

FINAL REPORT

Stormwater and Green Infrastructure Implementation Plan for the Roger Williams Park Zoo

SWIG23-2-ASRI-ZOO

Audubon Society of Rhode Island / Stormwater Innovation Center
Submitted to Restore America's Estuaries
Southeast New England Program Watershed Implementation Grants

May 2026

Field	Information
Project Name	Stormwater and Green Infrastructure Implementation Plan for the Roger Williams Park Zoo
Subaward Number	SWIG23-2-ASRI-ZOO
Subrecipient Organization	Audubon Society of Rhode Island
Report Contact	Ryan Kopp, Stormwater Innovation Center Director, 719-214-1269, rkopp@asri.org
Funding Source	EPA Southeast New England Program Watershed Implementation Grants through Restore America's Estuaries
Award Amount	\$197,348
Committed Non-Federal Match	\$68,901
Primary Deliverable	Roger Williams Park Zoo Stormwater Master Plan, May 2026

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1. Executive Summary

The Roger Williams Park Zoo Stormwater Master Plan project developed a practical, phased approach for improving water quality and wetland health within the Zoo Wetland and the larger Roger Williams Park pond system. The project was funded through an EPA Southeast New England Program Watershed Implementation Grant administered by Restore America's Estuaries and was led by the Audubon Society of Rhode Island through the Stormwater Innovation Center. Project partners included Roger Williams Park Zoo, the Horsley Witten Group, Ray Dunetz Landscape Architecture, the Providence Parks Department, the City of Providence Department of Public Works, the University of Rhode Island, The Nature Conservancy, EPA technical partners, and other collaborators.

The purpose of the project was to better understand how stormwater moves through the Zoo campus, identify sources and pathways for bacteria, phosphorus, sediment, and other pollutants, and recommend realistic structural and non-structural improvements that can be implemented over time. The Zoo Wetland is hydraulically connected to Polo Lake and the broader Roger Williams Park pond system, which has experienced long-standing water quality impairments, including elevated nutrients, bacteria, sedimentation, cyanobacteria blooms, poor water clarity, and ecological stress.

Zoo environments present stormwater challenges that differ from standard urban land uses. In addition to roofs, paths, roads, parking areas, and landscaped spaces, the Zoo includes animal exhibits with compacted soils, bare ground, and animal waste. Runoff from some exhibit areas can behave more like runoff from agricultural or livestock areas than typical urban stormwater. For that reason, this project emphasized a combined approach that includes green infrastructure, drainage improvements, source control, manure management, routine maintenance, education, and careful routing or treatment of higher-pollutant runoff.

The final Stormwater Master Plan was developed through review of existing plans and data, GIS analysis, dry- and wet-weather field assessments, baseline wetland water quality and sediment sampling, storm runoff sampling, stakeholder meetings, and an on-site design charrette. The assessment confirmed that much of the Zoo's closed-pipe drainage system connects to the combined sewer system, reducing direct discharge to the Zoo Wetland and Polo Lake. However, several uncontrolled areas still discharge to the wetland through sheet flow, shallow concentrated flow, eroding pathways, and localized drainage points. The field assessment also found that some existing green infrastructure practices are not functioning as intended because of grading issues, invasive vegetation, and maintenance needs.

Water quality results confirmed that stormwater contributes to impairment of the Zoo Wetland. Baseline wetland sampling was conducted at four locations on July 17, 2025. Total phosphorus ranged from 0.17 to 0.22 mg/L, indicating hypereutrophic conditions. Enterococci results ranged from 120 to 676 MPN/100 mL. Stormwater runoff sampling was conducted on August 20, 2025 at five priority locations during a 0.99-inch rain event. Fecal coliform results were high at all five locations, with four samples exceeding 24,200 MPN/100 mL. Total phosphorus ranged from 0.26 to 1.23 mg/L and total suspended solids ranged from 62 to 502 mg/L. These results indicate that runoff from selected Zoo areas contains elevated bacteria, nutrients, and sediment and has characteristics that differ from typical urban stormwater runoff.

The Master Plan recommends a phased strategy that combines structural improvements, non-structural best management practices, restoration of existing stormwater systems, improved maintenance, habitat restoration, continued monitoring, and public education. Eighteen structural stormwater opportunities were identified, ranging from smaller rain gardens, tree trenches, infiltration areas, and outlet stabilization to higher-priority water quality swales, proprietary treatment units, buffer restoration, and wetland restoration. Non-structural recommendations include improving manure management, source control, grading and drainage practices, defining maintenance responsibilities among partners, and exploring additional connections to the combined sewer system where higher-bacteria runoff can be treated appropriately.

