



55 Village Square Drive
South Kingstown RI 02879
T +1 401 789 6224

March 20, 2023

Nic Reuter
Picerne Real Estate Group, LLC
75 Lambert Lind Highway
Warwick, RI 02886

**Re: Hydrological Watershed Assessment
Fieldstone Farms Subdivision – South Kingstown, Rhode Island
RPS Project # 220916**

Dear: Mr. Reuter:

Picerne Real Estate Group, LLC (Picerne) retained RPS Group Incorporated (dba RPS) to perform a hydrological assessment of the Fieldstone Farms Project located at the southeastern corner of the intersection of Old North Road and Stony Fort Road, identified as Assessor's Plat 16-4, Lot 19 in South Kingstown, Rhode Island (the site). The scope of work was conducted in accordance with the approved proposal dated January 27, 2023. This report summarizes findings of the assessment.

Assessment Purpose

The site is a proposed housing development consisting of 39 proposed dwelling units which will be serviced by public water provided by the Kingston Water District and on-site wastewater treatment systems (OWTS).

RPS understands that although the project is located within the Saugatucket River watershed; the source of the public water provided for the project will be from wells that are located within the adjacent Chipuxet River Basin watershed. Additionally, as a condition of master plan approval for the project the town of South Kingstown has required the following:

“As part of the Preliminary Plan submittal, the applicant shall submit an analysis prepared by a hydrologist that addresses the impacts of water withdrawal from the Chipuxet River – Pawtucket River watershed and deposit of such water into the Saugatucket River watershed as related to water quality, the locally high water table, the impacts to existing drainage patterns, and the impact of depositing wastewater from the community onsite wastewater treatment systems in proximity to the surface water drainage basins and wetlands.”

Based on this requirement, RPS conducted this hydrological assessment to satisfy the requirements of the town. A description of the project site conditions; an evaluation of the hydrologic conditions of the site; and a discussion of potential hydrological impacts which may result from the project are presented below.

Existing Site Conditions

Site Description and Surrounding Uses

The site is located along the eastern side of Old North Road and the southern side of Stony Fort Road in South Kingstown, Rhode Island. The total area of the project site is 118.6 acres⁽¹⁾. The entire site comprised of undeveloped wooded land. Abutting properties are described below⁽²⁾.

- Residential land is located across Stony Fort Road to the north of the site.
- Residential and undeveloped wooded land is located across Old North Road along the northwestern site boundary; and the Compass School and residential properties abut the site along the southwestern property line.
- The Good Shepard Lutheran Church and residential properties abut the site to the south; and
- Kingston Hill Academy abuts the site in the northeast along Stony Fort Road; the remaining eastern boundary abuts undeveloped wooded open space land owned by the Town of South Kingstown⁽³⁾.

Topography

The topography of the site slopes from the northwest to the southeast. Surface elevations range from a high of approximately 266 feet in the northwestern corner of the property to a low of 174 feet in the southeastern corner of the property⁽¹⁾⁽⁴⁾. The existing runoff patterns follow the topography.

Soils

The site soils consist of upland and wetland soil types. The soil types found on the site are described below⁽⁴⁾⁽⁵⁾.

- **SdB - Scio very stony slit loam, 0 to 8 percent slopes**, are predominant soil type in the northern portion of the site. The soil is identified as a moderately well drained (upland) soil that is suitable for community development but is limited by seasonal high water table which is expected to be at a depth of about 20 inches.
- **NbB - Narragansett very stony silt loam, 0 to 8 percent slopes**, are located in the northeastern corner of the site. This soil type is identified as a well drained (upland) soil that is suitable for community development.
- **ScA - Scio silt loam, 0 to 3 percent slopes**, are located in the southwestern portion of the site, along Old North Road; and in the eastern and southern portions of the site. The soil is identified as a moderately well drained (upland) soil that is suitable for community development but is limited by seasonal high water table which is expected to be at a depth of about 20 inches.
- **Rf - Ridgebury, Whitman, and Leicester extremely stony fine sandy loams**, are located in the majority of the central and southern portions of the site. These soils are identified as poorly drained and very poorly drained (wetland) soils and are poorly suited due to the high water table.

