	3 in				100	100			100	
			1 1/2				100	100			100	
			3/4				100	100			100	
			3/8				100	100			100	
			4				100	100	99.4659	99.14	99	99.3761
			8								100	
			10				100	100	99.339	64.29	97	98.6943
		medium	16						98.8504		93	100
			20				100	100		84.45		
			30						96.6491		95	83.8046
			40				100	100		66.31	71	99
		fine	50						96.6491			83.8046
			60							33.37	37	
			70									39
			80				92	80	92.6698	6.97		41.9038
			100						42.5172	5.26	6	17.4719
	SILT	clay	140						26.39172056		3	10.74500323
			200				12	46	17.37520712	2.87	1	20
			270						11.90172384			6.81403086
			0.20 mm				5	35	8.54970672		7	4.65926604
			0.05 mm				2	19	4.54007512		2	3.29043663
MISC	mg/kg		Total Organic Carbon						< 85			
	%		Total Organic Carb					1.02		0.03	1.11	0.02
	mg/kg		Chem Oxy Demand			8700	29000			5300		
	mg/kg		Kiedahl Nitrogen			1300	4100		170	1600		
	mg/kg		Phosphorus (as P)			400	510		280			
	mg/kg		Oil and Grease									
	mg/kg		Cyanide, Total	20	7.3	13			< 0.20	< 0.20		< 0.20
	mg/kg		Ammonia						6.5			
	mg/kg		Ammonia Elutriate									
	%		Moisture						25.57	0.2		0.2
	%		Total Solids						74.43	99.8		99.8
	gVS/gTS		Total Volatile Solids						0.013			
	%		Volatile Solids							0.35		0.25
	mg/kg		Phenolics, Total						1.5			

* Data table reproduced from Cargill East River (MN – 14.2 RMP) Dredge Material Site Management Plan, Lower Minnesota River Watershed District, Appendix A: Chemical Analyses Data for the Minnesota River.

Table 3 Minnesota River Sediment Chemical Data* Lower Minnesota River Watershed District												
				Record #	307	78503	406	78502	308		78501	
				River Mile	12	12.0	11.7	11.5	11.4	11.3	11.0	
				Location	AB&BW PETERSON BAR	Peterson's Bar	AB&BW PETERSON BAR	Blw Peterson's Bar	AB&BW PETERSON BAR	Above 35W	Blw Perterson's Bar	
				Year	1975	1999	1989	1999	1980	10/17/2007	1999	
				MN Soil Leaching Values (June 2013)	MN Acute Residential/ Recreational SRVs (April 2022)	MN Chronic Residential SRVs (April 2022)						
Criteria Exceedance Key				Bold	No Exceedances	Shaded						
CHC's	ug/kg		a-BHC			700		< 0.08	< 0.09	< 0.08		< 0.08
	ug/kg		b-BHC			2500		< 0.08	< 0.18	< 0.08		< 0.08
	ug/kg		BHC					< 0.08	< 0.27	< 0.08		< 0.08
	ug/kg		2,4'-DDD							< 4		
	ug/kg		2,4'-DDE							< 4		
	ug/kg		2,4'-DDT							< 4		
	ug/kg		g-BHC (lindane)			150		< 0.08	< 0.12	< 0.08		< 0.08
	ug/kg		Heptachlor			1600		< 0.10	< 0.09	< 0.10		< 0.10
	ug/kg		Anthracene	1300000		2800000				1.4		
	ug/kg		Aldrin			450		< 0.12				
	ug/kg		Acenaphthene	81000		460000				< 0.71		
	ug/kg		Acenaphthylene							< 1.0		
	ug/kg		Benz(a)anthracene							8.4		
	ug/kg		Benzo(a)pyrene	1400		2000				9.8		
	ug/kg		Heptachlorepoide			280		< 0.12	< 0.15	< 0.12		< 0.12
	ug/kg		Benzo(g,h,i)perylene							6.2		
	ug/kg		Benzo(b)fluoranthene							19		
	ug/kg		Benzo(k)fluoranthene							5.6		
	ug/kg		Endosulfan I					< 0.15				
	ug/kg		Dieldrin			110		< 0.04	< 0.15	< 0.04	0.5	< 3.2
	ug/kg		4,4'-DDE			23000		< 0.04	< 0.12	< 0.04	0	< 3.5
	ug/kg		Endrin			4000		< 0.06	< 0.27	< 0.06	0	< 0.06
	ug/kg		Endosulfan II						< 0.3			
	ug/kg		4,4'-DDD			19000		< 0.06	< 0.33	< 0.06	0.8	< 3.7
	ug/kg		Endrinaldehyde						< 0.33			
	ug/kg		Endosulfan sulfate						< 0.33			
	ug/kg		4,4'-DDT			7400		< 0.18	< 0.4	< 0.18	0	< 4.2
	ug/kg		Methoxychlor						< 0.67			
	ug/kg		Endrinketone						< 0.33			
	ug/kg		alpha-Chlordane			9600						< 1.7
	ug/kg		Chlorodane			9600		< 0.20	< 1.82	< 0.20	1	< 0.20
	ug/kg		gamma-Chlordane			9600						< 1.6
	ug/kg		Oxychlordane					< 0.20		< 0.20		< 0.20
	ug/kg		Fluoranthene	670000		210000					26	
	ug/kg		Toxaphene			1200			< 1.82			
	ug/kg		Hexachlorobenzene			220					< 2	
	ug/kg		Pyrene	440000		220000					21	
METALS	mg/kg		Ag (silver)	7.9		78						
	mg/kg		Al (aluminum)			19000						
	mg/kg		As (arsenic)	5.8	9	9	0.83	1.43	3.2	1.13	0	1.2
	mg/kg		B (boron)	62		3100						
	mg/kg		Ba (barium)	1700	260	3100					60	
	mg/kg		Be (beryllium)	2.7		31						
	mg/kg		Cd (cadmium)	8.8	9.1	1.6	< 0.1	< 0.03	< 1.6	< 0.03	< 10	< 1.0
	mg/kg		Cr (chromium)	36		23000	7	3.30	7.1	3.07	10	5.3
	mg/kg		Cu (copper)	700	120	2200	2.8	1.67	12.1	2.17	< 10	2.5
	mg/kg		Fe (iron)			29000					5200	
	mg/kg		Hg (mercury)	3.3		2.7	0.13	< 0.0048	< 0.02	< 0.0048	0	< 0.10
	mg/kg		Mg (magnesium)									0.0058
	mg/kg		Mn (manganese)	130		730		235	59.3	160	660	203
	mg/kg		Mo (molybdenum)	16		78						357
	mg/kg		Ni (nickel)	180	260	170		7.32	11.5	6.54	10	4.7
	mg/kg		Pb (lead)	2700		200	< 0.1	5.8	11.6	6.4	10	2.5
	mg/kg		Sb (antimony)	5.4		6.3						9.2
	mg/kg		Se (selenium)	2.6		78			2.2			
	mg/kg		Sn (tin)	20000		4700						
	mg/kg		Sr (strontium)	2800		6700						
	mg/kg		Ti (titanium)			40000						
	mg/kg		Zn (zinc)	3000		4700		9.29		8.53		13.6
	mg/kg		V (vanadium)	4		62						19.3
	mg/kg		Chromium, Hexavalent	36		2.3						< 5.8
PCB's	ug/kg		Aroclor-1016					< 0.24	< 1.82	< 0.24		< 50
	ug/kg		Aroclor-1221					< 0.28	< 1.82	< 0.28		< 50
	ug/kg		Aroclor-1232					< 0.26	< 1.82	< 0.26		< 50
	ug/kg		Aroclor-1242					< 0.32	< 1.82	< 0.32		< 50
	ug/kg		Aroclor-1248					< 0.22	< 1.82	< 0.22		< 40
	ug/kg		Aroclor-1254					< 0.34	< 3.8	< 0.34		< 50
	ug/kg		Aroclor-1260					< 0.32	< 3.8	< 0.32		< 40
	ug/kg		Total PCB's	130		820						< 0.32
PARTICLE SIZE %FINER	SAND	coarse	3 in				100				100	
			1 1/2				100				100	
			3/4				100				100	
			3/8				100				100	
			4				99	100	100		100	100
		medium	8				95				100	
			10					97	99.9173	100		99.89
			16				84	92	99.6276	99	100	
			20									99.04
			30					84	98.5519	98		
	SILT	fine	40				41	76		94	98	95.1
			50						98.5519			
			60					37		38		64.79
			70									54
			80						81.6715			27.25
		clay	100			6	4		52.1307		83	21.89
			140				1	40.47394665		2		21
			200			2			26.9826311	1	70	13.16
			270						17.59732573			7
			0.20 mm						13.27129692		33	
			0.05 mm						9.16528674		18	
MISC	mg/kg		Total Organic Carbon								< 84	
	%		Total Organic Carb									0.18
	mg/kg		Chem Oxy Demand			1950		0.01	1.2	0.02		
	mg/kg		Kiedahl Nitrogen								31000	
	mg/kg		Phosphorus (as P)								3700	300
	mg/kg		Oil and Grease									270
	mg/kg		Cyanide, Total	20	7.3	13		< 0.20		< 0.20		< 0.20
	mg/kg		Ammonia									16
	mg/kg		Ammonia Elutriate									
	mg/l		Moisture									
	%		Total Solids					0.2		0.1		24.88
	%		Total Volatile Solids					99.8		99.9		75.12
	gVS/gTS		Volatile Solids									0.013
	%		Phenolics, Total					0.49		0.29		0.95
	mg/kg											6.2

* Data table reproduced from Cargill East River (MN – 14.2 RMP) Dredge Material Site Management Plan, Lower Minnesota River Watershed District, Appendix A: Chemical Analyses Data for the Minnesota River.

Peterson Farms Land Bank

2024 Monitoring Report

Hennepin, Carver, and Scott Counties, MN

Local Governmental Unit

City of Eden Prairie
Attn: Lori Haak

Coe Representative

U.S. Army Corps of Engineers
Saint Paul District
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February 14, 2025

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Sign-off Sheet

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Table of Contents

1	Project Summary.....	ii
2	Hydrology Monitoring.....	5
2.1	Methods	5
2.2	Results	5
2.2.1	Area 3 - Existing Floodplain Forest Wetland.....	5
2.2.2	Area 4 - Proposed Floodplain Forest Wetland.....	6
2.2.3	Area 5 - Existing Partially Drained Deep Marsh Wetland	7
2.2.4	Area 6 - Proposed Floodplain Forest Without Buffer	7
3	Vegetative Monitoring.....	9
3.1	Methods	9
3.2	Results	9
3.3	Graded Areas.....	15
3.4	Invasive Species	16
3.5	Activities Completed In 2024	16
3.6	Credit Release Summary And Request	16

List of Tables

Table 1. Credit Release Schedule	iii
Table 2. Performance Standards	1
Table 3. Monitoring Well Elevations and Number of Consecutive Days Inundated – Area 4	6
Table 4. Hydrology Performance Summary	7
Table 5. Vegetation Monitoring Plots Shrub and Tree Stratum Stem Counts per Acre	10
Table 6. Dominant Vegetation Observed in Graded Areas	15



1 Project Summary

The goal of this project is to restore the functions of a floodplain forest wetland system that totals 169.2 acres, enhance 4.9 acres of floodplain forest and 4.4 acres of deep marsh wetland, and restore and preserve 38.5 acres of forested upland buffer on a 217-acre tract of land located in the cities of Eden Prairie, Chanhassen, and Shakopee, Minnesota. The legal description of the parcels encumbered includes Section 36 T116N, R23W, Section 1, T115N, R23W, Section 31, T116N, R22W, and Section 6, T115N, R23W in Carver, Hennepin and Scott Counties (**Figure 1**). Actions eligible for credit on this site include restoration of drained wetland areas, restoration of drained farmed wetlands, wetland enhancement and preservation/establishment of upland buffers. Plant communities to be restored include floodplain forest and deep marsh.

Total projected credits of the wetland bank are 137.6150 acres per the final Corps Mitigation Banking Instrument (MBI).

Construction on the site was completed in February 2024. The initial release of credits was approved by the Wetland Conservation Act Technical Evaluation Panel and by the U.S. Army Corps of Engineers (ACOE) in early July 2024. At the end of June 2024, wetter than normal conditions led to the Minnesota River reaching major flood stage, resulting in extensive flooding at the project site. Portions of the site were under 18 feet of water and access was only attainable by boat. June 2024 was so wet that many weather observation stations in Minnesota recorded it as their all-time wettest month.

The design approach essentially restores historic hydrology by eliminating drainage features to retain hydrology and provide a range of hydrologic regimes. **Table 1** below is a summary of the projected credit releases that uses crediting and acreage information from the Corps MBI and also includes the applicable credit action per Minnesota Rules 8420.0526. The “Map ID Area” referred to in the below table is depicted on **Figure 2** of this Wetland Monitoring Report.



Peterson Farms Land Bank
2024 Monitoring Report
Project Summary
February 2025

Table 1. Credit Release Schedule

Map ID (See Figure 2)	Restored Wetland Community Type (Wetland Area)	Total Project-ed Acreage	Type of Wetland Credit (Credit Action per Minn. Rules 8420.0526)	Credit %	Final Projected Credits	Initial Release (15%)	Hydrology Per- formance Standards (release of additional 35% of total projected credits)	Interim 1 Vegetation Per- formance Standards (release of additional 15%)	Interim 2 Vegetation Per- formance Standards (release of additional 15%)	Final Vegetation Performance Standards & Approval of Final Wetland Delineation Report ⁴ (final release)
Area 1 Existing Floodplain Forest Upland Buffer	Floodplain Forest	1.8	Subp. 2A – Buffer	25.0	0.4500	0.0675	0.0900	0.1125	0.0900	0.0900
Area 2 Proposed Floodplain Forest Upland Buffer	Floodplain Forest	36.7	Subp. 2A – Buffer	25.0	9.1750	1.3763	1.8350	2.2938	1.8350	1.8349
Area 3 Existing Floodplain Forest Wetland	1-Floodplain Forest	4.9	Rehabilita- tion (RCA) (Subp. 2A – Buffer)	10.0	0.4900	0.0735	0.0980	0.1225	0.0980	0.098
Area 4 Proposed Floodplain Forest Wetland	1-Floodplain Forest	162.8	CFC	75.0	122.1000 0	18.3150	24.4200	30.5250	24.4200	24.4200
Area 5 Existing Partially Drained Deep Marsh Wetland	4 – Deep Marsh	4.4	Rehabilita- tion (Subp. 4B)	50.0	2.2000	0.3300	0.4400	0.5500	0.4400	0.4400
Area 6 Proposed Floodplain Forest Wetland Without Upland Buffer	1-Floodplain Forest	6.4	CFC	50.0	3.2000	0.4800	0.6400	0.8000	0.6400	0.6400
Total		217.0			137.6150	20.6423	27.5230	34.4038	27.5230	27.5229



Table 2 below includes the specific performance criteria required for eligibility of credit releases per the Final Mitigation Plan (Full Application).

Table 2. Performance Standards

Map ID	Initial Release (15%)	Hydrology Standard Release (20%)	Vegetation Interim Standard 1 Release (25%)	Vegetation Interim Standard 2 Release (20%)	Final Release (20%)
Area 1 Existing Floodplain Forest Upland Buffer	Approval of MBI, conservation easement recorded, approval of as-built plans, certification of construction	<u>NA</u>	No Vegetation Release may occur before approval of Hydrology Release. <30% cover by woody non-native/invasive species. <10% unvegetated areal coverage. Species richness shall consist of 6 or more native, non-invasive species across all strata.	No Vegetation Release may occur before approval of Hydrology Release. <25% cover by woody non-native/invasive species. <8% unvegetated areal coverage. Species richness shall consist of 8 or more native, non-invasive species across all strata.	No Vegetation Release may occur before approval of Hydrology Release. <20% cover by woody non-native/invasive species. <5% unvegetated areal coverage. Species richness shall consist of 10 or more native, non-invasive species across all strata.
Area 2 Proposed Floodplain Forest Upland Buffer	Approval of MBI, conservation easement recorded, approval of as-built plans, certification of construction	<u>NA</u>	No Vegetation Release may occur before approval of Hydrology Release. >300 live, NNI tree seedlings per acre for ≥2 growing seasons. <10% unvegetated areal coverage. Species richness shall consist of 6 or more native, non-invasive species across all strata.	No Vegetation Release may occur before approval of Hydrology Release. >250 live, NNI tree seedlings per acre >4 feet in height for ≥2 growing seasons, assuming Interim 1 was met. <8% unvegetated areal coverage. Species richness shall consist of 8 or more native, non-invasive species across all strata.	No Vegetation Release may occur before approval of Hydrology Release. >200 live, NNI tree seedlings per acre >6 feet in height for ≥3 growing seasons, assuming Interim 2 was met. <5% unvegetated areal coverage. Species richness shall consist of 10 or more native, non-invasive species across all strata.



Peterson Farms Land Bank
2024 Monitoring Report
Project Summary
February 2025

Map ID	Initial Release (15%)	Hydrology Standard Release (20%)	Vegetation Interim Standard 1 Release (25%)	Vegetation Interim Standard 2 Release (20%)	Final Release (20%)
Area 3 Existing Floodplain Forest Wetland	Approval of MBI, conservation easement recorded, approval of as-built plans, certification of construction	Hydrology shall consist of inundation for a minimum of 14 consecutive days during the growing season under normal and wetter than normal hydrological conditions for ≥ 2 growing seasons. Duration of inundation shall not exceed 28 consecutive days for a single flood event except: (1) during wetter than normal hydrological conditions; and (2) side channels and other depressional areas can have standing water for extended duration.	No Vegetation Release may occur before approval of Hydrology Release. <30% cover by non-native/invasive species. <10% unvegetated areal coverage. Species richness shall consist of 6 or more native, non-invasive species across all strata.	No Vegetation Release may occur before approval of Hydrology Release. <25% cover by non-native/invasive species. <8% unvegetated areal coverage. Species richness shall consist of 8 or more native, non-invasive species across all strata.	No Vegetation Release may occur before approval of Hydrology Release. <20% cover by non-native/invasive species. <5% unvegetated areal coverage. Species richness shall consist of 10 or more native, non-invasive species across all strata.
Areas 4 and 6 Proposed Floodplain Forest Wetland	Approval of MBI, conservation easement recorded, approval of as-built plans, certification of construction	Hydrology shall consist of inundation for a minimum of 14 consecutive days during the growing season under normal and wetter than normal hydrological	No Vegetation Release may occur before approval of Hydrology Release. After construction is completed: >300 live, NNI tree seedlings per acre for ≥ 2	No Vegetation Release may occur before approval of Hydrology Release. After construction is completed: >250 live, NNI tree seedlings per acre >4 feet in	No Vegetation Release may occur before approval of Hydrology Release. After construction is completed: >200 live, NNI tree seedlings per acre with a height of ≥ 6.0 feet for ≥ 3 growing seasons, assuming Interim 2



Peterson Farms Land Bank
2024 Monitoring Report
Project Summary
February 2025

Map ID	Initial Release (15%)	Hydrology Standard Release (20%)	Vegetation Interim Standard 1 Release (25%)	Vegetation Interim Standard 2 Release (20%)	Final Release (20%)
		conditions for ≥2 growing seasons. Duration of inundation shall not exceed 28 consecutive days for a single flood event except: (1) during wetter than normal hydrological conditions; and (2) side channels and other depressional areas can have standing water for extended duration. On-site wells that are within plus or minus 20 percent of the number of days of inundation at Monitoring Well #18 will be determined to meet hydrology.	growing seasons. Minimum 60% relative cover by hydrophytes. 60% relative cover by at least 2 native/non-invasive species. <30% cover by non-native/invasive species. <10% unvegetated areal coverage. Species richness shall consist of 6 or more native, non-invasive species across all strata.	height for ≥2 growing seasons, assuming Interim 1 was met. Minimum 70% relative cover by hydrophytes. 70% relative cover by at least 2 native/non-invasive species. <25% cover by non-native/invasive species. <8% unvegetated areal coverage. Species richness shall consist of 8 or more native, non-invasive species across all strata.	was met. Minimum 80% relative cover by hydrophytes. Minimum 80% relative cover by at least 2 native/non-invasive species. <20% cover by non-native/invasive species. <5% unvegetated areal coverage. Species richness shall consist of 10 or more native, non-invasive species across all strata.
Area 5 Existing Partially Drained Deep Marsh Wetland	Approval of MBI, conservation easement recorded, approval of as-built plans, certification of construction	Hydrology shall consist of 6 to 48 inches in depth throughout the growing season for ≥2 growing seasons with the exception of drought conditions.	No Vegetation Release may occur before approval of Hydrology Release. Minimum 60% relative cover by hydrophytes, 50% relative cover by at least 3 native/non-	No Vegetation Release may occur before approval of Hydrology Release. Minimum 70% relative cover by hydrophytes, 60% relative cover by at least 4 native/non-	No Vegetation Release may occur before approval of Hydrology Release. Minimum 80% relative cover by hydrophytes, 70% relative cover by at least 5 native/non-invasive species in areas with emergent vegetation. Absolute



Peterson Farms Land Bank
2024 Monitoring Report
 Project Summary
 February 2025

Map ID	Initial Release (15%)	Hydrology Standard Release (20%)	Vegetation Interim Standard 1 Release (25%)	Vegetation Interim Standard 2 Release (20%)	Final Release (20%)
			invasive species in areas with emergent vegetation. Absolute Cover of Open Water (acreage): Less than 50%	invasive species in areas with emergent vegetation. Absolute Cover of Open Water (acreage): 40% or less	Cover of Open Water (acreage): 30% or less



2 Hydrology Monitoring

2.1 Methods

Following site restoration, 19 monitoring wells were installed at the locations shown on Figure 2 to document hydrology per the Corps document *Technical Standard for Water-Table Monitoring of Potential Wetland Sites* (June 2005). All monitoring wells were installed in Area 4 except one that is in the Deep Marsh Area 5 (Well 17) and one on U.S. FWS property (Well 18) that serves as a reference well in an area of existing floodplain forest wetland.