The project also expanded monitoring and public engagement capacity. The Zoo Wetland was added to the URI Watershed Watch monitoring network, water level sensors were installed to better understand hydrologic exchange between the wetland and Polo Lake, and additional stormwater sampling methods were developed to capture overland flow from priority areas. The project supported education meetings with Zoo staff, public tabling, university and professional tours, Rain Harvest Festival outreach, Stormwater

Innovation Expo programming, and continued collaboration with EPA, URI, the City, Providence Parks, the Zoo, The Nature Conservancy, and other partners.

Overall, the project produced a transferable planning model for addressing stormwater pollution in a zoo setting while supporting the Zoo's conservation and education mission. By combining data collection, stakeholder-driven planning, conceptual designs, maintenance recommendations, and education, the project provides the Zoo and its partners with a clear path for future design, funding, implementation, monitoring, and adaptive management.

2. Cover Information

Field	Information
Project Name	Stormwater and Green Infrastructure Implementation Plan for the Roger Williams Park Zoo
Subaward Number	SWIG23-2-ASRI-ZOO
Subaward Period	2023-2025, with final closeout activities completed in 2026
Subrecipient Organization	Audubon Society of Rhode Island
Project Lead / Report Contact	Ryan Kopp, Stormwater Innovation Center Director, 719-214-1269, rkopp@asri.org
Funding Source	EPA Southeast New England Program Watershed Implementation Grants through Restore America's Estuaries
Award Amount	\$197,348
Required / Committed Non-Federal Match	\$68,901
Project Location	Roger Williams Park Zoo and connected Roger Williams Park pond system, Providence, Rhode Island
Primary Project Partners	Roger Williams Park Zoo; Horsley Witten Group; Ray Dunetz Landscape Architecture; City of Providence Department of Public Works; Providence Parks Department; University of Rhode Island; The Nature Conservancy; EPA Narragansett and Chelmsford laboratories; Audubon Society of Rhode Island / Stormwater Innovation Center
Report Type	Final Report

Funding acknowledgement: This project is supported by Southeast New England Program Watershed Implementation Grants. SNEP Watershed Implementation Grants are funded by the U.S. Environmental Protection Agency through a collaboration with Restore America's Estuaries.

Final Master Plan link: https://5e7bb91a-f2df-416f-8e72-b7e228e8c87f.filesusr.com/ugd/9b0624_edc9089422a34a02b4e9bb84042a7b47.pdf

3. Project Report Narrative

Project Purpose and Need

The Roger Williams Park Zoo is located within Roger Williams Park in Providence, Rhode Island, adjacent to Polo Lake and the interconnected Roger Williams Park pond system. These waters are part of the Pawtuxet River watershed and are connected downstream to Bellefonte Brook, the Pawtuxet River, and Narragansett Bay.

The Park pond system has long-standing water quality challenges associated with phosphorus, bacteria, suspended sediment, cyanobacteria blooms, poor water clarity, and ecological degradation. The Zoo Wetland is hydraulically connected to Polo Lake through an existing 36-inch culvert and is considered part of the larger impaired pond system. Prior to this project, the Zoo Wetland had not been fully incorporated into ongoing water quality monitoring and the Zoo campus had not been comprehensively assessed for stormwater retrofit opportunities.

The project was designed to fill this information gap by developing a Stormwater Master Plan for the Zoo campus that identifies drainage pathways, priority pollutant sources, opportunities for water quality treatment, maintenance needs, and education opportunities. The project also established baseline monitoring information that can be used to track future improvements after implementation.

Project Goals

- Identify and quantify key sources of bacteria, phosphorus, sediment, and other water quality degradation affecting the Zoo Wetland and adjacent Polo Lake.
- Develop creative and practical recommendations for both structural and non-structural stormwater best management practices, with an emphasis on green infrastructure that fits the Zoo's ecological and conservation mission.
- Prioritize restoration opportunities that improve water quality, wetland health, and the visitor experience.
- Align recommendations with the maintenance capabilities and operational realities of Zoo staff and partner organizations.
- Strengthen education, outreach, and continued collaboration among the Zoo, SIC, City, Parks, URI, and other partners.