Wetlands

The location of the on-site wetlands have been delineated in the field by Natural Resource Services, Inc., located by Diprete Engineering, and verified by the Rhode Island Department of Environmental Management (RIDEM). The wetlands consist of a large wooded swamp, approximately 56.7 acres in area, located in the central and southern portions of the site. The swamp is drained by a small stream which flows off-site to the south. The general runoff patterns at the site are from northwest to the southeast.

Soil Evaluation Test Holes

A total of 55 soil evaluation test holes were conducted on the site. The test holes were located in the upland portions of the site in the west along Old North Road and in the northeast adjacent the Kingston Academy School. The test holes were conducted by Chris Sutter, a RIDEM licensed soil evaluator. The findings indicated a seasonal high water table of 18 to 24 inches at all test hole locations. Additionally, the depth to an impervious layer was found to be greater than 96 inches⁽⁶⁾.

Groundwater Quality

The groundwater quality for the site is classified as GA ⁽²⁾. The RIDEM Groundwater Quality Rules⁽⁷⁾ define GA groundwater as those groundwater resources which the Director has designated to be suitable for public or private drinking water use without treatment.

Water Supply

The existing pre-development site currently has no associated water supplies (wells or public water service). The current water supply for the areas surrounding the site are public and private wells to the north, east and west of the site. A non-community wellhead protection area associated with the water supply well for the Kingston Hill Academy (east of the site) overlaps the northern portion of the site. Properties to the south, located along Old North Road and Bean Farm Road are serviced by public water supplied by the Kingston Water District⁽⁸⁾.

Watershed

The site is located within the Saugatucket River Watershed. The watershed is approximately 17.2 square miles in area and drains to the south into the northern end of Point Judith Pond⁽⁹⁾. The site is located along the eastern edge of the watershed. Old North Road forms the watershed boundary between the Saugatucket River watershed on the east and the Chipuxet River watershed on the west. The Chipuxet River Basin is approximately 36.93 square miles in area⁽¹⁰⁾ and supplies source water via public supply wells for the Kingston Water District distribution system. The site location and watershed boundaries are depicted in Attachment 1, Figure 1.

Proposed Site Conditions

Proposed Development

The proposed development will consist of the construction of 39 residential lots to be serviced by public water and private OWTS. It includes 16 residential homes on the western and northern sides of the property with frontage on Old North Road and Stony Fort Road. An additional 23 lots will be located in the northeastern corner of the site and be accessed via a new proposed roadway that will intersect with Stony Fort Road. All of the proposed improvements for the project are located in the upland sections of the site. The large central wetland area and an associated 50-foot buffer around the wetland perimeter will not be disturbed.

Stormwater Drainage

Diprete Engineering has designed the proposed stormwater drainage system using Low Impact Development (LID) techniques to mitigate the impacts of the development and to preserve existing drainage patterns, runoff rates, and water quality on the property by incorporating proper design and placement of the system components. The proposed stormwater drainage system has been designed utilizing best management practices (BMPs).

The 16 houses proposed with frontage along Old North Road and Stony Fort Road will control runoff through the use of bio-retention systems. Bio-retention systems are shallow vegetated landscaped depressions and are used to promote infiltration of runoff where it is treated by a number of physical,

chemical and biological processes. Additional runoff control methods to be used in this area include: stone infiltration trenches along driveways, drywells and qualifying pervious areas (QPAs) which aid in infiltration of roof runoff.

The stormwater drainage from the remaining 23 houses and proposed roadway will be directed through a closed drainage network to a drainage area treatment system that includes a sediment forebay, a sand filter, and a detention basin. The stormwater drainage system has been designed in accordance with the requirements of the Rhode Island Storm Water Design and Installation Manual⁽¹¹⁾ to treat the quantity and quality of stormwater being discharged to the environment. The system design was certified by a registered professional engineer and will be reviewed by RIDEM and local regulators prior to final approval and construction.