Hydrology monitoring information was collected with a data logger installed in each well and data was collected from April 15 to October 17, 2024. All of the wells have pressure transducers installed in order to continuously record water levels and provide a continuous record of hydrology data. Transducers were installed for the entire growing season in order to document the presence of wetland hydrology. Precipitation data was obtained using data from the USACE Antecedent Precipitation Tool. Hydrographs were utilized to help determine if hydrology performance standards were being met.

2.2 Results

Precipitation data is provided as **Appendix A**. The antecedent precipitation analysis shows above normal precipitation in June and July before it dropped below normal briefly in late July and back above normal in late August and early September. Drought data was obtained from the National Oceanic and Atmospheric Administration (NOAA) National Integrated Drought Information System (NIDIS). According to the NIDIS, Hennepin, Carver, and Scott Counties were abnormally dry in early April and late September and in a moderate drought starting in October of 2024. The hydrograph results are provided as **Appendix B**.

The hydrograph for the Minnesota River near Jordan, MN indicated the Minnesota River was at major flood stage for 4 days, moderate flood stage for 9 days, minor flood stage for 21 days and action stage for 50 days during the monitoring period.

A reference well (Well 18) located on U.S. FWS property experienced inundation for 52 consecutive days (Table 2 and Appendix B). This well was in place from April 15 to August 30th. It was discovered that the well had been removed by an unknown party sometime after August 30, 2024; however, data loggers captured most of the critical period during the growing season before the well was tampered with.

2.2.1 Area 3 - Existing Floodplain Forest Wetland

Wells 10, 11, 12, and 18 are located west of Area 3 at elevations similar to those throughout Area 3. Well 10 was inundated for 59 consecutive days and Well 11 for 52 consecutive days. This is similar to reference Well 18 which was inundated for 52 consecutive days. Well 12 was inundated for 28 consecutive days



(Table 2). Based on the data from these nearby wells, Area 3 clearly met hydrology criteria standards in 2024.

2.2.2 Area 4 - Proposed Floodplain Forest Wetland

Area 4 is monitored with Wells 1-16, and 19. Table 3 summarizes the number of consecutive days each of these wells was inundated. Wells 4, 8, 12, and 16 at elevations 706' and 707' met the performance standard of inundation not exceeding 28 days. The remaining wells exceeded the 28-day inundation performance standard; however, wetter than normal conditions existed during June and July, extending the period of inundation beyond 28 days in these months as allowed by the performance standard. The wetter than normal conditions raised the Minnesota River to major flood stage in late June and inundation continued as Rice Lake and the Minnesota River slowly receded from flood stage through July. Wells closest to Rice Lake with the lowest ground elevation had the longest consecutive inundation while those further away from Rice Lake and in higher ground elevations had shorter inundation periods, demonstrating the lengthy inundation due to flooding. Due to the wetter than normal conditions and similar inundation records at the reference well, hydrology standards throughout Area 4 should be considered met for 2024.

Table 3. Monitoring Well Elevations and Number of Consecutive Days Inundated – Area 4

Well Number/Elevation (ft)	Number of Consecutive Days Inundated
1 – 701'	80
2 – 703'	54
3 – 705'	30
4 – 707'	26
5 – 701'	78
6 – 703'	55
7 – 705'	46
8 – 707'	26
9 – 700'	81
10 – 702'	59
11 – 704'	52
12 – 706'	28
13 – 700'	83
14 – 702'	63
15 – 704'	53
16 – 706'	28
19 – 705'	67



2.2.3 Area 5 - Existing Partially Drained Deep Marsh Wetland

Area 5 is monitored with Well 17 which is at elevation 701'. This well had water levels from 0.5 to 48 inches for 110 days. Water levels were above 48 inches for an additional 48 days in June and July due to wetter than normal conditions. Reference Well 18 at 703' experienced 30 days of inundation over 48 inches during this time as well. Prior to construction, Area 5 was controlled at an elevation of 700.06 ft by dual 18-inch CMPs. Well 17 maintained a water elevation above 700.06 ft from May 10 until monitoring ended in 2024 (October 17), demonstrating hydrologic improvement and stability. Between mid-July and mid-October, when nearby wells 15 and 16 were no longer inundated, Well 17 maintained an inundation of 0.5 to 48 inches. The hydrograph results demonstrate that performance standards for deep marsh were met for Area 5.

2.2.4 Area 6 - Proposed Floodplain Forest Without Buffer

Area 6 consists of proposed floodplain forest along the west, south and east boundaries of the site where upland buffer is not possible. It is intended to result in similar communities as Area 4 but has a reduced credit allowance due to the lack of an upland buffer. Wells 1, 2, 3, 4, 5, 6, 13, 14, 15, 16, and 19 are physically closest to Area 6 and closely match elevations found in Area 6. Wells 1, 3, 5, and 13 had consecutive inundation (Table 2) beyond the hydrology performance standards of not exceeding 28 days; however, wetter than normal conditions existed during June and July, extending the period of inundation beyond 28 days in these months as allowed by performance standards. As with the rest of the site, inundation from the Minnesota River flooding extended into Area 6 during 2024. Due to the wetter than normal conditions and similar inundation records at the reference well, hydrology standards should be considered met for 2024 in Area 6.

Table 4. Hydrology Performance Summary

Performance Standards	Met in 2024?
Area 3 Existing Floodplain Forest Wetland: Hydrology shall consist of inundation for a minimum of 14 consecutive days during the growing season under normal and wetter than normal hydrological conditions for ≥ 2 growing seasons. Duration of inundation shall not exceed 28 consecutive days for a single flood event except: (1) during wetter than normal hydrological conditions; and (2) side channels and other depressional areas can have standing water for extended duration.	Yes
Area 4 Proposed Floodplain Forest Wetland: Hydrology shall consist of inundation for a minimum of 14 consecutive days during the growing season under normal and wetter than normal hydrological conditions for ≥ 2 growing seasons. Duration of inundation shall not exceed 28 consecutive days for a single flood event except: (1) during wetter than normal hydrological conditions; and (2) side channels and other depressional areas can have standing water for extended duration. On-site wells that are within plus or minus 20 percent of the number of days of inundation at Monitoring Well #18 will be determined to meet hydrology.	Yes



Peterson Farms Land Bank
2024 Monitoring Report
 Hydrology Monitoring
 February 2025

Performance Standards	Met in 2024?
Area 5 Existing Partially Drained Deep Marsh Wetland: Hydrology shall consist of 6 to 48 inches in depth throughout the growing season for ≥ 2 growing seasons with the exception of drought conditions.	Yes
Area 6 Proposed Floodplain Forest Wetland: Hydrology shall consist of inundation for a minimum of 14 consecutive days during the growing season under normal and wetter than normal hydrological conditions for ≥ 2 growing seasons. Duration of inundation shall not exceed 28 consecutive days for a single flood event except: (1) during wetter than normal hydrological conditions; and (2) side channels and other depressional areas can have standing water for extended duration. On-site wells that are within plus or minus 20 percent of the number of days of inundation at Monitoring Well #18 will be determined to meet hydrology.	Yes



3 Vegetative Monitoring

3.1 Methods

Vegetation and general site conditions were assessed on August 28th, 2024 by two teams of Stantec wetland scientists consisting of two people each. Much of the data presented in the report relies on the August 28 field visit. A follow-up visit was made on October 9, 2024 and notes are made in the report where data from that visit were used to aid in determining conformance with performance standards. Species lists and percent areal cover were estimated using sample plots as described in the *Wetland Monitoring and Adaptive Management Plan Peterson Farms Land Bank* (Stantec, November 2023) and as shown in Figure 2. The percent areal coverage of observed vegetation at the 14 Vegetation Monitoring Points per Figure 2 was catalogued by monitoring teams based on herbaceous species within 5 feet of the monitoring point, shrub species within 15 feet of the monitoring point and tree species within 30 feet of the monitoring point. Photos were taken at the 14 monitoring plot locations shown on Figure 2 and are provided in **Appendix C**. Woody stem counts were extrapolated from observed areal coverage at monitoring points and estimated based on a 15-ft. radius for shrubs equivalent to 707 square feet and a 30-ft. radius from the monitoring point for trees which is equivalent to 2,827 square feet as follows:

Shrubs (based on an area of 707 sq. ft.)

5% areal coverage = 2 stems
10% areal coverage = 4 stems
20% areal coverage = 8 stems
40% areal coverage = 16 stems
80% areal coverage = 32 stems

Trees (based on an area of 2,827 sq. ft.)

5% areal coverage = 2 stem
10% areal coverage = 3 stems
20% areal coverage = 8 stems
40% areal coverage = 16 stems
80% areal coverage = 32 stems

3.2 Results

The boundaries of plant communities present within the replacement site are shown in Figure 2. A list of species present and the percent areal cover based on the August 2024 monitoring at each plot is provided in **Appendix D**. Meander surveys were also conducted between plot points; that information is not included in Appendix D but is available upon request. No anomalies were encountered during meander surveys that differed in any significant way from the results found at the monitoring plots.



Nineteen native species were found within monitoring plots in Area 2, Proposed Floodplain Forest Upland Buffer. Plot total ranged from 7-13 native species with an average bare ground across monitoring points of 9.25%.

Monitoring plots within Area 3, Existing Floodplain Forest Wetland, averaged 96% relative areal cover of native species, a total of 16 native species were found and 0% bare ground.

Areas 4 and 6, Proposed Floodplain Forest Wetland, averaged 95% hydrophyte coverage, 65% native species coverage, and 0% bare ground. Invasive species cover at one monitoring plot was higher than others due to dominance by reed canary grass (*Phalaris arundinacea*), but overall averaged 14%.

Area 5, Existing Partially Drained Deep Marsh Wetland, had 100% relative cover by hydrophytes, 84% cover by native species within areas of emergent vegetation. Open water was estimated at 74% due to the historic flooding.

Table 5 presents the estimated stems per acre of shrubs and trees at each monitoring plot. Area 2 averaged 1,185 woody stems per acre, Area 3 averaged 1,456 woody stems per acre, and Area 4 averaged 1,415 woody stems per acre.

Table 5. Vegetation Monitoring Plots Shrub and Tree Stratum Stem Counts per Acre

Monitoring Plots	Stem Counts/Acre	
	Shrub	Tree
Plot 1	2,480	120
Plot 2	372	240
Plot 3	868	555
Plot 4	1,860	285
Plot 5	868	0
Plot 7	1,488	0
Plot 8	1,116	0
Plot 9	1,612	0
Plot 10	744	0
Plot 11	992	435
Plot 12	124	0
Plot 13	372	0
Plot 14	1,736	0



Area 1 Existing Floodplain Forest Upland Buffer Vegetation Performance Standards Summary
(Yellow in Figure 2)

Performance Standard Details	Met in 2024?
Interim 1	NA until approval of Hydrology Release
<30% cover by woody nonnative/ invasive species	Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
<10% unvegetated areal coverage	Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Species richness shall consist of 6 or more native, non-invasive species across all strata	Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Interim 2	NA until approval of Hydrology Release
<25% cover by woody non-native/invasive species	Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
<8% unvegetated areal coverage	Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Species richness shall consist of 8 or more native, non-invasive species across all strata	Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Final	NA until approval of Hydrology Release
<20% cover by woody non- native/invasive species	Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
<5% unvegetated areal coverage	Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Species richness shall consist of 10 or more native, non-invasive species across all strata	Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.

Area 2 Proposed Floodplain Forest Upland Buffer Vegetation Performance Standards Summary
(Brown in Figure 2)

Performance Standard Details	Met in 2024?
Interim 1	NA until approval of Hydrology Release
>300 live, NNI tree seedlings per acre for ≥2 growing seasons	Criteria met in 2024 for 34.0 acres of Area 2 per Figure 2
<10% unvegetated areal coverage	Yes
Species richness shall consist of 6 or more native, non-invasive species across all strata.	Yes
Interim 2	NA until approval of Hydrology Release
>250 live, NNI tree seedlings per acre >4 feet in height for ≥2 growing seasons, assuming Interim 1 was met	To be determined in 2025 for those areas meeting Interim 1
<8% unvegetated areal coverage	To be determined in 2025 for those areas meeting Interim 1



Peterson Farms Land Bank
2024 Monitoring Report
Vegetative Monitoring
February 2025

Performance Standard Details	Met in 2024?
Species richness shall consist of 8 or more native, non-invasive species across all strata.	To be determined in 2025 for those areas meeting Interim 1
Final	NA until approval of Hydrology Release
>200 live, NNI tree seedlings per acre >6 feet in height for ≥3 growing seasons, assuming Interim 2 was met	To be determined
<5% unvegetated areal coverage	To be determined
Species richness shall consist of 10 or more native, non- invasive species across all strata.	To be determined

Area 3 Existing Floodplain Forest Wetland Vegetation Performance Standards Summary (Green in Figure 2)

Performance Standard Details	Met in 2024?
Interim 1	NA until approval of Hydrology Release
<30% cover by non-native invasive species	Met in 2024. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
<10% unvegetated areal coverage	Met in 2024. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Species richness shall consist of 6 or more native, non-invasive species across all strata.	Met in 2024. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Interim 2	NA until approval of Hydrology Release
<25% cover by non-native /invasive species	Met in 2024. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
<8% unvegetated areal coverage	Met in 2024. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Species richness shall consist of 8 or more native, non-invasive species across all strata.	Met in 2024. There are 2 monitoring points in this area. 1 had 7 and 1 had 11 native species so the average meets the standard. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Final	NA until approval of Hydrology Release
<20% cover by non-native/invasive species	Met in 2024. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.



Performance Standard Details	Met in 2024?
<5% unvegetated areal coverage	Met in 2024. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Species richness shall consist of 10 or more native, non- invasive species across all strata.	To be determined

Area 4 and 6 Proposed Floodplain Forest Wetland Vegetation Performance Standards Summary
(Blue and Red in Figure 2)

Performance Standard Details	Met in 2024?
Interim 1	NA until approval of Hydrology Release
>300 live, NNI tree seedlings per acre for ≥2 growing seasons	Criteria met in 2024 for 117.69 acres of Area 4 per Figure 2
Minimum 60% relative cover by hydrophytes	Yes
60% relative cover by at least 2 native/non-invasive species	Yes
<30% cover by non-native/invasive species	Yes
<10% unvegetated areal coverage	Yes
Species richness shall consist of 6 or more native, non-invasive species across all strata.	Yes
Interim 2	NA until approval of Hydrology Release
>250 live, NNI tree seedlings per acre >4 feet in height for ≥2 growing seasons, assuming Interim 1 was met	To be determined in 2025 for those areas meeting Interim 1
Minimum 70% relative cover by hydrophytes	To be determined in 2025 for those areas meeting Interim 1
70% relative cover by at least 2 native/non-invasive species	To be determined in 2025 for those areas meeting Interim 1
<25% cover by non-native/invasive species	To be determined in 2025 for those areas meeting Interim 1
<8% unvegetated areal coverage	To be determined in 2025 for those areas meeting Interim 1
Species richness shall consist of 8 or more native, non-invasive species across all strata	To be determined in 2025 for those areas meeting Interim 1
Final	NA until approval of Hydrology Release
>200 live, NNI tree seedlings per acre >6 feet in height for ≥2 growing seasons, assuming Interim 2 was met	To be determined
Minimum 80% relative cover by hydrophytes	To be determined
Minimum 80% relative cover by at least 2 native/non-invasive species	To be determined
<20% cover by non-native/invasive species	To be determined



Peterson Farms Land Bank
2024 Monitoring Report
Vegetative Monitoring
February 2025

Performance Standard Details	Met in 2024?
<5% unvegetated areal coverage	To be determined
Species richness shall consist of 10 or more native, non- invasive species across all strata.	To be determined

Area 5 Existing Partially Drained Deep Marsh Wetland Vegetation Performance Standards Summary (Purple in Figure 2)

Performance Standard Details	2024
Interim 1	NA until approval of Hydrology Release
Minimum 60% relative cover by hydrophytes	Met in 2024 per August data collected and per visual assessment during October 9 site visit. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
50% relative cover by at least 3 native/non-invasive species in areas with emergent vegetation	Met in 2024 per August data collected and per visual assessment during October 9 site visit. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025.
Absolute cover of open water (acreage): less than 50%	Met in 2024 per October 9 site visit. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025. ^a
Interim 2	NA until approval of Hydrology Release
Minimum 70% relative cover by hydrophytes	Met in 2024 per October 9 site visit. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025
60% relative cover by at least 4 native/non-invasive species in areas with emergent vegetation	Met in 2024 per October 9 site visit. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025
Absolute cover of open water (acreage): 40% or less	Met in 2024 per October 9 site visit. Criteria will be monitored in 2025 in the event hydrology criteria is met in 2025
Final	NA until approval of Hydrology Release
Minimum 80% relative cover by hydrophytes	To be determined during monitoring in 2025
70% relative cover by at least 5 native/non-invasive species in areas with emergent vegetation	To be determined during monitoring in 2025
Absolute cover of open water (acreage): 30% or less	To be determined during monitoring in 2025

^a Absolute cover of open water was higher than 50% during the August 2024 field visit; however the historic flooding contributed to this larger area of open water. A follow-up visit to the site on October 9, 2024 demonstrated that Area 5 was recovering with vegetative growth after the high water of the previous months. See photo below:





Photo Taken 10/9/25 in Area 5 from same perspective as Photo 23 in Photo Log (Appendix C)

3.3 Graded Areas

As shown in Figure 2, there are multiple areas on the site that were graded to eliminate the drainage effect of the drainage ditches that had been in place. General vegetation notes were taken in these areas including dominant species and the estimated percent areal coverage of vegetation in the areas graded. Dominant species found within the graded areas are listed in Table 6. Overall average vegetated cover in these areas was 68% with a lowest vegetative coverage of 50%.

Table 6. Dominant Vegetation Observed in Graded Areas

Common Name	Scientific Name
Barnyard grass	<i>Echinochloa crus-galli</i>
Cocklebur	<i>Xanthium strumarium</i>
Yellow nutsedge	<i>Cyperus esculentus</i>
Lance-leaf fog fruit	<i>Phyla lanceolata</i>
Creeping yellowcress	<i>Rorippa sylvestris</i>
Lady's thumb	<i>Persicaria maculosa</i>
Devil's beggarticks	<i>Bidens frondosa</i>
Silver maple	<i>Acer saccharinum</i>
Sandbar willow	<i>Salix interior</i>



Common Name	Scientific Name
Redroot pigweed	<i>Amaranthus retroflexus</i>
Common water plantain	<i>Amaranthus tuberculatus</i>
Rough-fruited waterhemp	<i>Anemone canadensis</i>
Wild Cucumber	<i>Echinocystis lobata</i>
Creeping Lovegrass	<i>Eragrostis hypnoides</i>
Spotted Spurge	<i>Euphorbia maculata</i>
Witchgrass	<i>Panicum capillare</i>
Ontario Aster	<i>Symphyotrichum ontarionis</i>
Crooked Aster	<i>Symphyotrichum prenanthoides</i>

3.4 Invasive Species

One area was identified during 2024 monitoring that is dominated by invasive species. In the southwestern corner of the site, a 2.0-acre area of relatively monotypic reed canary grass has established which straddles Areas 2 and 4 (see Figure 2). 1.65 acres of this community is in Area 2 and 0.35 acre is in Area 4. A plan for treating this area with an appropriate herbicide in 2025 is recommended. Natural revegetation of the treated area would be planned; however, the Adaptive Management Plan would be followed if natural revegetation is unsuccessful. This could include re-seeding/planting if necessary.

3.5 Activities Completed In 2024

No management or restoration activities occurred in 2024.

3.6 Credit Release Summary And Request

2024 represents the first growing season after construction and the first year of monitoring. The next potential credit release would be for areas meeting the Hydrology performance standard, at which time some of the vegetative performance standards may also be met and additional credits eligible for release. This will be coordinated with the WCA Technical Evaluation Panel and U.S. Army Corps of Engineers in 2025.