Summary of Actual Accomplishments Compared with Anticipated Outputs

Anticipated Output / Outcome	Status and Accomplishment
Develop project scope and procure a consultant	Completed. SIC developed an RFP, reviewed six proposals, and selected Horsley Witten Group as the consultant. Ray Dunetz Landscape Architecture supported the development of design concepts.
Prepare QAPP and field assessment approach	Completed. The project team prepared a Quality Assurance Project Plan dated November 5, 2024 and signed by project partners in November 2024. The QAPP documented QA/QC protocols for primary and secondary data collection and supported field assessment, baseline wetland sampling, storm runoff sampling, sediment sampling, and water level monitoring.
Map drainage infrastructure and hydrologic connections	Completed. Existing plans, GIS data, stormwater and sewer mapping, field observations, and stakeholder knowledge were used to delineate drainage areas, identify infrastructure networks, and document stormwater discharge pathways to the Zoo Wetland and Polo Lake.
Collect baseline water quality, water level, sediment, and stormwater data	Completed. SIC and project partners conducted wetland water quality sampling, sediment sampling, stormwater runoff sampling, Watershed Watch sampling, and water level monitoring across the Zoo Wetland and connected pond system.

Identify structural and non-structural BMP opportunities	Completed. The Master Plan identifies 18 structural stormwater opportunities and several non-structural recommendations, including maintenance planning, source control, potential CSO connections for high-strength runoff, green infrastructure maintenance, and partner role clarification.
Develop conceptual designs and implementation roadmap	Completed. Horsley Witten and RDLA led an on-site design charrette and developed prioritized concept designs, planning-level cost ranges, permitting considerations, operations and maintenance notes, and implementation guidance.
Coordinate education and outreach with Zoo staff and public audiences	Completed and continuing. SIC coordinated education meetings and tours with Zoo education and maintenance staff, tabled at Zoo and park events, discussed interpretive signage, and shared project lessons through the 2025 Stormwater Innovation Expo and other outreach efforts.
Share lessons learned with professionals and partners	Completed and continuing. Project findings were shared through SIC advisory meetings, professional tours, Stormwater Innovation Expo programming, university presentations, partner meetings, and continued collaboration with regional zoos and watershed partners.

Major Project Activities by Phase

Time Period	Major Activities
July 2023-February 2024	Award ceremony; initial Zoo site visit with Zoo, URI, Parks, DPW, and SIC; preliminary infrastructure mapping; identification of a previously unknown outfall to Polo Lake; development of consultant RFP.
March-June 2024	RFP issued to 17 environmental and engineering consulting firms; six proposals received; consultant review and ranking completed; Horsley Witten Group selected; scope negotiated; kickoff meeting held with project stakeholders.
July-August 2024	Technical meeting with Horsley Witten and stakeholders; background research and memo development; QAPP drafting; investigation of carp impacts on water quality; part-time monitoring assistance initiated.
September 2024-February 2025	QAPP advanced and signed; desktop analysis and wet/dry field assessment planning; Buttonwood Park Zoo partner learning visit; electrofishing carp surveys in Roger Williams Park ponds; Goose Survey community science program initiated; draft water quality monitoring plan refined.
March-August 2025	Water level sensors and PVC stilling wells installed in Polo Lake and the Zoo Wetland; Zoo Wetland added to monitoring; seasonal monitoring staff supported field work; baseline wetland sampling and sediment sampling conducted; overland flow stormwater sampling locations and collection methods finalized; August stormwater runoff samples collected at five locations.
September-December 2025	On-site design charrette held with Zoo staff and project partners; conceptual stormwater designs refined; stormwater and wetland results incorporated into the Master Plan; Watershed Watch monitoring continued at eight sites; FLAME surveys initiated by EPA; outreach conducted through Rain Harvest Festival, Raptor Weekend, university tours, and Stormwater Innovation Expo programming.
January-May 2026	Draft Master Plan reviewed with project stakeholders; final Master Plan completed in May 2026; final invoice and final report prepared during closeout.

Key Findings and Results

Drainage and Infrastructure Assessment

The planning process confirmed that the Zoo campus has multiple drainage systems and pollutant pathways. Much of the closed-pipe drainage appears to connect to the combined sewer system, which reduces direct discharge to the Zoo Wetland and Polo Lake. However, several uncontrolled areas still discharge through sheet flow, shallow concentrated flow, eroding paths, localized drainage points, and unmanaged overland flow.