Sedimentation and Erosion Control

To protect the water quality at the site during construction, a Soil Erosion and Sedimentation Control Plan has been prepared by Diprete Engineering for the project. The plan describes measures to be implemented during the construction process to minimize erosion and sedimentation and protect the nearby wetlands. The sedimentation and erosion controls to be used are included on the project site plans. To address post-construction pollution prevention, Diprete Engineering has prepared a Site Operations and Maintenance (O&M) plan describing the operations that must be followed to ensure proper long-term effective operation of the stormwater treatment system.

On-site Wastewater Systems

Advanced treatment OWTS are proposed for all residences. Fifteen of the houses will utilize individual systems comprised of Advantex AX20 treatment systems and bottomless sand filters. The remainder of the dwellings will utilize a community OWTS which will consist of individual AX20 treatment systems discharging to a low-pressure sewer line which will utilize a community GeoMat 3900 leaching system.

All of the proposed technologies are RIDEM approved alternative technologies⁽¹²⁾ and will be part of advanced treatment denitrifying septic systems. For each wastewater system component to be installed, RIDEM has specified design requirements and installation requirements that must be adhered to. Additionally, the OWTS will be subject to operations and maintenance requirements which include periodic inspections to ensure that the system is operating as designed.

As required by RIDEM for community system leachfields, mounding calculations were completed by Diprete Engineering⁽¹³⁾ for the GeoMat 3900 community leaching system. The results of the calculations indicate that the maximum groundwater mounding will be approximately 0.7 feet over the seasonal high water table in the center of the leaching system. This level of mounding indicates that the native soil in the area is capable of accepting and transmitting effluent at the proposed loading rate without excessive mounding of ground water or seepage outbreak to the ground surface.

Additionally, the on-site location of all the OWTS will be in accordance with RIDEM regulations, including the placement of all components of the OWTS to be located a minimum of 150 feet from the edge of wetlands. The OWTS designs will be prepared by a Rhode Island registered professional engineer and approved by RIDEM prior to construction.

Water Service

The water service for the proposed development will be provided by Kingston Water District.

Water Budget

The proposed use of public water service for the development will result in a net increase of water imported onto the site in the post-construction condition. Additionally, the source of the imported water is from a separate hydrologically distinct watershed basin. The site is located within the Saugatucket River

watershed, and the proposed source of the imported drinking water is located within the Chipuxet River watershed basin. To evaluate possible impacts that importing water may have on existing drainage patterns and the local high water table, a water budget analysis has been completed for the site.

A water budget is an accounting of water inputs and outflows for the property. In the existing conditions the only source of water input is precipitation. Precipitation falls on the site and is either infiltrated into the soil, runs off via surface water flow to the southeast, or is lost through evapotranspiration.

Evapotranspiration is a combination water losses due to evaporation of water to the atmosphere and transpiration (uptake of water by plants). Changes in the outflow of water at a development site is largely dependent on changes to the drainage patterns and increases in impervious surfaces. As previously discussed, for this development the existing drainage patterns have been preserved. The large interior wetland area (and a 50 buffer area) will not be disturbed. Also, additional runoff water generated from impervious surfaces such as roadways and roofs will be treated onsite by infiltration through the use of stormwater basins, bio-retention areas, drywells and stone trenches. Therefore, the only real change in the water regime at the site will be the importation of water through use of a public water system.

To evaluate possible impacts to the site two water budget scenarios were evaluated, pre-development which included water inputs only from precipitation, and post-development which included water inputs from precipitation plus imported water service. A summary of the results of the water budget analysis are presented below.

Scenario	Water Inputs from Precipitation (cubic feet/year)	Water Inputs from Imported Water (cubic feet/year)	Total Water Inputs (cubic feet/year)	Percent Increase
Pre-Development	20,888,926	0	20,888,926	
Post Development	20,888,926	268,096	21,157,021	1.3%

The maximum calculated increase in water to the site is 1.3% per year. This is equivalent to approximately 0.63 inches of additional rainfall per year (or 0.0017 inches of additional rainfall per day).

Analysis of the Rhode Island yearly precipitation data has shown that the average yearly precipitation since 2000 is approximately 48.5 inches per year. Further analyses of the yearly rainfall totals since year 2000 shows a standard deviation of 6.4 inches. This indicates that it is not unusual for yearly rainfall amounts to vary by up to 6.4 inches higher or lower than the average amount of 48.5 inches.