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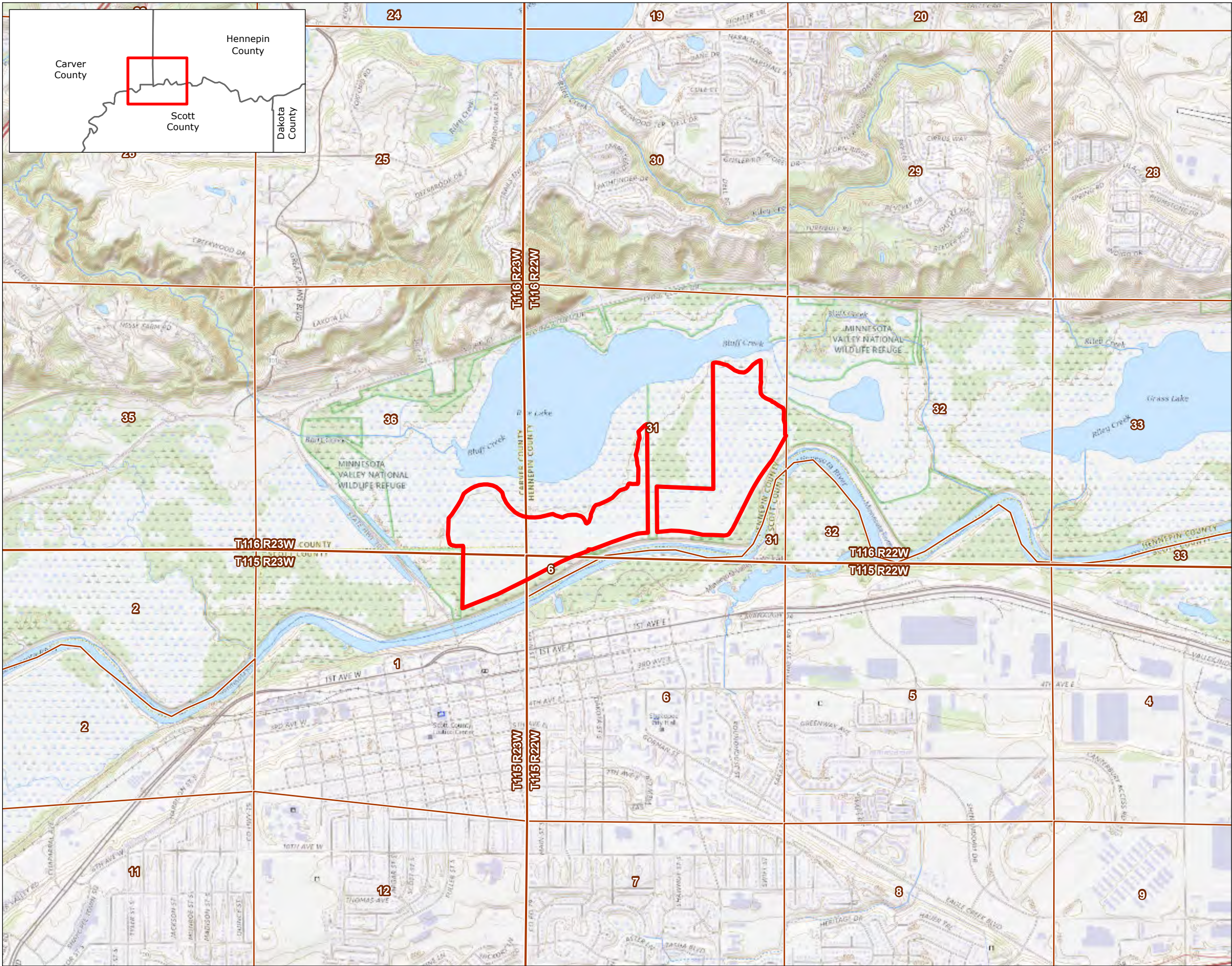


Figure No.
1

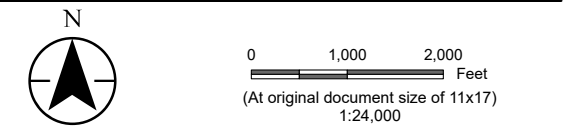
Title
7.5 Minute Quadrangle Map

Client/Project
Sever Peterson
Peterson Farms Land Bank
Final Application

Project Location
Chanhassen, Eden Prairie & Shakopee
Carver Co., Hennepin Co. & Scott Co., MN

227701083

Prepared by BS on 2023-10-25



Legend

Easement Boundary

Notes

1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, MNDNR, MNGEO, USGS
3. Background: USGS 7.5 Minute Quadrangle



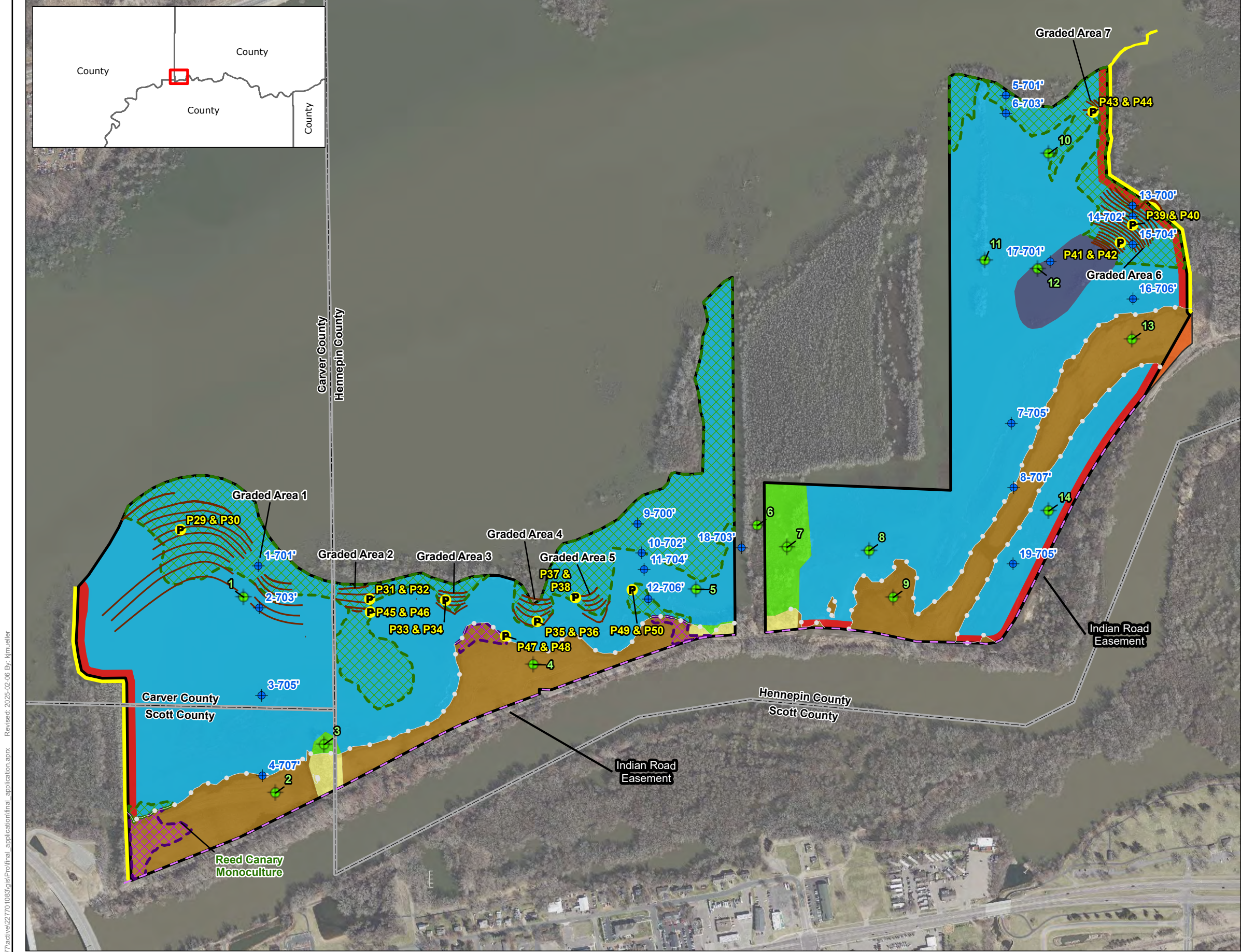


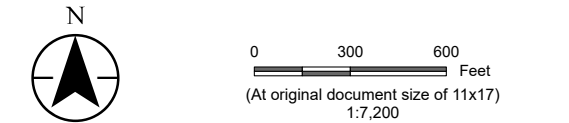
Figure No.
2
Title
**Credit Area and Proposed Vegetation Map
2024 Field Monitoring**

Client/Project
Sever Peterson
Peterson Farms Land Bank

227701083

Project Location
Chanhassen, Eden Prairie & Shakopee
Carver Co., Hennepin Co. & Scott Co., MN

Prepared by KJM on 2025-02-06



- Legend
- Easement Boundary
 - Photo Location Point
 - Vegetation Monitoring Plot Location
 - Monitoring Well Locations and Elevations
 - Grading Area
 - Surveyed 707' Contour/Existing Wetland Boundary
 - Northern Edge of Indian Road
 - Excluded - Food Plot Area (0.59 acres)
 - 30-ft Field Road Access Corridor
 - Area 2 - Herbaceous Dominant Area
 - Area 4 - Herbaceous Dominant Area

- Credit Area Type
- Area 1: Existing Floodplain Forest Buffer 1.8 Acres -25% Credit = 0.4500 Acres (MN Rules 8420.0526 Subp. 2(A)) Existing vegetation includes cottonwood, box elder, silver maple, black willow, lake sedge, sandbar willow
 - Area 2: Proposed Floodplain Forest Buffer 36.7 Acres - 25% Credit = 9.1750 Acres (MN Rules 8420.0526 Subp. 2(A)) Projected vegetation includes cottonwood, box elder, silver maple, black willow, rush, smartweed, sedges
 - Area 3: Existing Floodplain Forest Areas 4.9 Acres -10% Credit = 0.4900 Acres (MN Rules 8420.0526 Subp. 2(A)) Projected vegetation includes silver maple, cottonwood, black willow, sandbar willow, lake sedge
 - Area 4: Proposed Floodplain Forest Wetland 162.8 Acres - 75% Credit = 122.1000 Acres (Cultivated Field Credit Method) Projected vegetation includes cottonwood, silver maple, box elder, black willow, sandbar willow, sedges, rushes, bulrushes
 - Area 5: Existing Partially Drained Deep Marsh Wetland 4.40 Acres - 50% Credit = 2.2000 Acres (MN Rules 8420.0526 Subp. 4(B)) Projected vegetation includes bulrush, rushes, sedges, arrowhead, silver maple, cottonwood, sandbar willow
 - Area 6: Proposed Floodplain Forest Wetland 6.4 Acres - 50% Credit = 3.200 Acres (Cultivated Field Credit Method) Projected vegetation includes cottonwood, silver maple, box elder, black willow, sandbar willow, sedges, rushes, bulrushes

Notes
1. Coordinate System: NAD 1983 UTM Zone 15N
2. Data Sources: Stantec, MNDNR, MNGEO
3. Background: 2020 color 7-county



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Appendix A

Precipitation Data

Chart 1. Antecedent Precipitation Analysis - Peterson Wetland Bank
Data From Minnesota State Climatology Office (MNgage, WETs Table) Flying Cloud Station

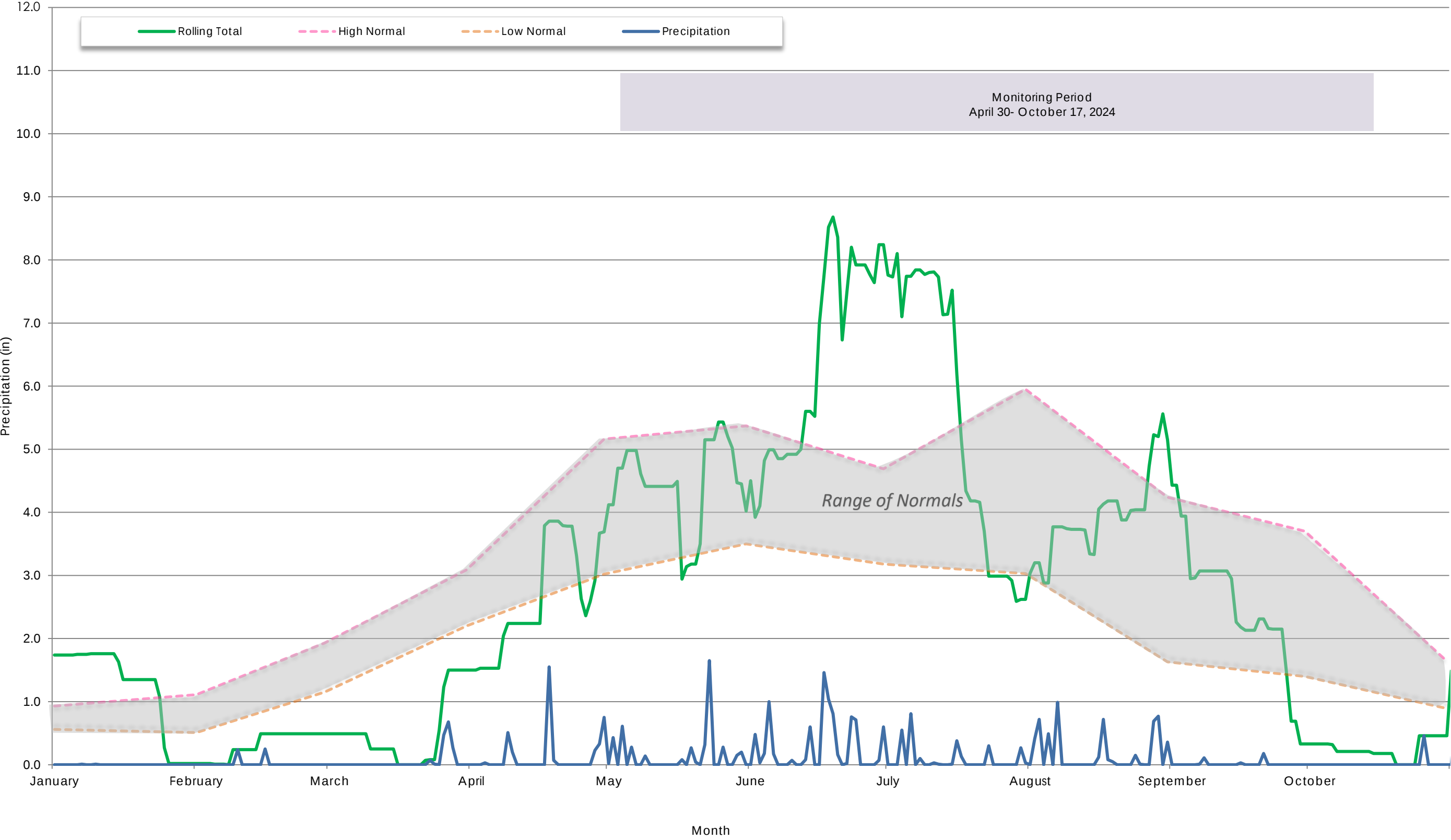
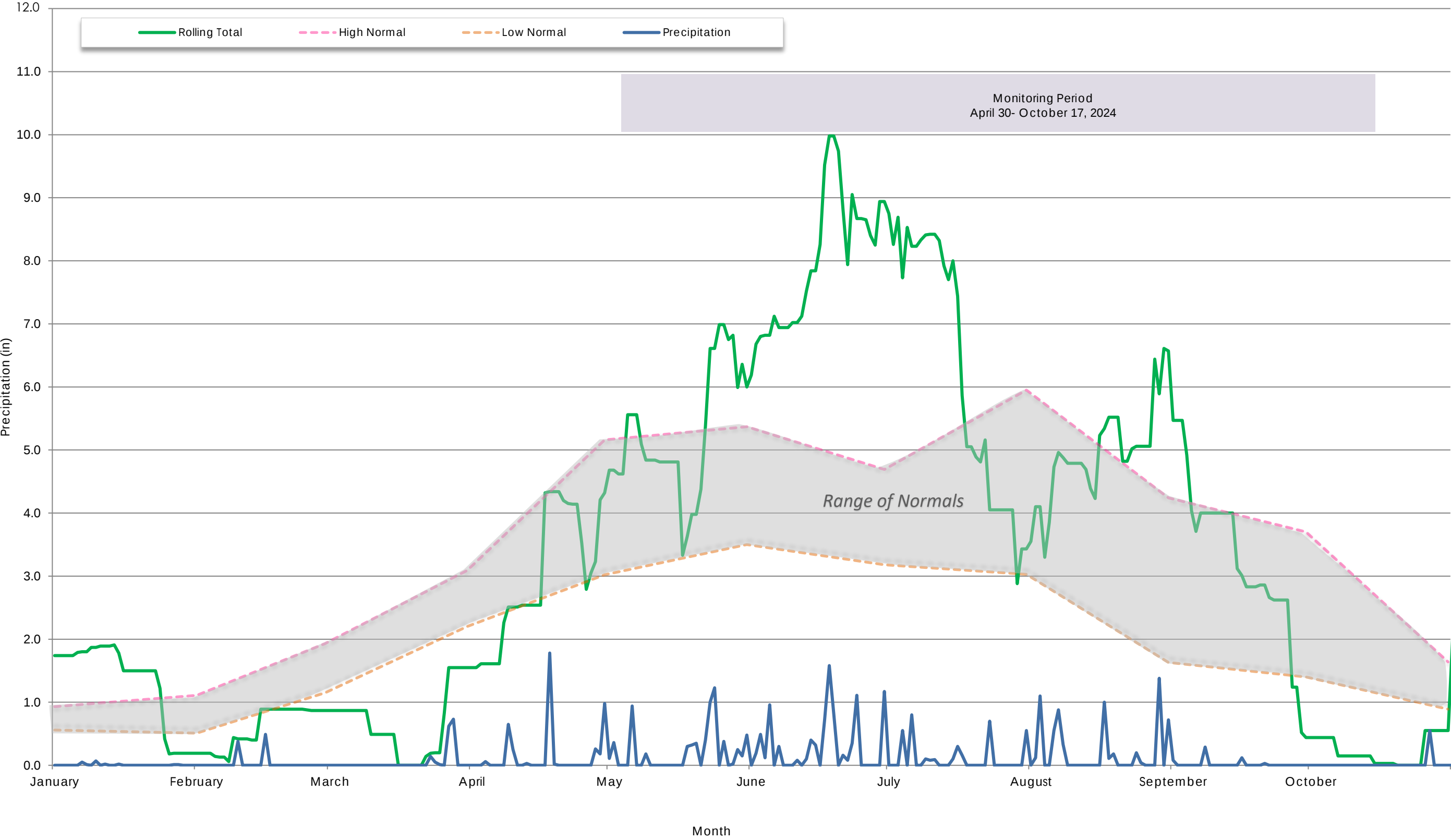


Chart 1. Antecedent Precipitation Analysis - Peterson Wetland Bank
Data From Minnesota State Climatology Office (MNgage, WETs Table) Chanhassen Station