The field assessment identified the need to better define responsibilities for stormwater and sewer infrastructure among the Zoo, City, and Parks Department. The plan recommends clarifying responsibilities through a memorandum of understanding or similar agreement so that cleaning, inspection, and maintenance can be incorporated into routine operations.

The Master Plan estimated more than 1,400,000 square feet of drainage area to the combined sewer system and identified a series of local outfalls and overland flow locations draining to the Zoo Wetland and Polo Lake. These findings helped prioritize where structural and non-structural controls should be considered.

Water Quality, Sediment, and Stormwater Sampling

Baseline wetland sampling was conducted at four locations in the Zoo Wetland on July 17, 2025. Results showed elevated nitrogen and phosphorus concentrations. Total phosphorus ranged from 0.17 to 0.22 mg/L, indicating hypereutrophic conditions. Enterococci ranged from 120 to 676 MPN/100 mL. Field measurements also showed high turbidity at several locations, ranging from 49.13 to 132.34 NTU.

Sediment sampling was conducted at one wetland location on July 17, 2025. Results included aluminum at 18,800 mg/L, iron at 45,100 mg/L, total nitrogen at 18,000 mg/L, and total phosphorus at 46 mg/L. These data provide a baseline for future wetland and in-pond management considerations.

Stormwater runoff sampling was conducted on August 20, 2025 at five priority locations around the Zoo Wetland and Polo Lake during a 0.99-inch rain event. SIC and Horsley Witten developed field methods using plastic sheeting, sand bags, dust pan samplers, and collection containers to capture overland flow. Results showed elevated bacteria, nutrients, and suspended solids, confirming that stormwater runoff from selected Zoo areas contributes to water quality impairment in the receiving wetland and Polo Lake.

All five stormwater samples had high fecal coliform concentrations. One sample was greater than 2,420 MPN/100 mL and four samples were greater than 24,200 MPN/100 mL. Total phosphorus ranged from 0.26 to 1.23 mg/L, total nitrogen ranged from 3.81 to 13.8 mg/L, and total suspended solids ranged from 62 to 502 mg/L. These results reinforce the need to reduce phosphorus, bacteria, and sediment inputs while continuing to monitor conditions over time.

Water Quality Data Summary

Metric	Date / Locations	Summary of Results	Use in Final Plan
Baseline wetland water quality	July 17, 2025; WS-01 to WS-04	Total phosphorus 0.17-0.22 mg/L; total nitrogen 1.94-3.93 mg/L; enterococci 120-676 MPN/100 mL; turbidity 49.13-132.34 NTU	Established baseline receiving-water conditions and documented hypereutrophic conditions.
Sediment sampling	July 17, 2025; SS-01	Aluminum 18,800 mg/L; iron 45,100 mg/L; total nitrogen 18,000 mg/L; total phosphorus 46 mg/L	Provides baseline sediment information for future wetland restoration and in-pond management decisions.
Stormwater runoff sampling	August 20, 2025; SWS-01 to SWS-05; 0.99-inch rain event	Fecal coliform >2,420 to >24,200 MPN/100 mL; total phosphorus 0.26-1.23 mg/L; total nitrogen 3.81-13.8 mg/L; TSS 62-502 mg/L	Identified high-bacteria and high-nutrient runoff from priority Zoo areas and supported BMP prioritization.

Water level monitoring	2025; sensors on both sides of wetland/Polo Lake culvert	Sensors installed to record water elevation and help understand culvert exchange during rain events	Supports future evaluation of hydrologic exchange and restoration outcomes.
URI Watershed Watch monitoring	May-October monitoring season	Zoo Wetland added to ongoing monitoring for temperature, dissolved oxygen, chlorophyll a, nutrients, bacteria, pH, and alkalinity	Supports long-term public data access and future implementation tracking.

Stormwater Management Recommendations

The Master Plan recommends a combination of green infrastructure, drainage improvements, maintenance actions, wetland restoration, source control, and continued monitoring. The recommendations are intended to reduce direct discharge of polluted runoff to the Zoo Wetland, improve water quality and wetland habitat, and create opportunities for visitors to learn about the connection between stormwater, wildlife, and water quality.