The findings of this water budget indicates that the calculated additional water input to the site of 1.3% is within the expected normal variation in yearly rainfall and therefore the import of water to the site in the post-development condition will not result in a significant increase in the high water table at the site.

Therefore, site drainage patterns will not be impacted. The complete water budget calculations⁽¹⁴⁾⁽¹⁵⁾⁽¹⁶⁾ and an analysis of yearly precipitation totals are included in Attachment 2.

Water Transfer Between Watersheds

RPS evaluated the occurrence of water export via the Kingston Water District's distribution system from the Chipuxet watershed basin to the Saugatucket watershed. RPS found that the Kingston Water District provides water service to an estimated 200 properties located within the Saugatucket River watershed⁽¹⁷⁾. These properties are located mainly along South Road and Route 108, refer to Figure 1 RPS reviewed sanitary sewer records⁽¹⁸⁾ and confirmed that a significant percentage (approximately half) of the properties were serviced by OWTS (not connected to the municipal sanitary sewer system). This analysis confirmed that the import of water between the watersheds is not a rare or uncommon occurrence and does not necessarily result in significant impacts to the water resources where it occurs.

Summary of Key Findings

RPS has conducted this hydrologic assessment of the Fieldstone Farms development to assess possible water resources related impacts which may result from the proposed development. The key findings of our assessment are presented below.

- The existing site is comprised of 118.6 acres of undeveloped wooded land with a 56.7 acre wooded swamp wetland located in the central and southern portions of the site. The general runoff patterns at the site are from northwest to the southeast.
- The groundwater quality for the site is classified as GA, suitable for public or private drinking water use without treatment.
- The site is located within the Saugatucket River Watershed. Old North Road forms the watershed boundary between the Saugatucket River watershed on the east and the Chipuxet River watershed on the west.
- The proposed development will consist of the construction of 39 residential lots to be serviced by public water and private OWTS. All of the proposed improvements for the project are located in the upland sections of the site. The large central wetland area and an associated 50-foot buffer around the wetland perimeter will not be disturbed.
- The proposed stormwater drainage system will utilize LID techniques to mitigate the impacts of the development and to preserve existing drainage patterns, runoff rates, and water quality on the property by incorporation of BMPs.
- A Soil Erosion and Sedimentation Control Plan and a Site Operations and Maintenance Plan have been prepared for the project to ensure environmental protection of resources from the start of construction through the life of the development.
- Advanced treatment OWTS are proposed for all residences. The proposed OWTS technologies are RIDEM approved alternative technologies and will be part of denitrifying septic systems. Long term operations and maintenance, including periodic inspections, will be required to ensure that all OWTS are operating as designed.
- Mounding calculations completed for the community leaching system indicate that the maximum groundwater mounding will be approximately 0.7 feet over the seasonal high water table in the center of the leaching system. This level of mounding indicates that the native soil in the area is capable of accepting and transmitting effluent at the proposed loading rate without excessive mounding of ground water or seepage outbreak to the ground surface.
- All engineering design of the stormwater system and OWTS designs will be prepared by a Rhode Island registered professional engineer and approved by RIDEM to ensure compliance with all applicable regulations.
- Water budget calculations were conducted to evaluate possible impacts that importing water between adjacent watersheds may have on existing drainage patterns and the local high water table. The calculations indicated the water import would not result in a significant increase of water to the site.
- Review of water service and sanitary sewer location records confirmed that the import of water from the Chipuxet River watershed to the Saugatucket River watershed is not a rare or uncommon occurrence and does not necessarily result in significant impacts to the water resources where it occurs.

Conclusions

Based on the findings listed above, the following statements represent RPS's professional opinion.

- The water budget calculations conducted for the project indicate that the import of water from the Chipuxet River basin watershed to the site, located in the Saugatucket River watershed, would not result in a significant increase of water to the site and would not result in significant impacts to the high water table or drainage patterns at the site.
- The proposed site layout and stormwater design plans appear to be in compliance with applicable RIDEM rules and regulations; and therefore will be protective of water quality; and will preserve existing drainage patterns at the site.
- The proposed individual and community OWTS will be designed, installed, operated, maintained and inspected in accordance with applicable RIDEM rules and regulations; and therefore will be protective of water quality; will not result in significant impacts to the high water table; and will preserve existing drainage patterns at the site.