Appendix B

Hydrographs

Figure 2.1 Well 1 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

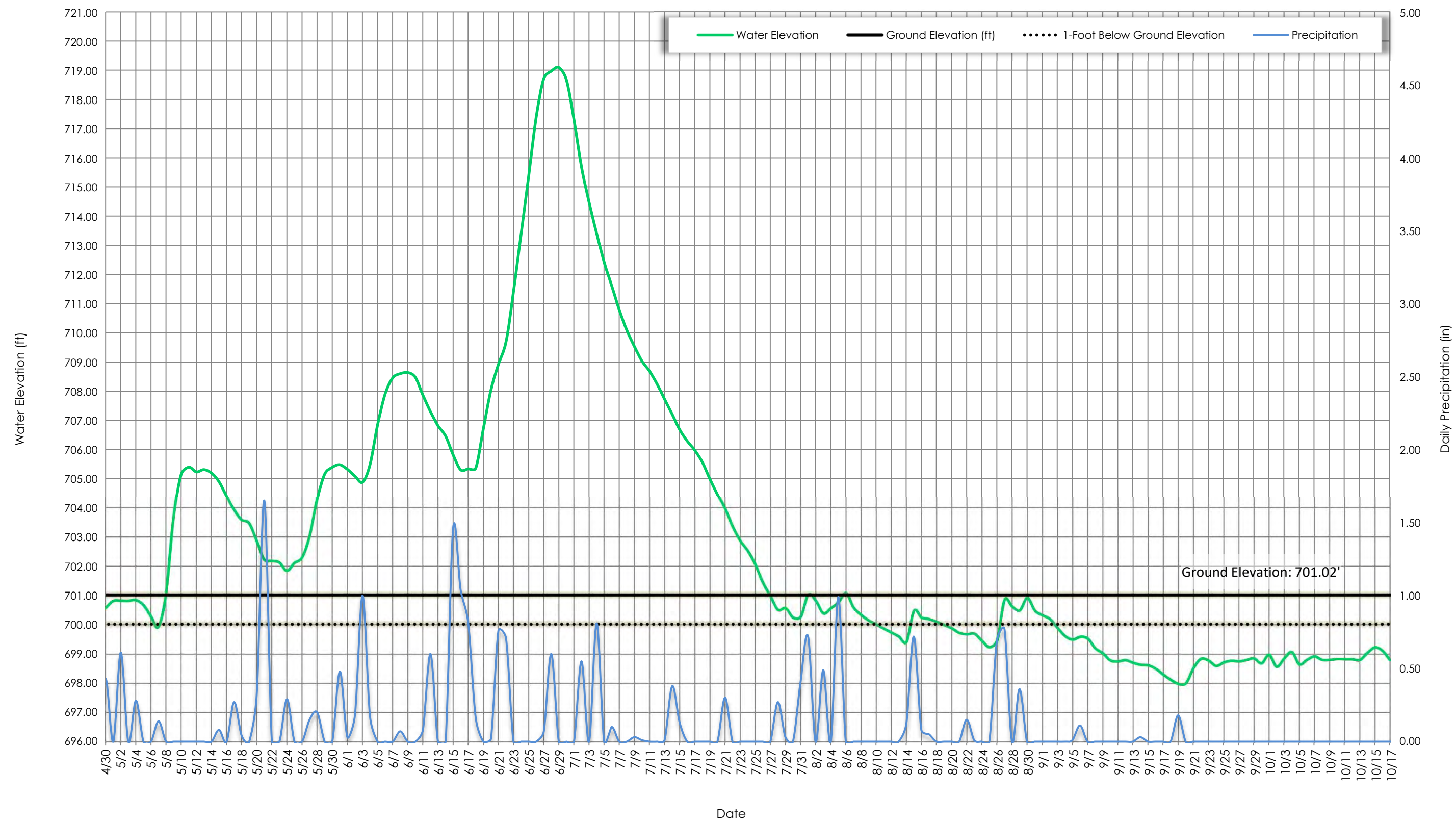


Figure 2.2 Well 2 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

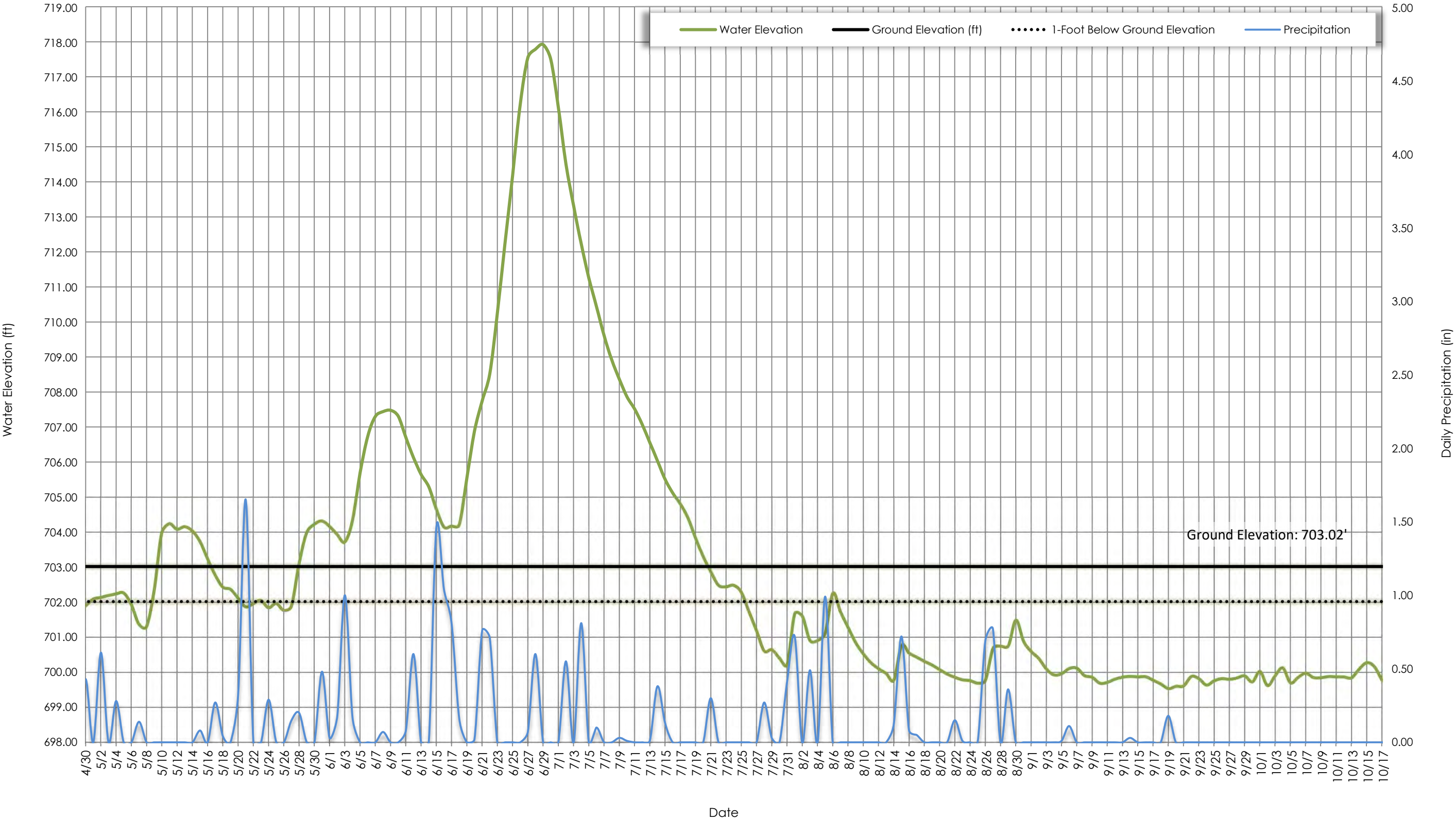


Figure 2.3 Well 3 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

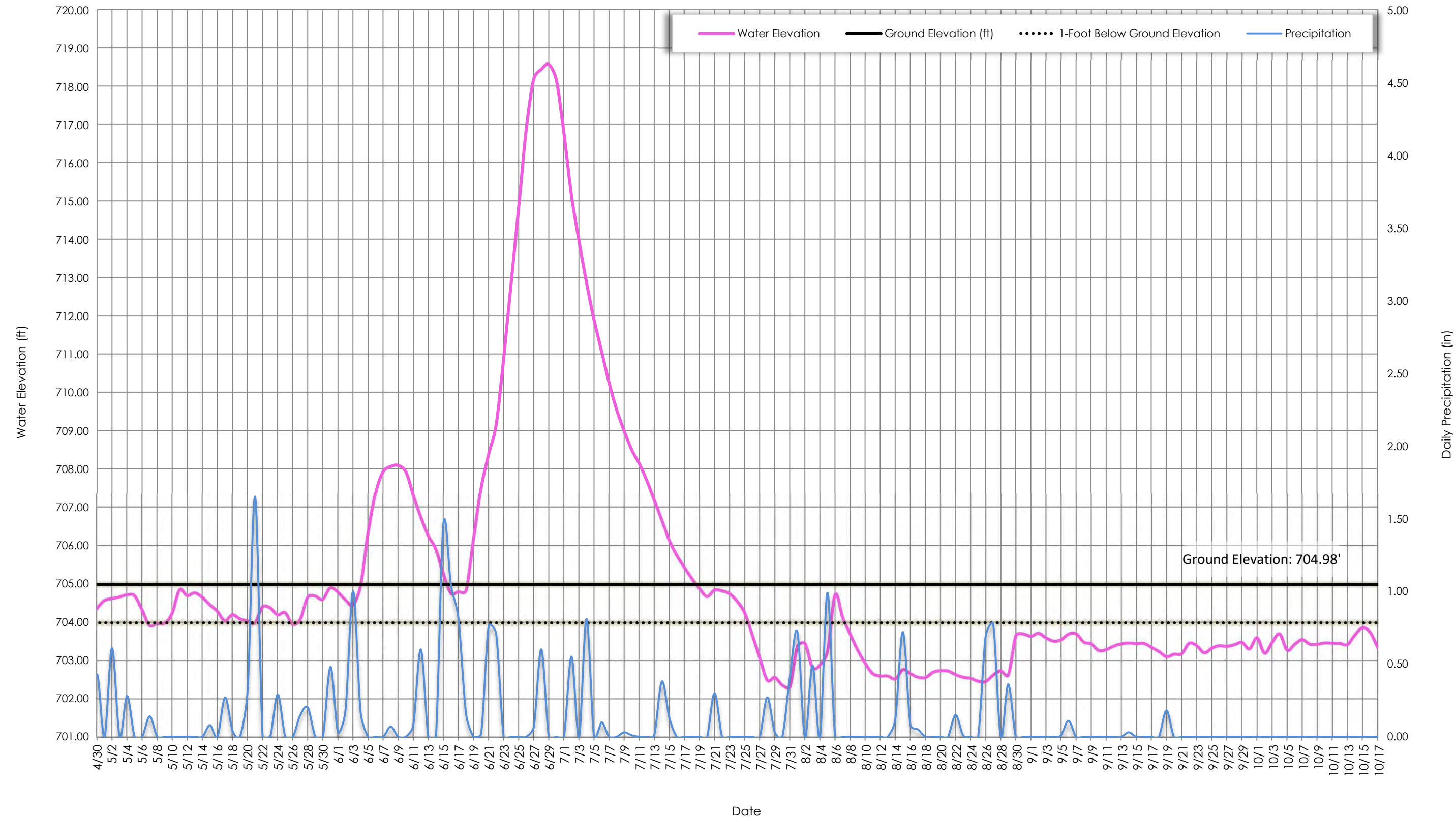


Figure 2.4 Well 4 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

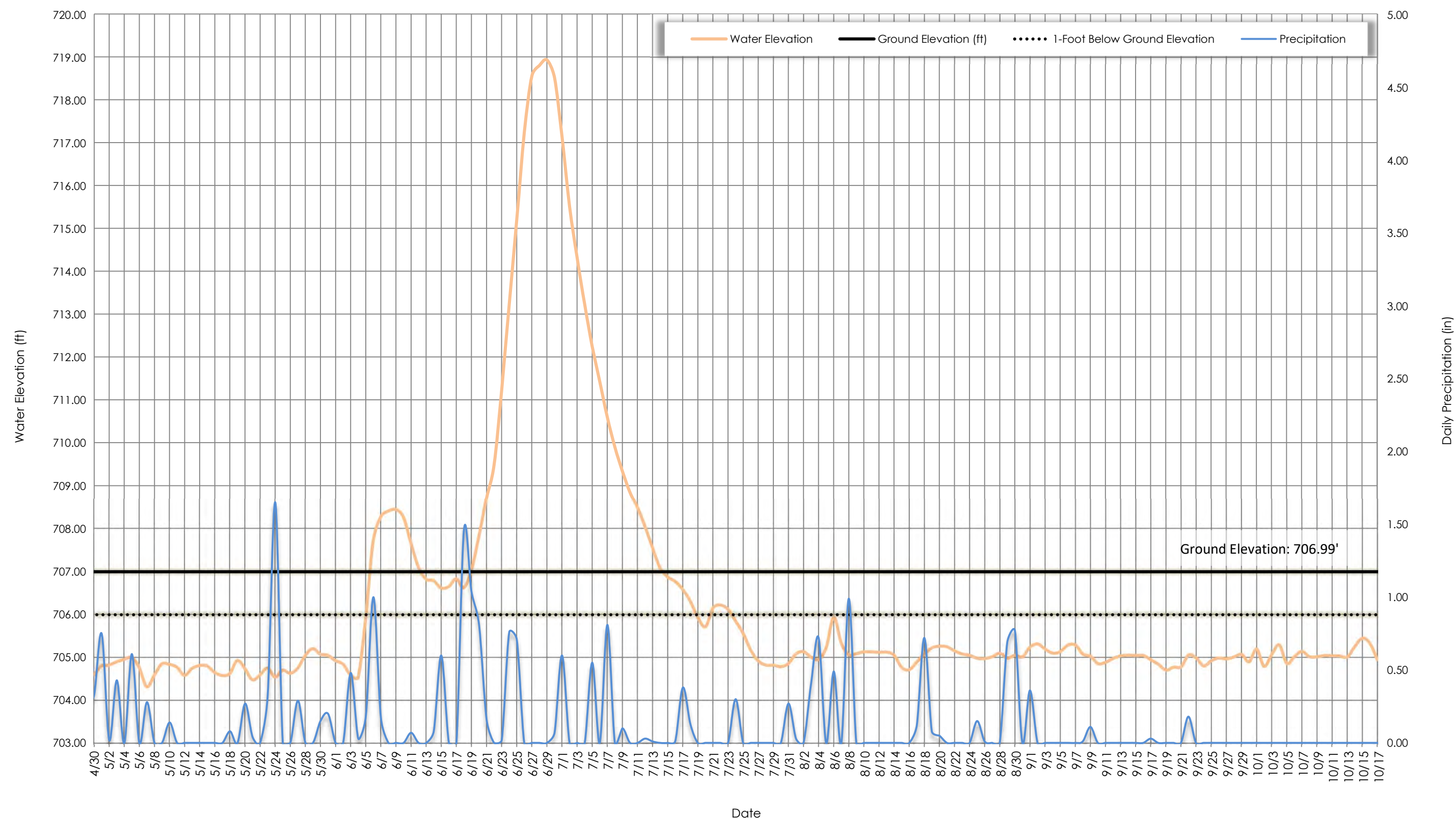


Figure 2.5 Well 5 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

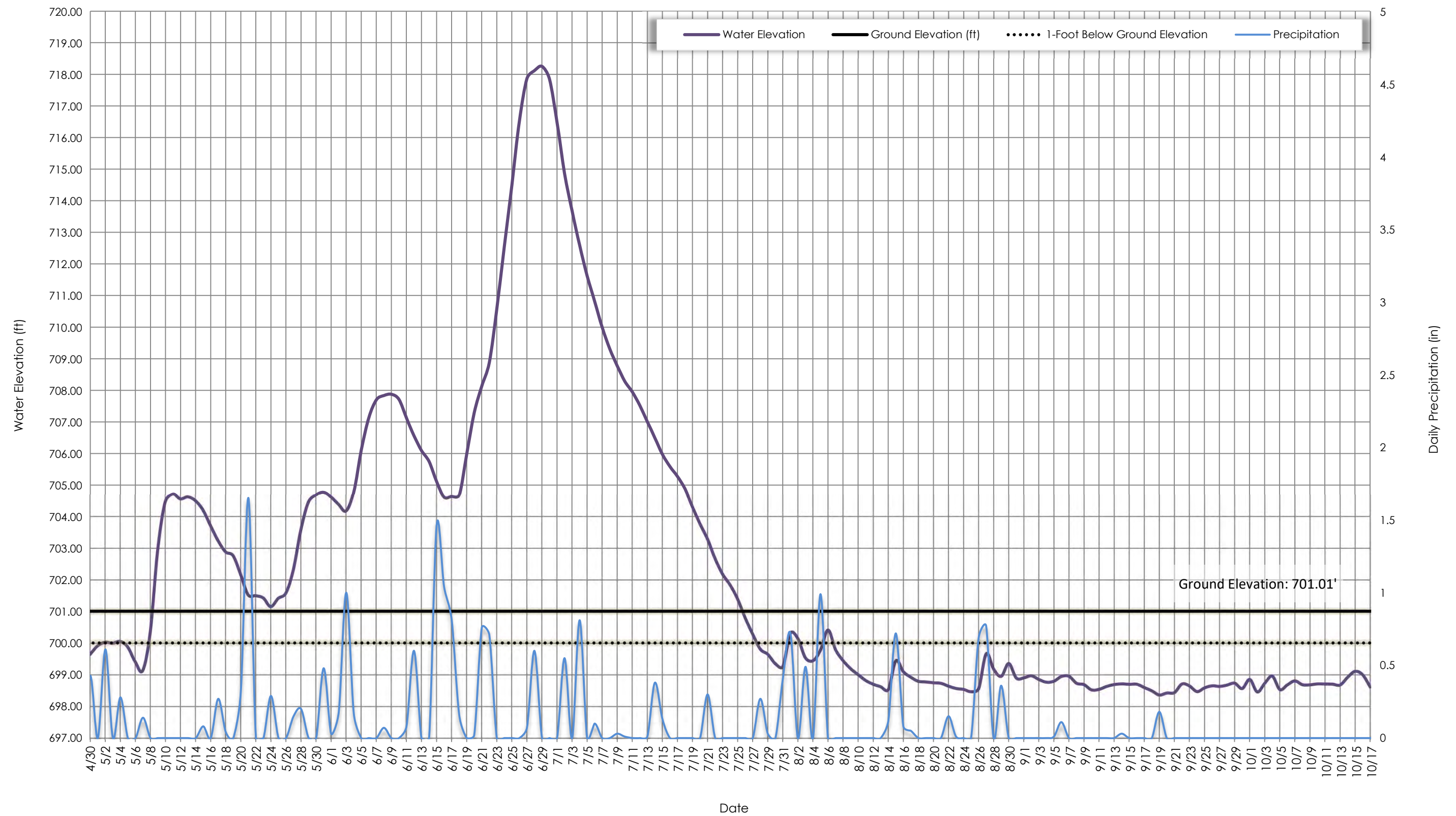


Figure 2.6 Well 6 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

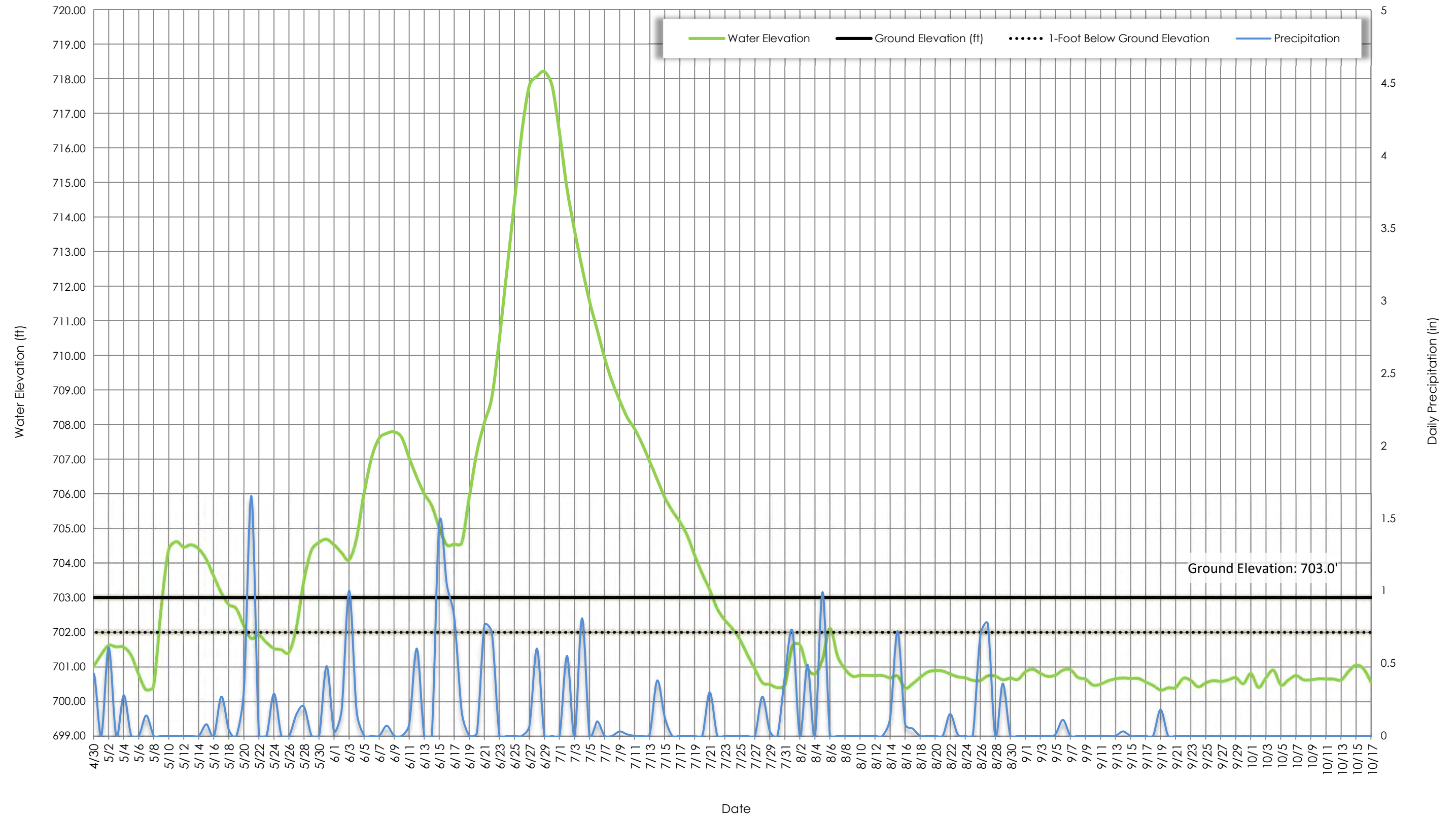