Eighteen structural stormwater opportunities were identified and ranked based on water quality value, feasibility, partner input, maintenance considerations, and visitor-experience opportunities. The opportunities range from smaller rain gardens, tree trenches, infiltration areas, and outlet stabilization to higher-priority water quality swales, proprietary treatment units, buffer restoration, and wetland restoration.

Category	Representative Recommendations
High-priority drainage / treatment areas	Wet swale, boardwalk, and buffer restoration behind the veterinary building; wet swale near the giraffe-wolf intersection; water quality unit near the Red River Hog shed entrance; Gate 6 water quality and wet swale concept.
Medium-priority improvements	Buffer restoration, stabilized outlets, infiltration basins, restoration of poorly functioning existing green infrastructure, and wetland-edge improvements.
Lower-cost / smaller-scale opportunities	Rain gardens, downspout stabilization, tree trenches, subsurface infiltration for roof runoff, and pavement reduction where feasible.
Wetland restoration	Long-term restoration of the Zoo Wetland, including sediment management, invasive species control, buffer enhancement, varied wetland topography, and future restoration actions coordinated with carp management.
Non-structural practices	Manure management and source control, maintenance planning, defining partner responsibilities, contracting specialized green infrastructure maintenance, routing high-strength runoff to the combined sewer where appropriate, and integrating stormwater guidelines into future Zoo projects.

Invasive Carp, Geese, and Wetland Health

The project also highlighted the connection between biological stressors and water quality. Carp surveys and partner discussions reinforced the importance of invasive carp management as part of water quality restoration. Carp can disturb sediments, increase turbidity, release phosphorus, and limit aquatic vegetation recovery. Surveys also suggested that the Zoo Wetland may function as a breeding or nursery area for juvenile carp.

Community science work also continued around Canada Goose populations in Roger Williams Park, since waterfowl can contribute nutrients and bacteria to the pond system. These efforts provide useful supporting information for future adaptive management strategies.

Monitoring, Data Access, and Future Evaluation

The project expanded monitoring capacity in a way that will support future implementation. URI Watershed Watch monitoring will continue to provide seasonal data for the Zoo Wetland and Roger Williams Park

ponds, including temperature, dissolved oxygen, chlorophyll a, nutrients, bacteria, pH, and alkalinity. Data will be available through the URI Watershed Watch Data Resources website and the Stormwater Innovation Center's Watershed Watch in Roger Williams Park ArcGIS dashboard.

URI Watershed Watch Data Resources: <https://web.uri.edu/watershedwatch/data/>

Stormwater Innovation Center Watershed Watch Dashboard:

<https://psic.maps.arcgis.com/apps/dashboards/24ffa553cfe4f1499cce887977897c5>

The Master Plan recommends continued wetland water quality monitoring, additional stormwater investigations under different storm conditions, water level monitoring, groundwater investigations where appropriate, possible eDNA testing to identify fecal contamination sources, and post-implementation monitoring of stormwater retrofits and wetland restoration projects.

Over the next few monitoring seasons, the Master Plan recommends adding continuous monitoring using a water quality sonde in the wetland to collect high-frequency temperature, specific conductivity, phycocyanin, turbidity, pH, and dissolved oxygen data. These data can support future carp management, wetland restoration, and evaluation of implemented stormwater projects.

Education, Outreach, and Communication

The project created multiple opportunities to translate technical stormwater work into education and outreach. SIC staff coordinated with Zoo education and maintenance staff, provided green infrastructure tours, and discussed how stormwater content could be incorporated into existing Zoo education programs and visitor experiences. The Zoo's annual audience of more than 800,000 visitors provides a major opportunity to connect the public with water quality, habitat, and stormwater stewardship.

The original workplan anticipated a webinar summarizing and highlighting the project, findings, lessons learned, and final implementation plan. This outreach deliverable was completed as a presentation at the 2025 Stormwater Innovation Expo, which reached environmental professionals and regional partners. The Expo presentation shared the Zoo Stormwater Master Plan as a collaborative model for improving water quality and demonstrated the overland flow sampling approach used for the project.

Project-related outreach also occurred through World Ocean Day at Roger Williams Park Zoo, the Rain Harvest Festival, Raptor Weekend, university class presentations, professional tours, SIC Advisory Committee meetings, partner communications, social media, and media coverage. These outreach efforts helped communicate the role of stormwater management, carp management, geese management, green infrastructure, and community action in improving pond health.