Authorization and Closing

RPS appreciates the opportunity to be of service on this project. Please do not hesitate to call the undersigned if you have any questions or comments.

Respectfully Submitted,

RPS | Environmental Risk



Tom Daley

Manager I

tom.daley@rpsgroup.com

+1 401 661 8646



Mike Wilson

Vice President, Legacy Site Services

mike.wilson@rpsgroup.com

+1 404 809 3884

Attachments

Attachment A Figure 1. Watershed Boundaries

Attachment B Water Budget Calculations

Attachment C References

Attachment D Resumes



Attachment A
Figure 1. Watershed
Boundaries



Attachment B
Water Budget Calculations

Fieldstone Farm - Water Budget

Pre- Development - Precipitation Input Only				
Water in Due to Precipitation Calculation				
Total area (acres)	Total area (sf)	Average Precip. ⁽¹⁾ (inch/year)	Average Precip. (ft/year)	Water in (cf/year)
118.65	5168394	48.5	4.04	20,888,926

Post Development - Precipitaion + Imported Water					
Imported Water Calculation					
Units #	Pop./Unit ⁽²⁾ (people/unit)	Water use per cap ⁽³⁾ (gal/person/day)	Water Imported (gal/day)	Water Imported (cf/day)	Water Imported (cf/year)
39	2.45	57.5	5494	735	268,096
Total Post Development Water Inputs Caculation					
Imported Water (cf/year)	Water From Precip. (cf/year)	Total Water Input (cf/year)	Percent Increase		
268,096	20,888,926	21,157,021	1.3%		

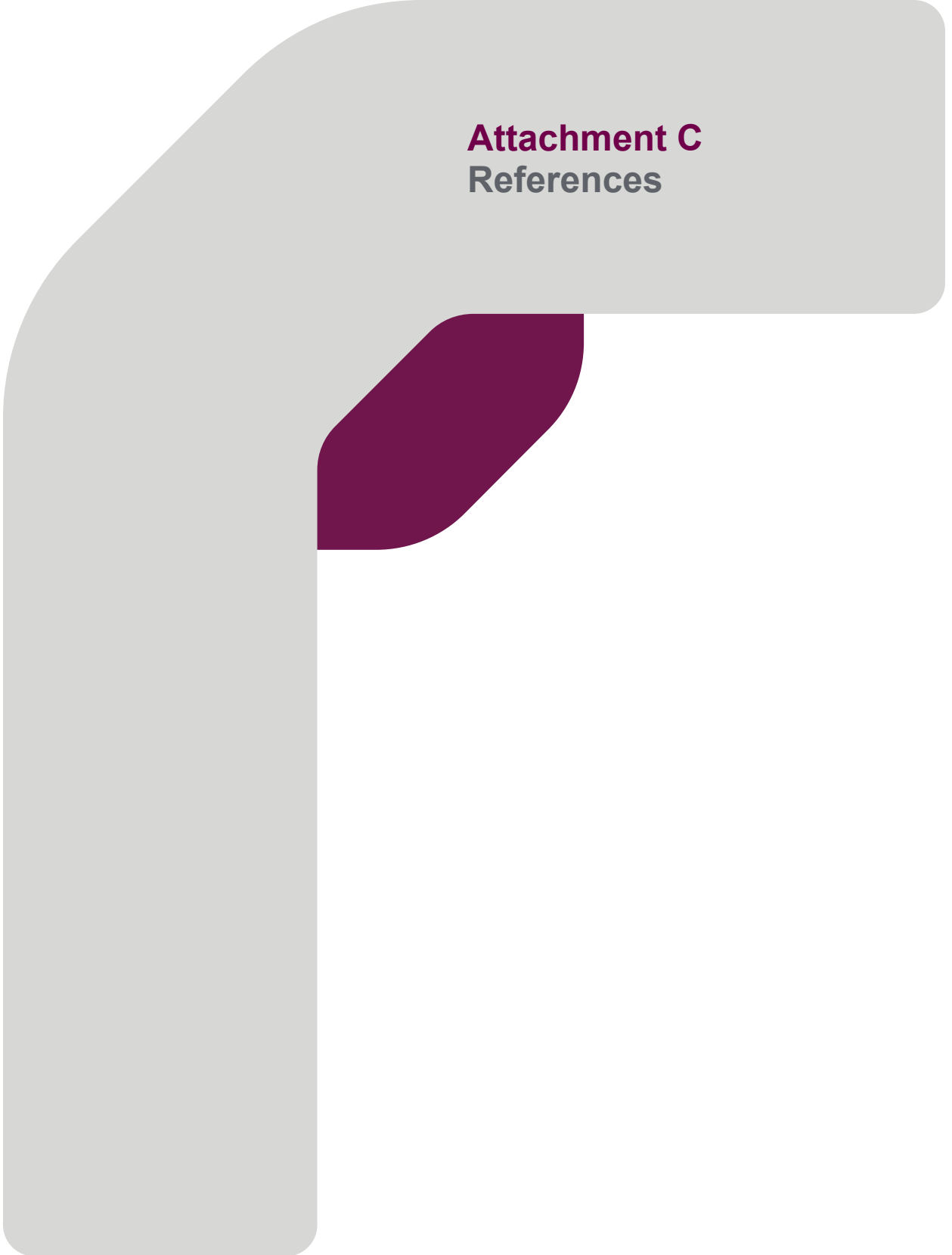
Water Import Equivalent Inches of Additional Rainfall = 1.3% X 48.5 =	0.63 inches/year 0.0017 inches/day
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Sources:

1. National Weather Service, NOAA online weather data, Precipitation, Providence area, years 2000-2022, <https://www.weather.gov/wrh/climate?wfo=box>, Accessed: March 3, 2023.
2. United States Census Bureau, Quick Facts, South Kingstown, Rhode Island, <https://www.census.gov/quickfacts/southkingstowntownwashingtoncountyrhodeisland>, accessed March 3, 2023
3. State of Rhode Island, Department of Environmental Management, Rules Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Treatment Systems, November 2018

Rhode Island Yearly Precipitation Data 2000 - 2022⁽¹⁾

Year	Rainfall (inches)
2000	46
2001	40.19
2002	42.34
2003	50.27
2004	45.33
2005	57.92
2006	54.3
2007	42.81
2008	57.12
2009	54.85
2010	53.54
2011	56.72
2012	41.19
2013	45.46
2014	46.94
2015	40.83
2016	40
2017	49
2018	63.49
2019	51.97
2020	44.71
2021	46.65
2022	45.83
Average =	48.59
Standard Deviation =	6.42



Attachment C
References

References

1. Fieldstone Farms, RIDEM Submission, prepared for Old North Land Investments LLC, prepared by Diprete Engineering, revision date October 6, 2023.
2. Google Maps website, <https://www.google.com/maps/@41.4950194,-71.5082404,1746m/data=!3m1!1e3?hl=en>, accessed March 4, 2023.
3. Town of South Kingstown, Web GIS, <https://gishost.cdmsmithgis.com/webgis/>, accessed March 3, 2023.
4. Rhode Island Department of Environmental Management, Online environmental resource map, <https://ridemgis.maps.arcgis.com/apps/webappviewer/index.html?id=87e104c8adb449eb9f905e5f18020de5>, accessed March 4, 2023.
5. Rhode Island Soil Survey, <http://nesoil.com/ri/>, accessed March 5, 2023.
6. Stormwater Management Report, Fieldstone Farms, Applicant: Old North Land Investments LLC, prepared for Diprete Engineering, revision date September 02, 2022.
7. Rhode Island Department of Environmental Management, Groundwater Quality Rules, effective: January 04, 2022.
8. Rhode Island Department of Health, Kingston Water District, Clean Water Infrastructure Plan, 2020, <https://health.ri.gov/materialbyothers/2020KingstonCleanWaterInfrastructurePlan.pdf>, accessed March 3, 2023.
9. Aronold C, Kellogg DQ, Forshay KJ, Damon C, Wilson EH, Gold A, Wentz EA, Shimizu MM. 2013. Tracking the Fate of Watershed Nitrogen: The “N-Sink” Web Tool and Two Case Studies. US EPA Office of Research and Development, National Risk Management Research Laboratory: Ada, OK.
10. The Chipuxet Basin, Rhode Island Water Resources Board website: http://www.wrb.ri.gov/documents/Chipuxet_specific%20watershed.pdf, accessed March 3, 2023.
- 11 Rhode Island Department of Environmental Management, Rhode Island Stormwater Design and Installation Manual, Ammended 2015.
12. Rhode Island Department of Environmental Management, Alternative or Experimental Onsite Wastewater Treatment System Technologies, July 1, 2022.
13. Comprehensive Analysis & Impact Minimization Rule 35 “Large OWTS Requirements”, Prepared for Fieldstone Farms in South Kingstown, Rhode Island, by Diprete Engineering, May 2013.