Figure 2.7 Well 7 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2023

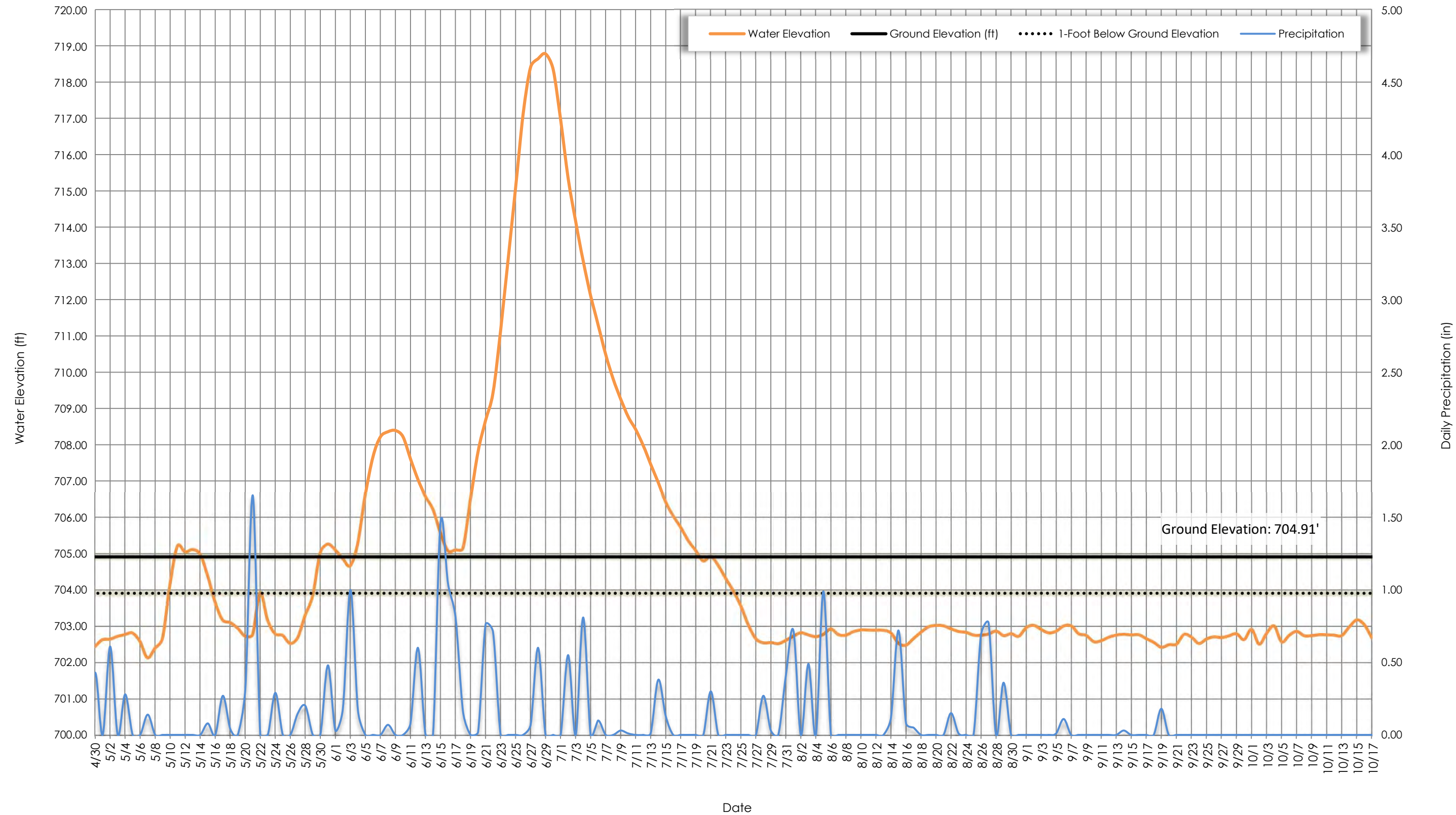


Figure 2.8 Well 8 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

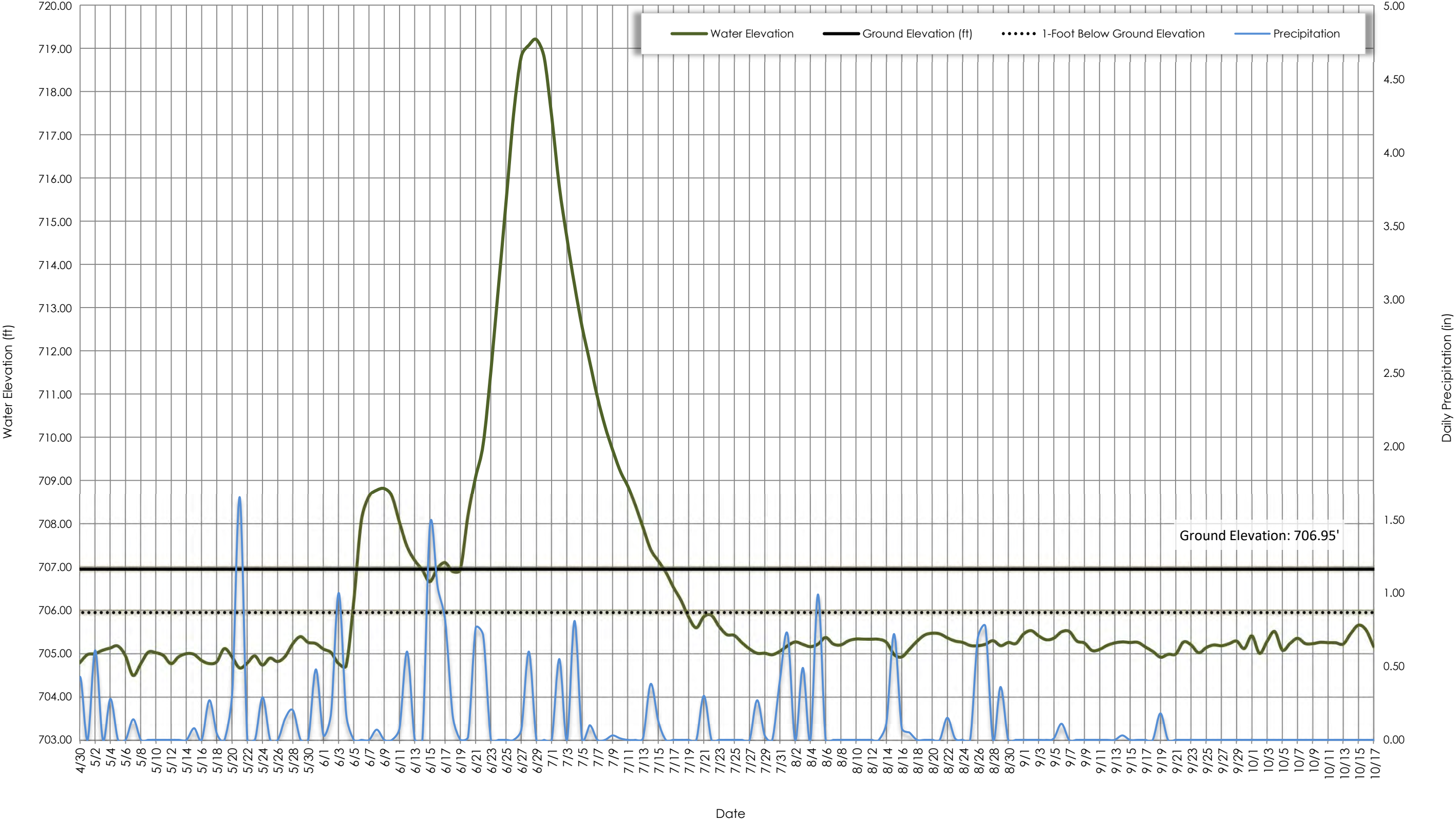


Figure 2.9 Well 9 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

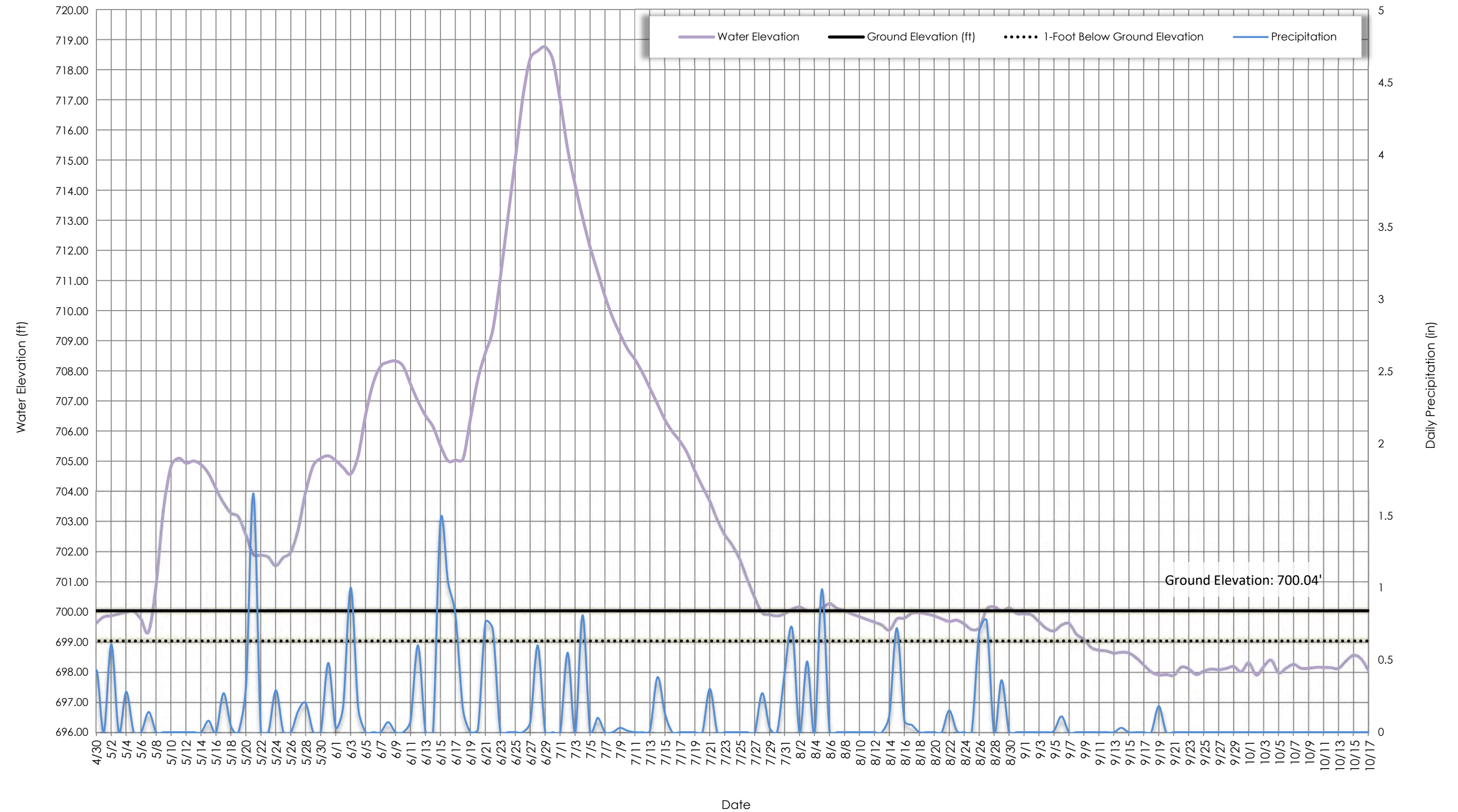


Figure 2.10 Well 10 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

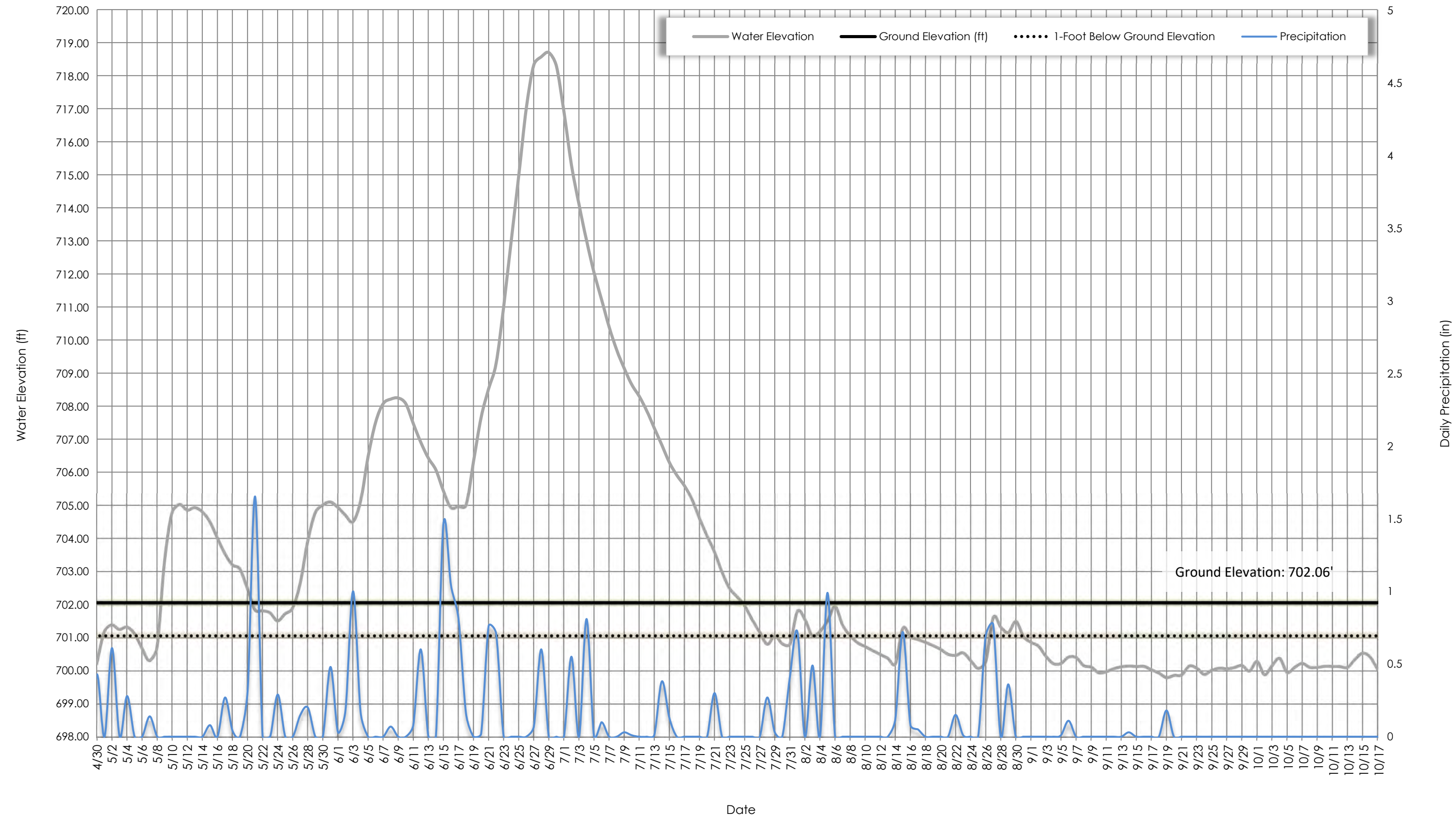


Figure 2.11 Well 11 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

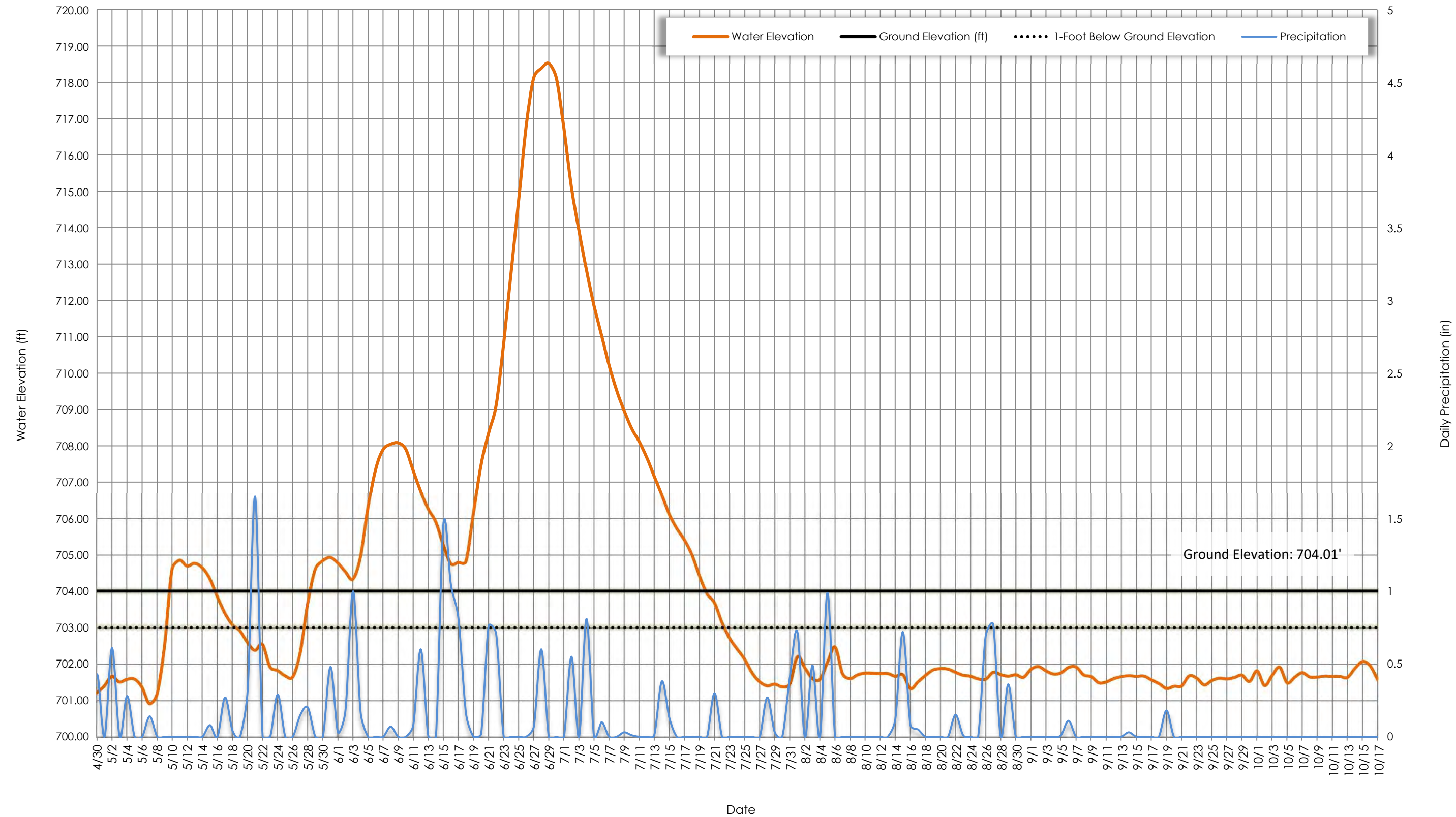


Figure 2.12 Well 12 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

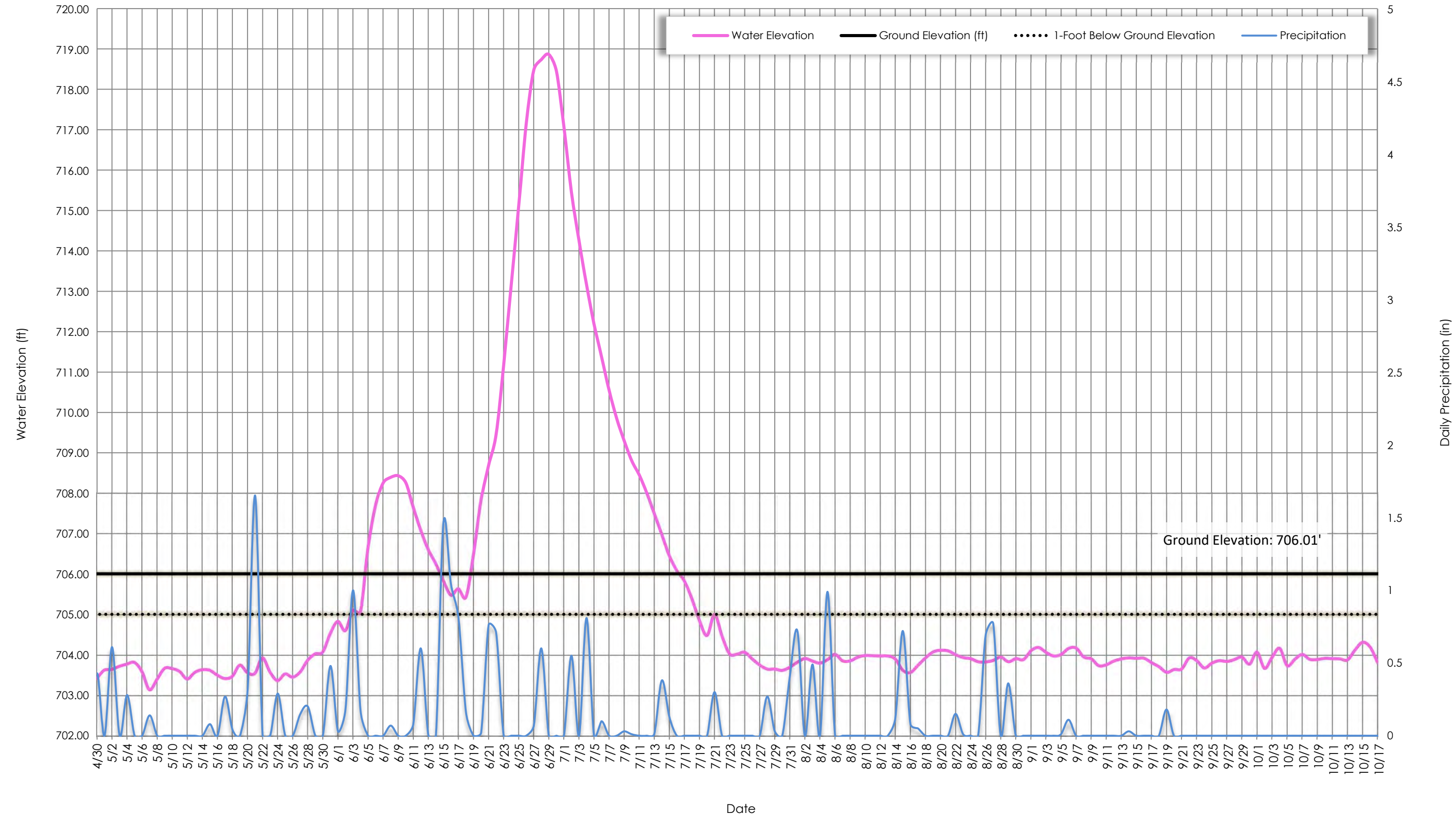