Outreach / Engagement Activity	Purpose and Result
Zoo staff tour and education meetings	Introduced Zoo education and maintenance staff to green infrastructure and generated ideas for incorporating stormwater into Zoo programs.
World Ocean Day at the Zoo	Shared rain barrel, rain garden, watershed, and stormwater pollution information with families and visitors.
Stormwater Innovation Expo presentation	Presented the Zoo Stormwater Master Plan as a collaborative approach to improve water quality and demonstrated overland flow sample collection.
Rain Harvest Festival	Highlighted stormwater, water quality, art, community science, and partner restoration efforts in Roger Williams Park.
University and professional tours	Shared project lessons with Roger Williams University engineering students, Salve Regina University students, SIC advisory participants, and other professional audiences.
Media and communications	Supported broader public awareness through social media, outreach materials, newsletters, partner videos, and local media coverage.

Project Partners and Roles

Partner	Role
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Audubon Society of Rhode Island / Stormwater Innovation Center	Project lead, coordination, reporting, monitoring, field sampling, outreach, education, partner engagement, and dissemination of lessons learned.
Roger Williams Park Zoo	Site partner, operational input, access to infrastructure and staff knowledge, education collaboration, maintenance input, and long-term implementation partner.
Horsley Witten Group / Ray Dunetz Landscape Architecture	Stormwater Master Plan development, desktop analysis, field assessment, stakeholder facilitation, conceptual design, implementation recommendations, and cost estimates.
City of Providence Department of Public Works	Engineering and stormwater infrastructure expertise, TMDL implementation context, infrastructure data, and future implementation coordination.
Providence Parks Department	Park infrastructure and management expertise, coordination with the broader Roger Williams Park pond system, and long-term restoration implementation partner.
University of Rhode Island / Watershed Watch / Coastal Institute	Water quality monitoring support, Watershed Watch sampling and laboratory analysis, and technical input on monitoring and assessment.
EPA Narragansett and Chelmsford Laboratories	Technical support for fish surveys, water quality monitoring, FLAME surveys, and discussions around continuous monitoring.
The Nature Conservancy	Carp and water quality collaboration, fish survey support, and public communication support.
Buzzards Bay Coalition and regional zoo partners	Peer learning related to zoo stormwater, manure management, and restoration practices.

Volunteer and Community Involvement

Volunteer and community involvement supported both data collection and public stewardship. The URI Watershed Watch program included trained community volunteers and Zoo staff to support monitoring of the Roger Williams Park and Zoo sites. In 2025, eight sites in Roger Williams Park and the Zoo were monitored, including the Zoo Wetland and Edgewood Lake. Monitoring included weekly chlorophyll, temperature, and dissolved oxygen measurements and monthly nutrients, pH, alkalinity, and bacteria sampling.

The Canada Goose Survey also expanded community science engagement by training volunteers to monitor the resident goose population, environmental conditions, and waterfowl feeding observations. These data will help partners better understand waterfowl pressure and water quality issues in the Park.

Public outreach events, including the Rain Harvest Festival, World Ocean Day, Raptor Weekend, and Stormwater Innovation Expo, provided additional opportunities for community members to learn about stormwater, water quality, carp and geese impacts, native gardens, rain barrels, and practical actions that can reduce pollution.

We continue to work on develop educational signage within the Zoo that outlines the Master Plan, water quality issues, stormwater, water quality and carp management improvement projects.

Problems Encountered, Slippage, and Remedies

Issue / Adjustment	Effect on Project	Remedy / Outcome
QAPP approval and data collection timing	Field assessment and data collection could not begin until QAPP review and approval were complete.	Project team prepared the QAPP, coordinated with RAE/EPA, and completed data collection after QAPP completion. The final signed QAPP is included as a supporting material.
Monitoring scope changes	The original approach included pollutant load modeling, but the project team determined that additional field sampling would provide more useful information for identifying actual Zoo runoff conditions.	The monitoring scope was adjusted to emphasize baseline wetland sampling, sediment sampling, and stormwater runoff sampling at priority locations.