14. National Weather Service, NOAA online weather data, Precipitation, Providence area, years 2000-2022, <https://www.weather.gov/wrh/climate?wfo=box>, accessed: March 3, 2023.
15. United States Census Bureau, Quick Facts, South Kingstown, Rhode Island, <https://www.census.gov/quickfacts/southkingstowntownwashingtoncountyrhodeisland>, accessed March 3, 2023.
16. State of Rhode Island, Department of Environmental Management, Rules Establishing Minimum Standards Relating to Location, Design, Construction and Maintenance of Onsite Wastewater Treatment Systems, November 2018.
17. Town of South Kingstown, Water Suppliers Map, Geographic Information System, PS22-12 cpb 7/22, <https://www.southkingstownri.com/DocumentCenter/View/474/Water-Supply-Districts-PDF?bidId=>, accessed March 3, 2023.
18. Town of South Kingstown Department of Public Works, Review of sewerred areas near Kingston RI, Meeting attended by Tom Daley, RPS and Liz Ennis, South Kingstown, DPW, March 6, 2023.



Attachment D
Resumes



Thomas Daley
tom.daley@rpsgroup.com

Manager I

Department: Environmental Risk

Location: South Kingstown, Rhode Island

Project Roles Manager I

Overview

Mr. Daley's professional background as an environmental consultant is comprised of scientific evaluation, engineering design, and project management experience. He has 30 years of experience in the environmental field. His experience includes water resources evaluations, pollutant loading analyses, geo-environmental engineering, site development engineering, site investigation and remediation, air emissions permitting, landfill engineering, and surveying.

Mr. Daley has been responsible for providing expert consulting services for many diverse engineering and environmental projects. His experience also includes expert witness testimony at public hearings before regulatory agencies

Experience

- **Project Management** - Served as project manager on hundreds of varied projects in the civil/environmental engineering field. Project manager responsibilities include identification of project scope and strategies; preparation of project budgets; secure contracts and subcontractor agreements; conduct research and scientific investigations; collection, tabulation, and interpretation of data; preparation of scientific reports and/or engineering plans; representation of clients before regulatory agencies, and state and local boards; presentation of data and findings to public; preparation of project invoices; follow-up on collection of receivables; and maintenance of client relationships.

Areas of Expertise

- Site Investigation and Remediation
- Due Diligence
- Site Development Permitting and Engineering
- Water Resources Evaluation
- Landfill Design Engineering
- Environmental Compliance
- Air Emissions Monitoring

Certificate

- Engineer-in-Training—RI; 1987

Education

- M.S./Natural Resources Science, Soil, and Water Resources/1992 (University of Rhode Island)
- B.S./Applied Mathematics/1985 (University of Rhode Island)