Figure 2.13 Well 13 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

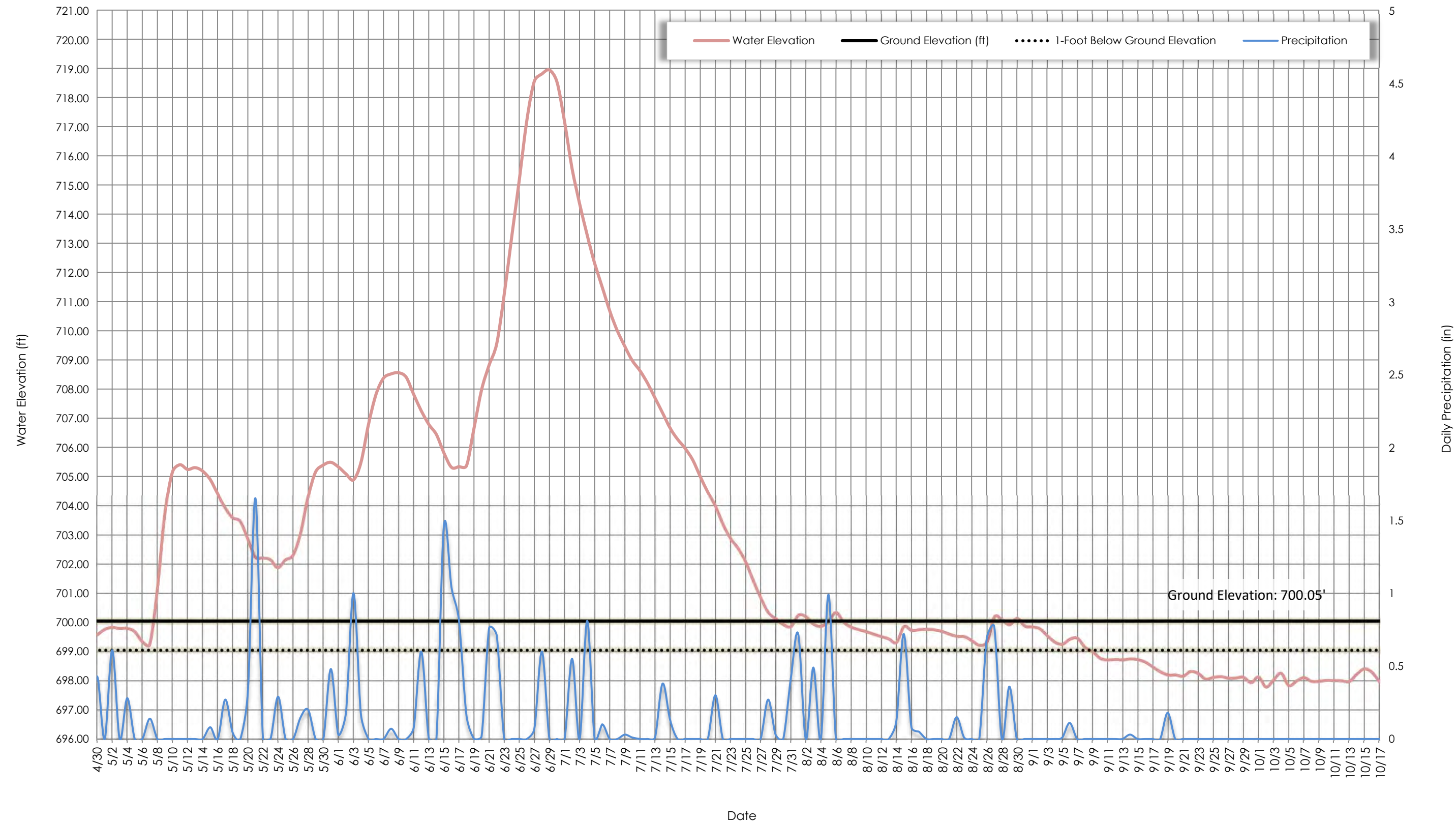


Figure 2.14 Well 14 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

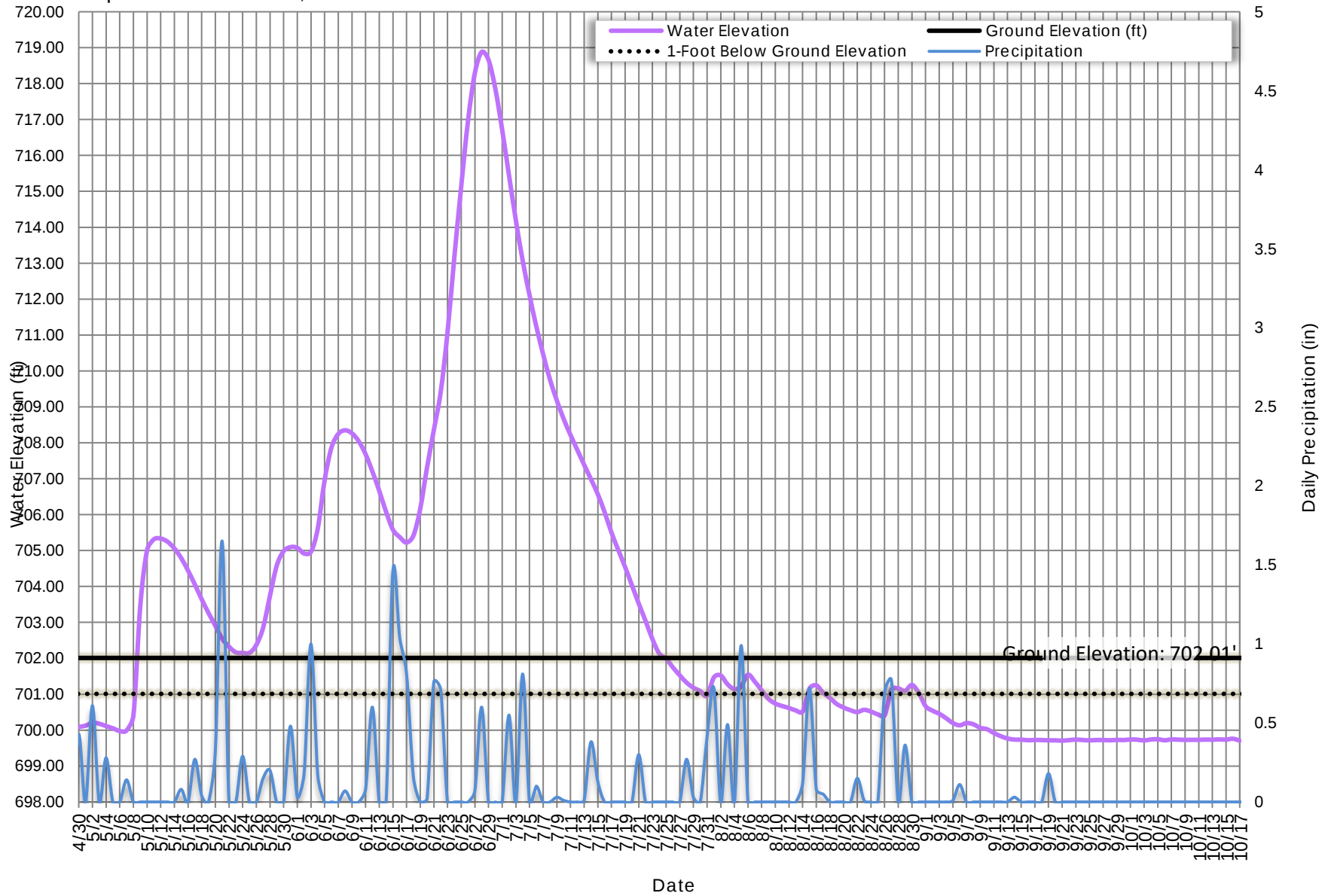


Figure 2.15 Well 15 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

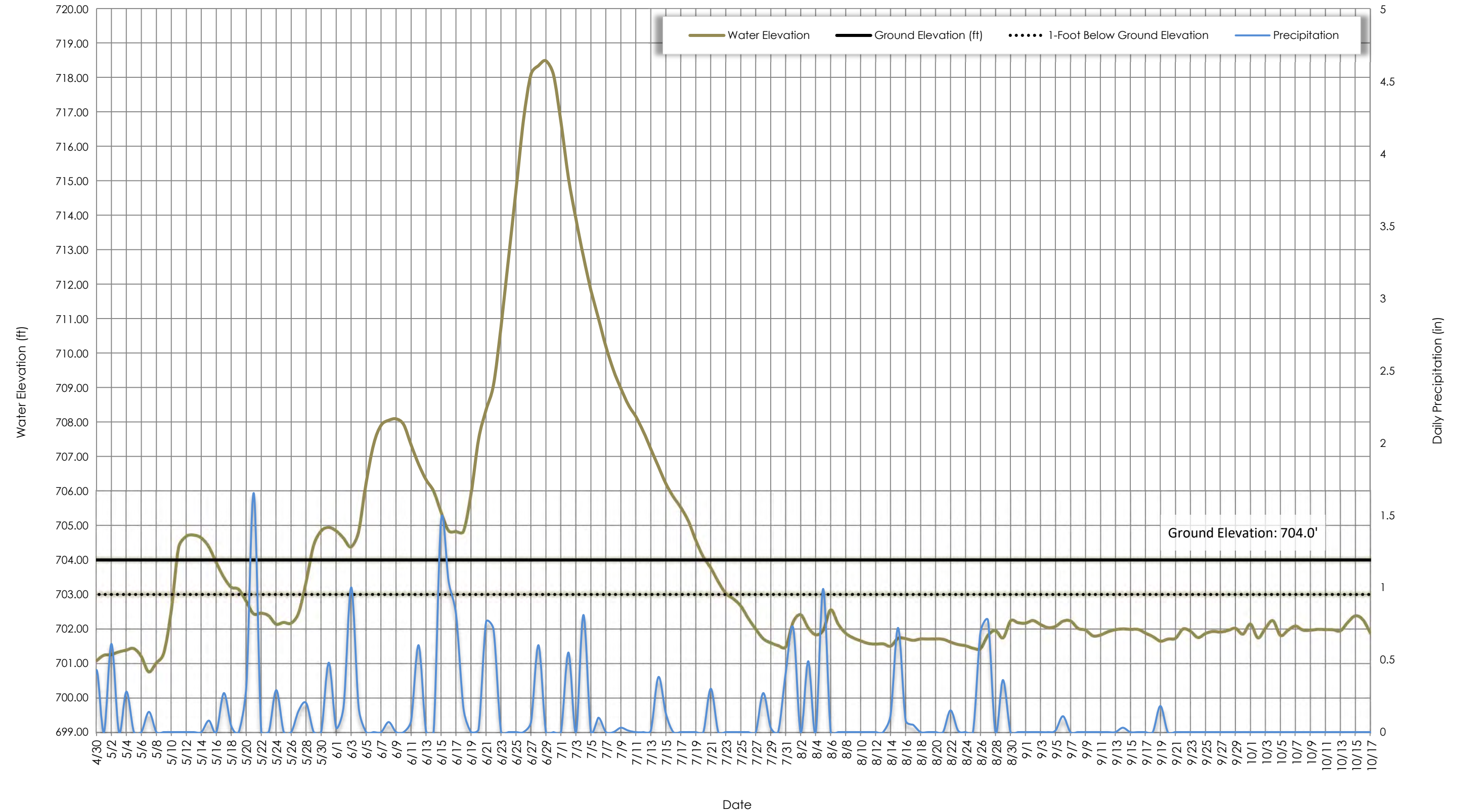


Figure 2.16 Well 16 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

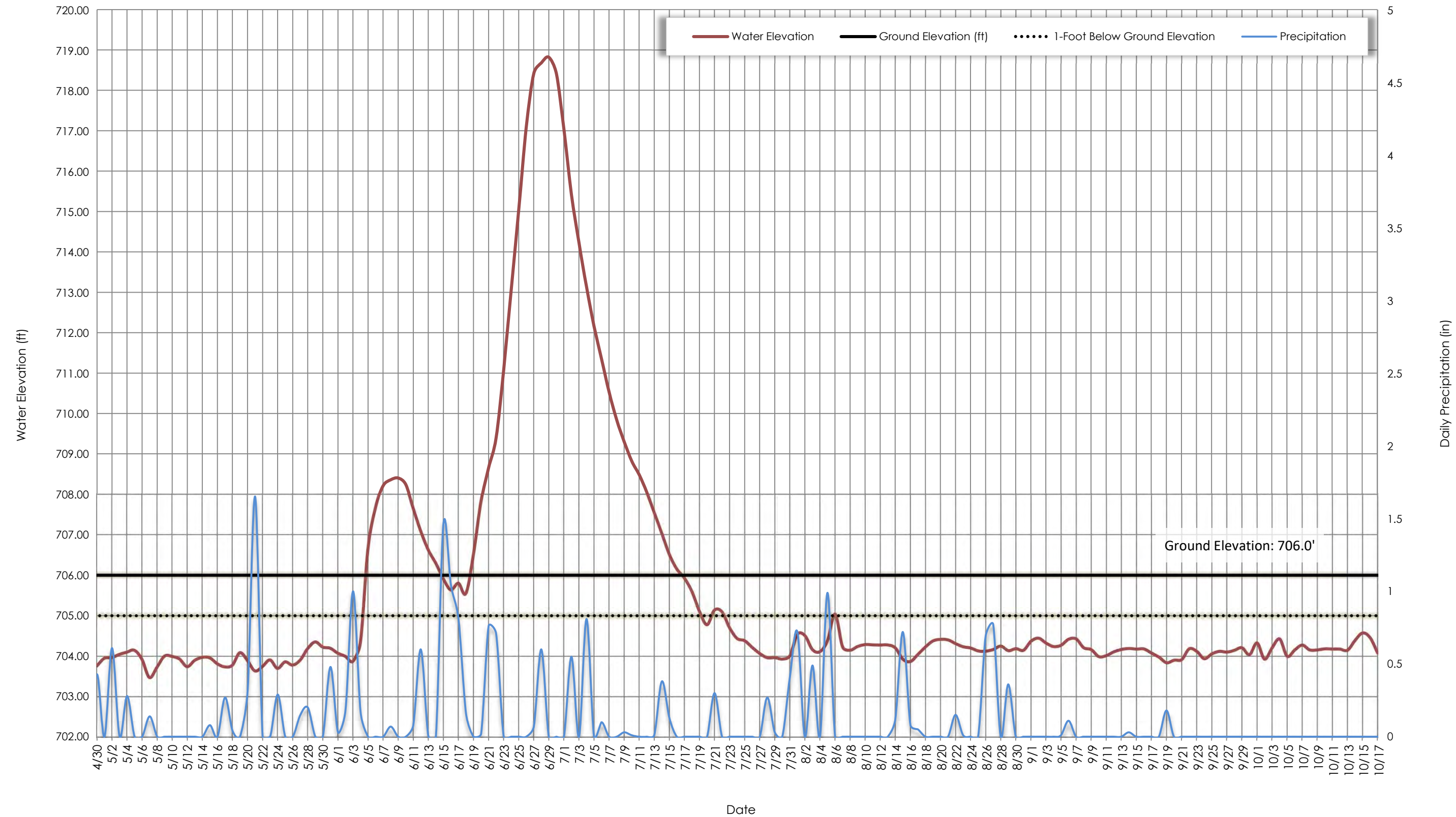


Figure 2.17 Well 17 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024

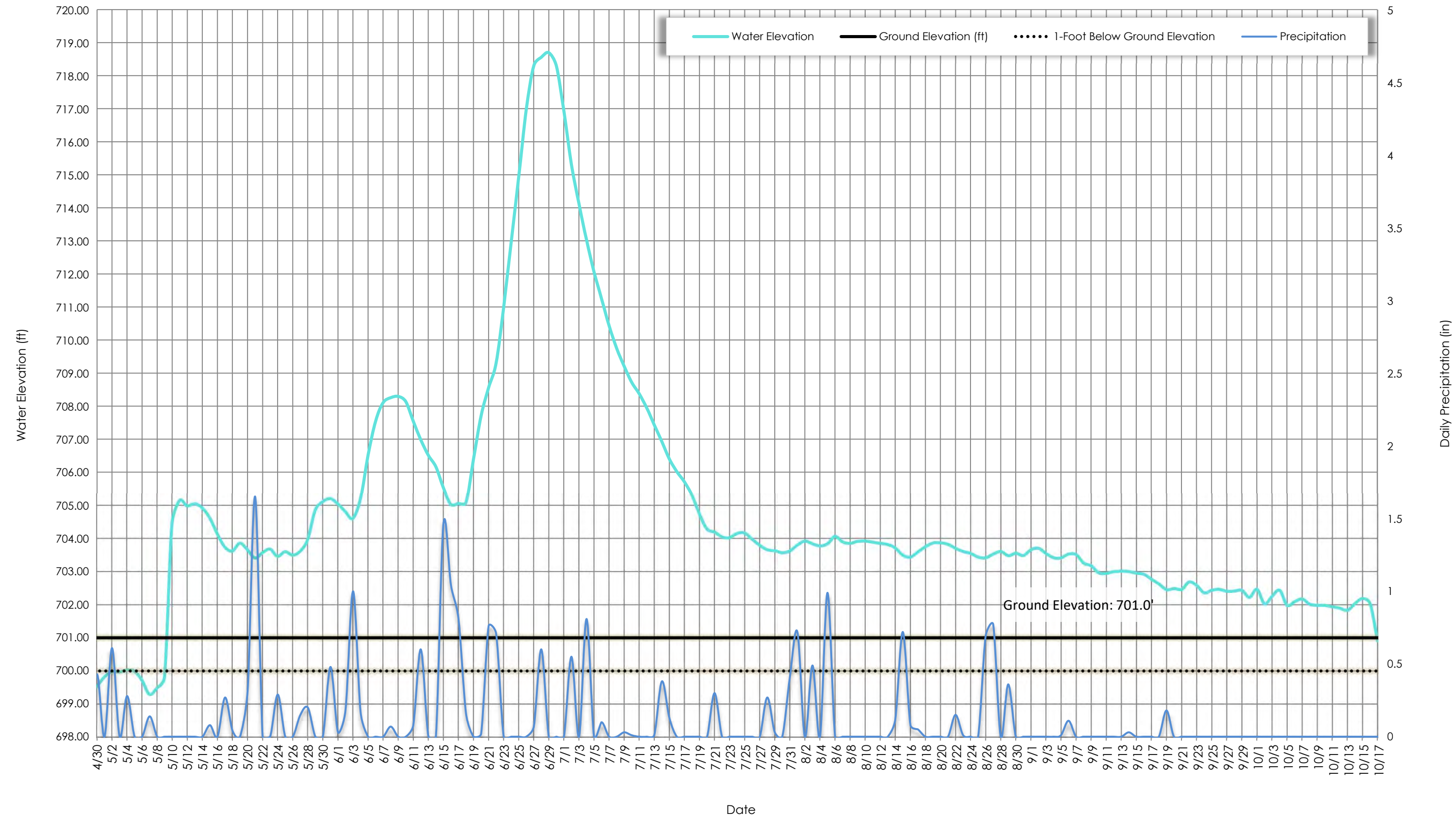


Figure 2.18 Well 18 Water Level Hydrograph - Peterson Wetland Bank
April 30 - August 30, 2024