Weather-dependent sampling	Stormwater sampling required adequate rainfall at suitable timing and staff availability.	Project team finalized overland flow sampling locations and methods and successfully collected five stormwater samples during an August 20, 2025 rain event.
Complex Zoo operations and active construction	Construction of a new educational center and Zoo operations affected where sampling could occur and how future drainage patterns should be evaluated.	The Master Plan recommends reassessing relevant drainage patterns after construction and conducting additional stormwater investigations under a range of storm conditions.
Implementation beyond planning scope	The grant supported planning, monitoring, assessment, outreach, and conceptual design rather than final engineering, permitting, or construction.	The completed Master Plan provides concept designs, cost ranges, O&M notes, funding opportunities, and an implementation framework for future phases.

Objectives Not Carried Out

No approved workplan objective is known to have been eliminated. The central deliverable, the Roger Williams Park Zoo Stormwater Master Plan, was completed in May 2026. The outreach deliverable was completed as a presentation at the 2025 Stormwater Innovation Expo for sharing findings with environmental professionals.

No construction or implementation was included in this grant scope, and no construction permits were required for the completed planning, assessment, monitoring, and outreach work. Future implementation projects may require RIDEM Freshwater Wetland permits or other reviews depending on the location and scope selected.

Work Completed and Remaining Needs

The central project deliverable, the Roger Williams Park Zoo Stormwater Master Plan, has been completed. It includes project context, goals, assessment methods, sampling results, stormwater recommendations, concept designs, monitoring recommendations, education and outreach opportunities, and implementation guidance.

Future work should focus on moving priority projects from planning to design, permitting, construction, maintenance, and post-implementation monitoring. Near-term priorities include selecting one or more high-value demonstration projects, pursuing implementation funding, developing a maintenance agreement among the Zoo, City, Parks, and SIC where appropriate, continuing Watershed Watch and sensor monitoring, and coordinating stormwater improvements with the upcoming carp management demonstration project.

Compliance

No compliance issues were identified. No permits were required for the completed planning, field assessment, sampling, monitoring, and outreach work. The project team prepared and followed a QAPP for environmental data collection and maintained coordination with RAE/EPA around quality assurance requirements.

4. Project Budget Report

The table below is based on the final invoice workbook provided for the project. The invoice reports the full federal award as expended and reports non-federal match in excess of the committed match requirement. Dollar amounts are rounded to the nearest cent; small negative balances in the workbook reflect rounding and/or final category-level reconciliation, while the total award was fully expended.

Budget Category	Total SWIG Award	Total Non-Federal Match Budget	Grant Funds Expended Cumulative	Grant Funds Remaining	Match Funds Expended Cumulative	Match Source / Notes
Personnel	\$59,885.00	\$14,379.04	\$59,937.03	\$-52.03	\$25,317.76	ASRI in-kind personnel
Fringe	\$14,372.40	\$0.00	\$14,384.77	\$-12.37	\$4,388.34	ASRI in-kind fringe
Travel	\$1,900.00	\$0.00	\$1,497.40	\$402.60	\$0.00	Mileage / project travel
Equipment	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	None
Supplies	\$3,250.00	\$5,690.00	\$3,266.62	\$-16.62	\$5,690.00	Field and outreach supplies; match supplies
Contracts	\$100,000.00	\$0.00	\$100,000.00	\$0.00	\$0.00	Consultant and contracted project work
Other	\$0.00	\$48,832.00	\$0.00	\$0.00	\$51,667.56	Partner in-kind / other match
Total Direct	\$179,407.40	\$68,901.04	\$179,407.40	\$-0.00	\$87,063.66	Direct cost totals
Indirect	\$17,940.74	\$0.00	\$17,940.74	\$-0.00	\$0.00	10% de minimis / indirect
TOTAL	\$197,348.14	\$68,901.04	\$197,348.14	\$-0.00	\$87,063.66	Final invoice total

Budget Narrative

Personnel and fringe supported SIC project management, coordination with the Zoo and project partners, reporting, field monitoring, stormwater sampling, water level monitoring, outreach, education coordination, data analysis, and preparation of final reporting materials.

Travel supported project-related mileage and field coordination, including meetings, monitoring, field assessment, and outreach activities. Equipment was not used as a budget category for this project.

Supplies supported field sampling materials, monitoring supplies, outreach and training materials, and other project implementation needs.

Contractual expenses supported professional services needed to complete the Stormwater Master Plan, including technical analysis, QAPP development, field assessment, conceptual design, implementation planning, and related project deliverables.

Non-federal match was provided through ASRI personnel and fringe, supplies, and partner in-kind contributions. The final invoice reports cumulative match of \$87,063.66, exceeding the committed match amount of \$68,901.