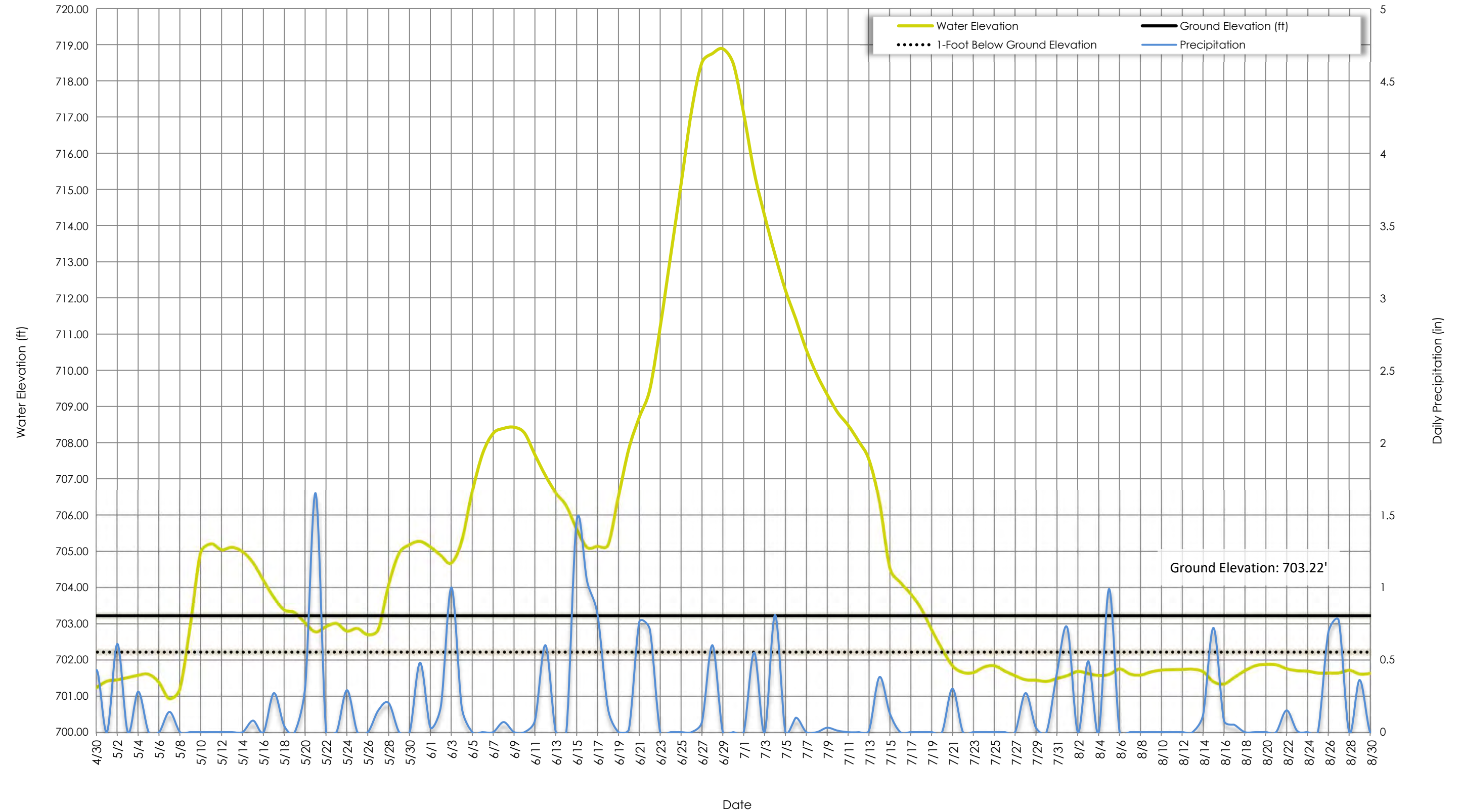
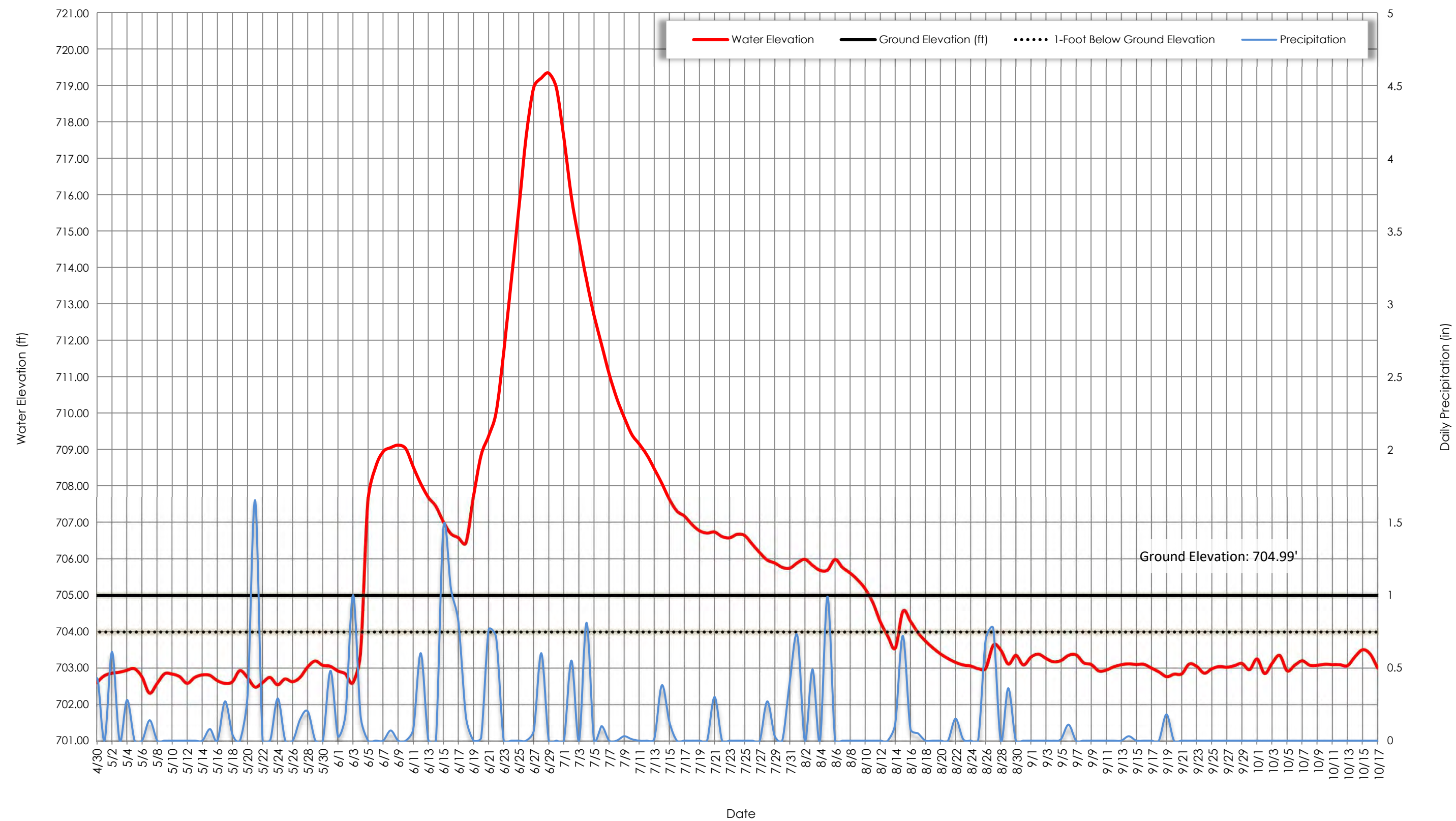


Figure 2.19 Well 19 Water Level Hydrograph - Peterson Wetland Bank
April 30 - October 17, 2024



Appendix C

Photo Log



Photo 1. Monitoring Point 1 – Proposed floodplain forest, View N



Photo 2. Monitoring Point 1 – Proposed floodplain forest, View S



Photo 3. Monitoring Point 2 – Floodplain forest buffer, View E



Photo 4. Monitoring Point 2 – Floodplain forest buffer, View W



Photo 5. Monitoring Point 3 – Existing partially drained floodplain forest – View N



Photo 6. Monitoring Point 3 – Existing partially drained floodplain forest – View S



Photo 7. Monitoring Point 4 – Proposed floodplain forest buffer – View E



Photo 8. Monitoring Point 4 – Proposed floodplain forest buffer – View W



Photo 9. Monitoring Point 5 – Proposed floodplain forest – View N



Photo 10. Monitoring Point 5 – Proposed floodplain forest – View S



Photo 11. Monitoring Point 6 – Reference wetland -Existing partially drained floodplain forest – View E



Photo 12. Monitoring Point 6 – Reference wetland -Existing partially drained floodplain forest – View W



Photo 13. Monitoring Point 7 – Existing partially drained floodplain forest – View E



Photo 14. Monitoring Point 7 – Existing partially drained floodplain forest – View S



Photo 15. Monitoring Point 8 – Proposed floodplain forest – View E



Photo 16. Monitoring Point 8 – Proposed floodplain forest – View W



Photo 17. Monitoring Point 9 – Proposed floodplain forest buffer – View N



Photo 18. Monitoring Point 9 – Proposed floodplain forest buffer – View S



Photo 19. Monitoring Point 10 – Proposed floodplain forest – View N



Photo 20. Monitoring Point 10 – Proposed floodplain forest – View W



Photo 21. Monitoring Point 11 – Proposed floodplain forest – View N



Photo 22. Monitoring Point 11 – Proposed floodplain forest – View W



Photo 23. Monitoring Point 12 – Existing partially drained deep marsh – View E



Photo 24. Monitoring Point 12 – Existing partially drained deep marsh – View W



Photo 25. Monitoring Point 13 – Proposed floodplain forest buffer – View N



Photo 26. Monitoring Point 13 – Proposed floodplain forest buffer – View S



Photo 27. Monitoring Point 14 – Proposed floodplain forest – View E



Photo 28. Monitoring Point 14 – Proposed floodplain forest – View W



Photo 29. Graded Area 1 – Proposed floodplain forest – View N



Photo 30. Graded Area 1 – Proposed floodplain forest – View NE



Photo 31. Graded Area 2 – Proposed floodplain forest – View N



Photo 32. Graded Area 2 – Proposed floodplain forest – View S



Photo 33. Graded Area 3 – Proposed floodplain forest – View N



Photo 34. Graded Area 3 – Proposed floodplain forest – View E



Photo 35. Graded Area 4 – Proposed floodplain forest – View N



Photo 36. Graded Area 4 – Proposed floodplain forest – View E



Photo 37. Graded Area 5 – Proposed floodplain forest – View N



Photo 38. Graded Area 5 – Proposed floodplain forest – View W



Photo 39. Graded Area 6 – Proposed floodplain forest – View E



Photo 40. Graded Area 6 – Proposed floodplain forest – View ground



Photo 41. Graded Area 6 – Proposed floodplain forest – View E



Photo 42. Graded Area 6 – Proposed floodplain forest – View W



Photo 43. Graded Area 7 – Proposed floodplain forest – View N



Photo 44. Graded Area 7 – Proposed floodplain forest – View E



Photo 45. Open area in center of Western easement area – View E



Photo 46. Open area in center of Western easement area – View S



Photo 47. Open area – View N



Photo 48. Open area – View W



Photo 49. Open area – View E



Photo 50. Open area – View W

Appendix D

Vegetation Data

Peterson Wetland Bank Monitoring Plots																		
Species																		
Common Name	Scientific Name	Indicator	Native	Invasive	Strata	Average relative cover	MP1 Absolute Cover	MP1 Relative Cover	MP1 Dominant	MP2 Absolute Cover	MP2 Relative Cover	MP2 Dominant	MP3 Absolute Cover	MP3 Relative Cover	MP3 Dominant			
Trees																		
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	T	0.79			No			No	25	11	Yes			
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	T	0.36			No			No	10	5	No			
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	T	7.71			No	40	33	Yes	60	26	Yes			
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	T	1.21	20	9	Yes			No						
						Total	20	9		40	33		95	42				
Shrubs																		
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	S	0.93			No			No	25	11	Yes			
Silver Maple	<i>Acer saccharinum</i>	FACW	Yes	No	S	0.07			No			No			No			
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	S	0.29			No			No	10	4	Yes			
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	S	9.14	15	7	No	5	4	Yes			No			
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	S	2.21	10	4	No			No			No			
Sandbar Willow	<i>Salix interior</i>	FACW	Yes	No	S	12.57	80	37	Yes	10	8	Yes			No			
American Elm	<i>Ulmus americana</i>	FACW	Yes	No	S	0.07			No			No			No			
						Total	105	48		15	12		35	15				
Vines																		
Riverbank grape	<i>Vitis riparia</i>	FACW	Yes	No	V	0.36			No			No	2	1	Yes			
						Total	0	0	0	0	0	0	2	1				
Herbs																		
Redroot Pigweed	<i>Amaranthus retroflexus</i>	FACU	No	No	H	0.00			No			No			No			
Barnyard Grass	<i>Echinochloa crus-galli</i>	FACW	No	No	H	0.79	1	1	No			No			No			
Lady's thumb	<i>Persicaria maculosa</i>	FACW	No	No	H	0.14			No			No			No			
Creeping Yellowcress	<i>Rorippa sylvestris</i>	OBL	No	No	H	0.36			No			No			No			
Curly Dock	<i>Rumex crispus</i>	FAC	No	No	H	0.14			No			No			No			
Silver Maple	<i>Acer saccharinum</i>	FACW	Yes	No	H	0.00			No			No			No			
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	H	0.21			No	1	1	No			No			
Common water plantain	<i>Alisma triviale</i>	OBL	Yes	No	H	0.00			No			No			No			
Rough-fruited Waterhemp	<i>Amaranthus tuberculatus</i>	OBL	Yes	No	H	0.14			No			No			No			
Canada Anemone	<i>Anemone canadensis</i>	FACW	Yes	No	H	2.50			No			No	60	26	Yes			
Spreading Dogbane	<i>Apocynum androsaemifolium</i>	UPL	Yes	No	H	0.07			No			No			No			
Devil's Beggarticks	<i>Bidens frondosa</i>	FACW	Yes	No	H	1.14	1	1	No			No			No			
False Nettle	<i>Boehmeria cylindrica</i>	OBL	Yes	No	H	2.21			No			No			No			
River bulrush	<i>Bolboschoenus fluviatilis</i>	OBL	Yes	No	H	3.50			No			No			No			
Lake Sedge	<i>Carex lacustris</i>	OBL	Yes	No	H	0.64			No			No	20	9	Yes			
Bulbet-bearing Water Hemlock	<i>Cicuta bulbifera</i>	OBL	Yes	No	H	0.07			No			No			No			
Wild Cucumber	<i>Echinocystis lobata</i>	FACW	Yes	No	H	0.00			No			No			No			
Common Spikerush	<i>Eleocharis palustris</i>	OBL	Yes	No	H	0.29			No			No			No			
Stink Grass	<i>Eragrostis cilianensis</i>	FACU	Yes	No	H	0.00			No			No			No			
Creeping Lovegrass	<i>Eragrostis hypnoides</i>	OBL	Yes	No	H	0.00			No			No			No			
Spotted Spurge	<i>Euphorbia maculata</i>	FACU	Yes	No	H	0.00			No			No			No			
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	H	0.07			No			No	2	1	No			
Lesser Duckweed	<i>Lemna minor</i>	OBL	Yes	No	H	0.21			No			No			No			
False Pimpernel	<i>Lindernia dubia</i>	OBL	Yes	No	H	1.86			No			No			No			
American Water Horehound	<i>Lycopus americanus</i>	OBL	Yes	No	H	0.00			No			No			No			
Tufted Loosestrife	<i>Lysimachia thyrsiflora</i>	OBL	Yes	No	H	0.21			No			No			No			
Moonseed	<i>Menispermum canadense</i>	FAC	Yes	No	H	0.00			No			No			No			
Witchgrass	<i>Panicum capillare</i>	FAC	Yes	No	H	1.36			No	2	2	No			No			
Swamp Smartweed	<i>Persicaria amphibia</i>	OBL	Yes	No	H	2.86			No			No	2	1	No			
Nodding Smartweed	<i>Persicaria lapathifolia</i>	FACW	Yes	No	H	0.07			No			No			No			
Pennsylvania Smartweed	<i>Persicaria pensylvanica</i>	FACW	Yes	No	H	0.14			No			No			No			
Lance-leaf Fog Fruit	<i>Phyla lanceolata</i>	OBL	Yes	No	H	4.79	75	34	Yes	30	24	Yes			No			
Clammy Ground Cherry	<i>Physalis heterophylla</i>	NI	Yes	No	H	0.21			No			No			No			
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	H	0.00			No			No			No			
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	H	0.00			No			No			No			
Sandbar Willow	<i>Salix interior</i>	FACW	Yes	No	H	0.71			No			No			No			
Lance-leaved Aster	<i>Symphyotrichum lanceolatum</i>	FAC	Yes	No	H	0.57			No			No			No			
Ontario Aster	<i>Symphyotrichum ontarionis</i>	FAC	Yes	No	H	2.07	5	2	No	15	12	Yes			No			
Crooked Aster	<i>Symphyotrichum prenanthoides</i>	FAC	Yes	No	H	0.00			No			No			No			
Arrowleaf Aster	<i>Symphyotrichum urophyllum</i>	NI	Yes	No	H	3.64			No			No			No			
Prairie Ironweed	<i>Vernonia fasciculata</i>	FACW	Yes	No	H	0.36			No			No	1	1	No			
American Vetch	<i>Vicia americana</i>	FACU	Yes	No	H	0.07			No			No			No			
Cocklebur	<i>Xanthium strumarium</i>	FAC	Yes	No	H	2.64	3	2	No			No			No			
Velvet Leaf	<i>Abutilon theophrasti</i>	FACU	No	Yes	H	0.00			No			No			No			
Lamb's Quarters	<i>Chenopodium album</i>	FACU	No	Yes	H	0.07			No			No			No			
Canada Thistle	<i>Cirsium arvense</i>	FACU	No	Yes	H	0.07			No			No			No			
Yellow Nutsedge	<i>Cyperus esculentus</i>	FACW	No	Yes	H	2.64	5	3	No	10	8	No			No			
White Mulberry	<i>Morus alba</i>	FACU	No	Yes	H	0.36			No			No	10	4	No			
Reed canary grass	<i>Phalaris arundinacea</i>	FACW	No	Yes	H	5.29			No	10	8	No			No			
Prostrate knotweed	<i>Polygonum aviculare</i>	FAC	No	Yes	H	0.07			No			No			No			
Unknown Buttercup	<i>Ranunculus sp.</i>				H	0.14			No			No			No			
Unknown Sedge	<i>Carex sp.</i>				H	0.14			No			No			No			
						Total	90	43		68	55		95	42				
Open Water																		
Bare Ground										32								
Grand Total							215	100		123	100		227	100				
% areal cover invasives							5	3		20	16		10	4				
% areal cover natives							209	96		103	84		217	96				
Number Native Non-invasive Species							8			7			11					

Peterson Wetland Bank Monitoring Plots															
Species															
Common Name	Scientific Name	Indicator	Native	Invasive	Strata	Average relative cover	MP4 Absolute Cover	MP4 Relative Cover	MP4 Dominant	MP5 Absolute Cover	MP5 Relative Cover	MP5 Dominant	MP7 Absolute Cover	MP7 Relative Cover	MP7 Dominant
Trees															
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	T	0.79			No			No			No
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	T	0.36			No			No			No
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	T	7.71	50	25	Yes			No			No
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	T	1.21			No			No			No
						Total	50	25		0	0		0		
Shrubs															
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	S	0.93			No			No			No
Silver Maple	<i>Acer saccharinum</i>	FACW	Yes	No	S	0.07			No			No			No
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	S	0.29			No			No			No
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	S	9.14	50	25	Yes			No			No
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	S	2.21			No	10	7	Yes			No
Sandbar Willow	<i>Salix interior</i>	FACW	Yes	No	S	12.57	25	13	Yes	25	17	Yes	60	46	Yes
American Elm	<i>Ulmus americana</i>	FACW	Yes	No	S	0.07			No			No			No
						Total	75	38		35	24		60	46	
Vines															
Riverbank grape	<i>Vitis riparia</i>	FACW	Yes	No	V	0.36	2	1				No	2	2	Yes
						Total	2	1		0	0		2	2	
Herbs															
Redroot Pigweed	<i>Amaranthus retroflexus</i>	FACU	No	No	H	0.00			No						No
Barnyard Grass	<i>Echinochloa crus-galli</i>	FACW	No	No	H	0.79			No						No
Lady's thumb	<i>Persicaria maculosa</i>	FACW	No	No	H	0.14			No						No
Creeping Yellowcress	<i>Rorippa sylvestris</i>	OBL	No	No	H	0.36	10	5	Yes	20	13				No
Curly Dock	<i>Rumex crispus</i>	FAC	No	No	H	0.14			No						No
Silver Maple	<i>Acer saccharinum</i>	FACW	Yes	No	H	0.00			No	5	4				No
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	H	0.21			No						No
Common water plantain	<i>Alisma triviale</i>	OBL	Yes	No	H	0.00			No						No
Rough-fruited Waterhemp	<i>Amaranthus tuberculatus</i>	OBL	Yes	No	H	0.14			No						No
Canada Anemone	<i>Anemone canadensis</i>	FACW	Yes	No	H	2.50			No						No
Spreading Dogbane	<i>Apocynum androsaemifolium</i>	UPL	Yes	No	H	0.07			No				1	1	No
Devil's Beggarticks	<i>Bidens frondosa</i>	FACW	Yes	No	H	1.14	15	8	Yes	2	1		10	7	No
False Nettle	<i>Boehmeria cylindrica</i>	OBL	Yes	No	H	2.21			No				40	31	Yes
River bulrush	<i>Bolboschoenus fluviatilis</i>	OBL	Yes	No	H	3.50			No						No
Lake Sedge	<i>Carex lacustris</i>	OBL	Yes	No	H	0.64			No						No
Bulbet-bearing Water Hemlock	<i>Cicuta bulbifera</i>	OBL	Yes	No	H	0.07			No						No
Wild Cucumber	<i>Echinocystis lobata</i>	FACW	Yes	No	H	0.00			No						No
Common Spikerush	<i>Eleocharis palustris</i>	OBL	Yes	No	H	0.29			No	20	13				No
Stink Grass	<i>Eragrostis cilianensis</i>	FACU	Yes	No	H	0.00			No						No
Creeping Lovegrass	<i>Eragrostis hypnoides</i>	OBL	Yes	No	H	0.00			No						No
Spotted Spurge	<i>Euphorbia maculata</i>	FACU	Yes	No	H	0.00			No						No
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	H	0.07			No						No
Lesser Duckweed	<i>Lemna minor</i>	OBL	Yes	No	H	0.21			No						No
False Pimpernel	<i>Lindernia dubia</i>	OBL	Yes	No	H	1.86			No						No
American Water Horehound	<i>Lycopus americanus</i>	OBL	Yes	No	H	0.00	2	1	No						No
Tufted Loosestrife	<i>Lysimachia thyrsiflora</i>	OBL	Yes	No	H	0.21			No						No
Moonseed	<i>Menispermum canadense</i>	FAC	Yes	No	H	0.00	2	1	No						No
Witchgrass	<i>Panicum capillare</i>	FAC	Yes	No	H	1.36	5	3	No						No
Swamp Smartweed	<i>Persicaria amphibia</i>	OBL	Yes	No	H	2.86			No				10	7	No
Nodding Smartweed	<i>Persicaria lapathifolia</i>	FACW	Yes	No	H	0.07			No						No
Pennsylvania Smartweed	<i>Persicaria pensylvanica</i>	FACW	Yes	No	H	0.14			No						No
Lance-leaf Fog Fruit	<i>Phyla lanceolata</i>	OBL	Yes	No	H	4.79			No	30	20				No
Clammy Ground Cherry	<i>Physalis heterophylla</i>	NI	Yes	No	H	0.21			No						No
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	H	0.00			No						No
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	H	0.00			No						No
Sandbar Willow	<i>Salix interior</i>	FACW	Yes	No	H	0.71			No				2	2	No
Lance-leaved Aster	<i>Symphyotrichum lanceolatum</i>	FAC	Yes	No	H	0.57			No						No
Ontario Aster	<i>Symphyotrichum ontariensis</i>	FAC	Yes	No	H	2.07	10	5	Yes	3	2				No
Crooked Aster	<i>Symphyotrichum prenanthoides</i>	FAC	Yes	No	H	0.00			No						No
Arrowleaf Aster	<i>Symphyotrichum urophyllum</i>	NI	Yes	No	H	3.64			No						No
Prairie Ironweed	<i>Vernonia fasciculata</i>	FACW	Yes	No	H	0.36			No						No
American Vetch	<i>Vicia americana</i>	FACU	Yes	No	H	0.07			No						No
Cocklebur	<i>Xanthium strumarium</i>	FAC	Yes	No	H	2.64	5	3	No	15	10				No
Velvet Leaf	<i>Abutilon theophrasti</i>	FACU	No	Yes	H	0.00			No						No
Lamb's Quarters	<i>Chenopodium album</i>	FACU	No	Yes	H	0.07			No						No
Canada Thistle	<i>Cirsium arvense</i>	FACU	No	Yes	H	0.07			No						No
Yellow Nutsedge	<i>Cyperus esculentus</i>	FACW	No	Yes	H	2.64			No	20	13				No
White Mulberry	<i>Morus alba</i>	FACU	No	Yes	H	0.36			No						No
Reed canary grass	<i>Phalaris arundinacea</i>	FACW	No	Yes	H	5.29	20	10	Yes				5	4	No
Prostrate knotweed	<i>Polygonum aviculare</i>	FAC	No	Yes	H	0.07			No						No
Unknown Buttercup	<i>Ranunculus sp.</i>				H	0.14			No						No
Unknown Sedge	<i>Carex sp.</i>				H	0.14			No						No
						Total	69	36		115	76		68	52	
Open Water															
Bare Ground															
Grand Total							196	100		150	100		130	100	
% areal cover invasives							20	10		20	13		5	4	
% areal cover natives							166	85		110	74		125	96	
Number Native Non-invasive Species							10			8			7		

Peterson Wetland Bank Monitoring Plots															
Species															
Common Name	Scientific Name	Indicator	Native	Invasive	Strata	Average relative cover	MP8 Absolute Cover	MP8 Relative Cover	MP8 Dominant	MP9 Absolute Cover	MP9 Relative Cover	MP9 Dominant	MP10 Absolute Cover	MP10 Relative Cover	MP10 Dominant
Trees															
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	T	0.79			No			No			No
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	T	0.36			No			No			No
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	T	7.71			No			No			No
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	T	1.21			No			No			No
						Total	0	0		0	0		0	0	
Shrubs															
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	S	0.93	2	2	No			No			No
Silver Maple	<i>Acer saccharinum</i>	FACW	Yes	No	S	0.07			No			No	1	1	No
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	S	0.29			No			No			No
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	S	9.14	30	22	Yes	60	49	Yes	5	4	No
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	S	2.21			No	1	1	No			No
Sandbar Willow	<i>Salix interior</i>	FACW	Yes	No	S	12.57	15	11	Yes	5	4	No	25	21	Yes
American Elm	<i>Ulmus americana</i>	FACW	Yes	No	S	0.07			No	1	1	No			No
						Total	47	35		67	55		31	26	
Vines															
Riverbank grape	<i>Vitis riparia</i>	FACW	Yes	No	V	0.36			No			No			No
						Total	0	0		0	0		0	0	
Herbs															
Redroot Pigweed	<i>Amaranthus retroflexus</i>	FACU	No	No	H	0.00			No			No			No
Barneyard Grass	<i>Echinochloa crus-galli</i>	FACW	No	No	H	0.79			No			No	10	8	No
Lady's thumb	<i>Persicaria maculosa</i>	FACW	No	No	H	0.14			No			No			No
Creeping Yellowcress	<i>Rorippa sylvestris</i>	OBL	No	No	H	0.36			No	5	4	No			No
Curly Dock	<i>Rumex crispus</i>	FAC	No	No	H	0.14			No			No			No
Silver Maple	<i>Acer saccharinum</i>	FACW	Yes	No	H	0.00			No			No			No
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	H	0.21			No	2	2	No			No
Common water plantain	<i>Alisma triviale</i>	OBL	Yes	No	H	0.00			No			No			No
Rough-fruited Waterhemp	<i>Amaranthus tuberculatus</i>	OBL	Yes	No	H	0.14			No			No			No
Canada Anemone	<i>Anemone canadensis</i>	FACW	Yes	No	H	2.50	2	2	No			No			No
Spreading Dogbane	<i>Apocynum androsaemifolium</i>	UPL	Yes	No	H	0.07			No			No			No
Devil's Beggarticks	<i>Bidens frondosa</i>	FACW	Yes	No	H	1.14			No			No	3	2	No
False Nettle	<i>Boehmeria cylindrica</i>	OBL	Yes	No	H	2.21			No			No			No
River bulrush	<i>Bolboschoenus fluviatilis</i>	OBL	Yes	No	H	3.50			No			No			No
Lake Sedge	<i>Carex lacustris</i>	OBL	Yes	No	H	0.64			No			No			No
Bulbet-bearing Water Hemlock	<i>Cicuta bulbifera</i>	OBL	Yes	No	H	0.07			No			No	1	1	No
Wild Cucumber	<i>Echinocystis lobata</i>	FACW	Yes	No	H	0.00			No			No			No
Common Spikerush	<i>Eleocharis palustris</i>	OBL	Yes	No	H	0.29			No			No	5	4	No
Stink Grass	<i>Eragrostis cilianensis</i>	FACU	Yes	No	H	0.00			No			No			No
Creeping Lovegrass	<i>Eragrostis hypnoides</i>	OBL	Yes	No	H	0.00			No			No			No
Spotted Spurge	<i>Euphorbia maculata</i>	FACU	Yes	No	H	0.00			No			No			No
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	H	0.07			No			No			No
Lesser Duckweed	<i>Lemna minor</i>	OBL	Yes	No	H	0.21			No			No			No
False Pimpernel	<i>Lindernia dubia</i>	OBL	Yes	No	H	1.86			No			No	30	25	Yes
American Water Horehound	<i>Lycopus americanus</i>	OBL	Yes	No	H	0.00			No			No			No
Tufted Loosestrife	<i>Lysimachia thyrsoiflora</i>	OBL	Yes	No	H	0.21			No			No	2	2	No
Moonseed	<i>Menispermum canadense</i>	FAC	Yes	No	H	0.00			No			No			No
Witchgrass	<i>Panicum capillare</i>	FAC	Yes	No	H	1.36			No			No			No
Swamp Smartweed	<i>Persicaria amphibia</i>	OBL	Yes	No	H	2.86			No			No			No
Nodding Smartweed	<i>Persicaria lapathifolia</i>	FACW	Yes	No	H	0.07			No			No			No
Pennsylvania Smartweed	<i>Persicaria pensylvanica</i>	FACW	Yes	No	H	0.14			No			No			No
Lance-leaf Fog Fruit	<i>Phyla lanceolata</i>	OBL	Yes	No	H	4.79			No			No	10	8	No
Clammy Ground Cherry	<i>Physalis heterophylla</i>	NI	Yes	No	H	0.21			No			No			No
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	H	0.00			No			No			No
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	H	0.00			No			No			No
Sandbar Willow	<i>Salix interior</i>	FACW	Yes	No	H	0.71	5	4	No			No			No
Lance-leaved Aster	<i>Symphyotrichum lanceolatum</i>	FAC	Yes	No	H	0.57			No	10	8	No			No
Ontario Aster	<i>Symphyotrichum ontarionis</i>	FAC	Yes	No	H	2.07			No			No	5	4	No
Crooked Aster	<i>Symphyotrichum prenanthoides</i>	FAC	Yes	No	H	0.00			No			No			No
Arrowleaf Aster	<i>Symphyotrichum urophyllum</i>	NI	Yes	No	H	3.64			No	30	25	Yes			No
Prairie Ironweed	<i>Vernonia fasciculata</i>	FACW	Yes	No	H	0.36			No			No	2	2	No
American Vetch	<i>Vicia americana</i>	FACU	Yes	No	H	0.07			No	1	1	No			No
Cocklebur	<i>Xanthium strumarium</i>	FAC	Yes	No	H	2.64	20	15	Yes			No			No
Velvet Leaf	<i>Abutilon theophrasti</i>	FACU	No	Yes	H	0.00			No			No			No
Lamb's Quarters	<i>Chenopodium album</i>	FACU	No	Yes	H	0.07			No			No			No
Canada Thistle	<i>Cirsium arvense</i>	FACU	No	Yes	H	0.07			No			No			No
Yellow Nutsedge	<i>Cyperus esculentus</i>	FACW	No	Yes	H	2.64	10	7	No			No	20	16	Yes
White Mulberry	<i>Morus alba</i>	FACU	No	Yes	H	0.36			No	1	1	No			No
Reed canary grass	<i>Phalaris arundinacea</i>	FACW	No	Yes	H	5.29	50	37	Yes	5	4	No			No
Prostrate knotweed	<i>Polygonum aviculare</i>	FAC	No	Yes	H	0.07			No			No			No
Unknown Buttercup	<i>Ranunculus sp.</i>				H	0.14			No			No	2	2	No
Unknown Sedge	<i>Carex sp.</i>				H	0.14			No			No			No
						Total	87	65		54	45		90	74	
Open Water															
Bare Ground															
Grand Total							134	100		121	100		121	100	
% areal cover invasives							60	44		6	5		20	16	
% areal cover natives							74	56		110	91		89	74	
Number Native Non-invasive Species							6			8			11		

Peterson Wetland Bank Monitoring Plots															
Species															
Common Name	Scientific Name	Indicator	Native	Invasive	Strata	Average relative cover	MP11 Absolute Cover	MP11 Relative Cover	MP11 Dominant	MP12 Absolute Cover	MP12 Relative Cover	MP12 Dominant	MP13 Absolute Cover	MP13 Relative Cover	MP13 Dominant
Trees															
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	T	0.79			No			No			No
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	T	0.36			No			No			No
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	T	7.71	60	49	Yes			No			No
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	T	1.21	10	8	No			No			No
						Total	70	57		0	0		0	0	
Shrubs															
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	S	0.93			No			No			No
Silver Maple	<i>Acer saccharinum</i>	FACW	Yes	No	S	0.07			No			No			No
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	S	0.29			No			No			No
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	S	9.14			No			No	5	5	Yes
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	S	2.21	30	25	Yes			No			No
Sandbar Willow	<i>Salix interior</i>	FACW	Yes	No	S	12.57	10	8	No	5	16	Yes	10	10	Yes
American Elm	<i>Ulmus americana</i>	FACW	Yes	No	S	0.07			No			No			No
						Total	40	33		5	16		15	15	
Vines															
Riverbank grape	<i>Vitis riparia</i>	FACW	Yes	No	V	0.36	3	2	Yes			No			No
						Total	3	2		0	0		0	0	
Herbs															
Redroot Pigweed	<i>Amaranthus retroflexus</i>	FACU	No	No	H	0.00			No			No			No
Barneyard Grass	<i>Echinochloa crus-galli</i>	FACW	No	No	H	0.79			No			No	2	2	No
Lady's thumb	<i>Persicaria maculosa</i>	FACW	No	No	H	0.14			No			No	2	2	No
Creeping Yellowcress	<i>Rorippa sylvestris</i>	OBL	No	No	H	0.36			No			No	1	1	No
Curly Dock	<i>Rumex crispus</i>	FAC	No	No	H	0.14			No			No	2	2	No
Silver Maple	<i>Acer saccharinum</i>	FACW	Yes	No	H	0.00			No			No			No
Boxelder	<i>Acer negundo</i>	FAC	Yes	No	H	0.21			No			No			No
Common water plantain	<i>Alisma triviale</i>	OBL	Yes	No	H	0.00			No			No			No
Rough-fruited Waterhemp	<i>Amaranthus tuberculatus</i>	OBL	Yes	No	H	0.14			No			No	2	2	No
Canada Anemone	<i>Anemone canadensis</i>	FACW	Yes	No	H	2.50			No			No	7	7	No
Spreading Dogbane	<i>Apocynum androsaemifolium</i>	UPL	Yes	No	H	0.07			No			No			No
Devil's Beggarticks	<i>Bidens frondosa</i>	FACW	Yes	No	H	1.14	1	1	No			No	1	1	No
False Nettle	<i>Boehmeria cylindrica</i>	OBL	Yes	No	H	2.21			No			No			No
River bulrush	<i>Bolboschoenus fluviatilis</i>	OBL	Yes	No	H	3.50			No	15	49	Yes			No
Lake Sedge	<i>Carex lacustris</i>	OBL	Yes	No	H	0.64			No			No			No
Bulbet-bearing Water Hemlock	<i>Cicuta bulbifera</i>	OBL	Yes	No	H	0.07			No			No			No
Wild Cucumber	<i>Echinocystis lobata</i>	FACW	Yes	No	H	0.00			No			No			No
Common Spikerush	<i>Eleocharis palustris</i>	OBL	Yes	No	H	0.29			No			No			No
Stink Grass	<i>Eragrostis cilianensis</i>	FACU	Yes	No	H	0.00			No			No			No
Creeping Lovegrass	<i>Eragrostis hypnoides</i>	OBL	Yes	No	H	0.00			No			No			No
Spotted Spurge	<i>Euphorbia maculata</i>	FACU	Yes	No	H	0.00			No			No			No
Green Ash	<i>Fraxinus pennsylvanica</i>	FACW	Yes	No	H	0.07			No			No			No
Lesser Duckweed	<i>Lemna minor</i>	OBL	Yes	No	H	0.21			No	1	3	No			No
False Pimpernel	<i>Lindernia dubia</i>	OBL	Yes	No	H	1.86			No			No	1	1	No
American Water Horehound	<i>Lycopus americanus</i>	OBL	Yes	No	H	0.00			No			No			No
Tufted Loosestrife	<i>Lysimachia thyrsiflora</i>	OBL	Yes	No	H	0.21	1	1	No			No			No
Moonseed	<i>Menispermum canadense</i>	FAC	Yes	No	H	0.00			No			No			No
Witchgrass	<i>Panicum capillare</i>	FAC	Yes	No	H	1.36			No			No	18	17	Yes
Swamp Smartweed	<i>Persicaria amphibia</i>	OBL	Yes	No	H	2.86			No	10	32	Yes			No
Nodding Smartweed	<i>Persicaria lapathifolia</i>	FACW	Yes	No	H	0.07			No			No	1	1	No
Pennsylvania Smartweed	<i>Persicaria pensylvanica</i>	FACW	Yes	No	H	0.14			No			No	2	2	No
Lance-leaf Fog Fruit	<i>Phyla lanceolata</i>	OBL	Yes	No	H	4.79			No			No	1	1	No
Clammy Ground Cherry	<i>Physalis heterophylla</i>	NI	Yes	No	H	0.21			No			No	3	3	No
Plains Cottonwood	<i>Populus deltoides</i>	FAC	Yes	No	H	0.00			No			No			No
Peach Leaved Willow	<i>Salix amygdaloides</i>	FACW	Yes	No	H	0.00			No			No			No
Sandbar Willow	<i>Salix interior</i>	FACW	Yes	No	H	0.71			No			No	4	4	No
Lance-leaved Aster	<i>Symphyotrichum lanceolatum</i>	FAC	Yes	No	H	0.57			No			No			No
Ontario Aster	<i>Symphyotrichum ontarionis</i>	FAC	Yes	No	H	2.07			No			No			No
Crooked Aster	<i>Symphyotrichum prenanthoides</i>	FAC	Yes	No	H	0.00			No			No			No
Arrowleaf Aster	<i>Symphyotrichum urophyllum</i>	NI	Yes	No	H	3.64	5	4	Yes			No			No
Prairie Ironweed	<i>Vernonia fasciculata</i>	FACW	Yes	No	H	0.36	2	2	Yes			No			No
American Vetch	<i>Vicia americana</i>	FACU	Yes	No	H	0.07			No			No			No
Cocklebur	<i>Xanthium strumarium</i>	FAC	Yes	No	H	2.64			No			No	20	19	Yes
Velvet Leaf	<i>Abutilon theophrasti</i>	FACU	No	Yes	H	0.00			No			No			No
Lamb's Quarters	<i>Chenopodium album</i>	FACU	No	Yes	H	0.07			No			No	1	1	No
Canada Thistle	<i>Cirsium arvense</i>	FACU	No	Yes	H	0.07			No			No	1	1	No
Yellow Nutsedge	<i>Cyperus esculentus</i>	FACW	No	Yes	H	2.64			No			No	3	3	No
White Mulberry	<i>Morus alba</i>	FACU	No	Yes	H	0.36			No			No			No
Reed canary grass	<i>Phalaris arundinacea</i>	FACW	No	Yes	H	5.29			No			No	15	14	Yes
Prostrate knotweed	<i>Polygonum aviculare</i>	FAC	No	Yes	H	0.07			No			No	1	1	No
Unknown Buttercup	<i>Ranunculus sp.</i>				H	0.14			No			No			No
Unknown Sedge	<i>Carex sp.</i>				H	0.14			No			No			No
						Total	9	8		26	84		88	85	
Open Water										74					
Bare Ground													5		
Grand Total							122	100		31	100		103	100	
% areal cover invasives							0	0		0	0		21	20	
% areal cover natives							122	100		31	100		75	73	
Number Native Non-invasive Species							9			4			13		