Cost Overruns, High Unit Costs, and Budget Modifications

The final invoice reports the full federal award as expended and match requirements exceeded. Category-level balances in the invoice show small overages and underruns across personnel, fringe, supplies, and travel, with the total grant award fully expended. No unresolved cost overrun issue is identified in the source materials provided for this final report.

5. Supporting Materials

The following supporting materials document the full project period and should be included with or linked from the final report package. The grant agreement and final report instructions request supporting materials that provide an overview of the entire project, including project maps and drawings, data analyses, project photographs, outreach materials, and other documentation. Because several source files are large, the final report is organized to link to major deliverables and to list progress reports and photo documentation as supporting attachments.

Supporting Material	Description / Access
Roger Williams Park Zoo Stormwater Master Plan, May 2026	Final project deliverable. Link: https://5e7bb91a-f2df-416f-8e72-b7e228e8c87f.filesusr.com/ugd/9b0624_edc9089422a34a02b4e9bb84042a7b47.pdf
Quality Assurance Project Plan	Final signed QAPP dated November 5, 2024, Revision 0. Documents QA/QC protocols for primary and secondary data used in the project. Link: 24052 Roger Williams Park QAPP FINAL-signed.mp.pdf
Water quality and monitoring data	Baseline wetland, sediment, stormwater runoff, Watershed Watch, water level, and related monitoring information are summarized in the Master Plan. URI Watershed Watch Data Resources: https://web.uri.edu/watershedwatch/data/
SIC Watershed Watch Dashboard	Public-facing ArcGIS dashboard for Watershed Watch monitoring in Roger Williams Park. Link: https://psic.maps.arcgis.com/apps/dashboards/24ffa553cfe4f1499cce887977897c5
Project maps, drawings, and conceptual stormwater designs	Infrastructure, subwatershed, outfall, structural opportunity, and concept design maps are included in the Master Plan, along with water quality volume estimates, O&M guidance, permitting notes, and planning-level cost ranges.
Outreach materials and presentations	2025 Stormwater Innovation Expo presentation, Zoo staff education tours and meetings, World Ocean Day , Rain Harvest Festival outreach, Raptor Weekend outreach, university tours, article in the Audubon Report , and professional presentations.
Photographs and site documentation	Photo documentation is included below and in the progress reports. Photos document field assessment, monitoring, sampling, stakeholder meetings, the charrette, fish survey work, laboratory analysis, and outreach.

Progress Reports and Detailed Project Documentation

The progress reports below provide additional narrative detail, interim results, field photographs, outreach summaries, and supporting documentation across the full project period. The links are included as relative file links for use when the final report is submitted with the supporting documents in the same folder or shared file package.

Project Photographs

The final report instructions ask for high-resolution digital images where available. The representative photographs below are included in the report to document project activities; additional images are retained in the progress reports and project files.



Award ceremony for Restore America's Estuaries / SNEP Watershed Implementation Grant recipients in Providence.



Project kickoff and site tour with Roger Williams Park Zoo, City, Parks, URI, Horsley Witten, and SIC partners.



Installation of water level monitoring infrastructure to evaluate hydrologic exchange between the Zoo Wetland and Polo Lake.



Electrofishing survey work in the Roger Williams Park Zoo Wetland to support carp and water quality investigations.



On-site design charrette with Zoo staff and project stakeholders to prioritize stormwater concepts and implementation opportunities.



Rain Harvest Festival outreach highlighting stormwater, water quality, and community science in Roger Williams Park.



Stormwater laboratory work supporting analysis of bacteria, nutrients, turbidity, and suspended solids.



Stakeholder review and project discussion as the Roger Williams Park Zoo Stormwater Master Plan was finalized.



Stormwater sampling setup in Roger Williams Park Zoo



Presentation of the Stormwater Master Plan at the Stormwater Innovation Expo, sharing lessons learned

6. Certification

The undersigned verifies that the descriptions of activities and expenditures in this final report are accurate to the best of my knowledge; and that the activities were conducted in agreement with the grant contract. I certify that the matching fund levels established in the grant contract and reported here have been met.

Field	Information
Subrecipient Signature	 Type text here
Name	Ryan Kopp
Job Title	Stormwater Innovation Center Director
Date	5/26/2026
Organization	Audubon Society of Rhode Island