- **Stormwater and Groundwater Resources Evaluations** - Has direct experience managing and conducting many projects water resources projects. Typical projects include stormwater runoff modeling; stormwater system engineering design; evaluation of best management practices (BMPs) and stormwater treatment technologies; evaluation of stormwater pollutant loading analyses; groundwater quality evaluations; nutrient loading modeling; preparation of stormwater pollution prevention plans; soil testing and characterization; stormwater and groundwater sampling, groundwater modeling, and groundwater mounding evaluations; hydrologic aquifer parameter testing; soil infiltration, percolation and water table testing; and expert witness testimony.
- **Environmental Site Assessment, Investigation and Remediation** - Conducted and managed numerous projects for private and government clients. These projects have included the following activities: Phase I site assessments, compliance assessments, and Phase II site investigations; preparation of quality assurance project plans and site health and safety plans; installation of test borings and monitoring wells; collection and analysis of soil and groundwater samples; surveying and gauging of wells; groundwater flow evaluation; contaminant plume characterization; remedial system design and installation; remedial system monitoring; preparation of Spill Prevention, Control, and Countermeasure plans; and permitting and reporting as required relative to the pertinent regulatory standards including the U.S. Environmental Protection Agency; Rhode Island Department of Environmental Management (RIDEM); Massachusetts Department of Environmental Protection; and other federal, state, and municipal agencies.
- **Environmental Compliance** - Served as project manager and compliance engineer on several various environmental compliance projects. Typical projects included completion of Spill Prevention Control and Countermeasure Plans, Stormwater Pollution Prevention Plans, Tier 2 reporting in compliance with the Emergency Planning and Community Right-to-Know Act, and hazardous waste management and compliance with the Resource Conservation and Recovery Act regulations as well as State Hazardous Waste Regulations. These projects have been completed for clients in both the public and private sector.
- **Civil/Environmental Engineering Design and Permitting** - Has been project manager and design engineer on a variety of civil/environmental engineering projects. These projects include residential and commercial land development projects. Design responsibilities have included site planning design, lot design, roadway layout and designs, stormwater drainage system modeling and design, onsite wastewater treatment system design, and industrial site planning. Has experience with landfill baseliner design, topographical, boundary, and construction layout surveying; review of subcontractor qualifications; procurement of contracts and materials; supervision and monitoring of construction projects; and presentation of projects in public meetings.

Project Experience

- **Water Resources Consulting- Solar Projects, Green Development Inc., 2015-present**
Tom has conducted investigation of water resources on two proposed solar array projects. Reviewed available documentation pertaining to the existing hydrogeological conditions at the subject property; evaluated hydrogeological information obtained from available drinking water well records for public and private wells located in the vicinity of the site; researched professional journal articles pertaining to possible environmental impacts resulting from similar solar projects; assessed applicable regulations pertaining to blasting; testified as expert witness at public hearing.
- **Hazardous Waste and Stormwater Compliance Consultant, Fortune Metals Inc., 2015-present**
Tom has provided oversight and management of hazardous waste and stormwater compliance issues. This included directing negotiations with RIDEM Office of Waste Management regarding enforcement actions and outstanding notices of violation for a metals recycling facility. Directed the implementation of waste management practices and the certification of a hazardous waste

containment building to resolve potential enforcement actions with the State regulators. Stormwater compliance including completing Notice of Intent and Stormwater Management Plan for the facility to obtain coverage under the State of Rhode Island's general permit for stormwater discharge associated with industrial activities.

- **Sewer Development Project Management, United Site Services Inc., 2019-2020**

Tom provided project management, permitting, bidding and construction support for sanitary sewer improvement projects at seven national locations. Projects involved feasibility analysis of location, project planning, permitting with various state and municipal agencies, identifying suitable contractors, preparing bid documents, review of contracts, hiring and overseeing subcontractors, consultation and client support on local and corporate levels.

- **North Smithfield Rhode Island Air National Guard Groundwater Investigation; Air Force Civil Engineer Center; Project Engineer**

Served as planning, technical, and project management staff responsible for the investigation into two releases from former petroleum aboveground storage tanks following a removal action. Investigation included the advancement of soil borings, installation of groundwater monitoring wells, a potentiometric groundwater elevation survey to ascertain flow direction, and sampling and analysis of soil and groundwater. The results of the investigations were documented in a Site Investigation Report. The Rhode Island Department of Environmental Management issued a No Further Action Letter to close the site.

- **Air Quality Monitoring Study at Conley Terminal, Boston, Massachusetts; Massachusetts Port Authority; Project Engineer**, Prepared Work Plan for ambient air monitoring study and developed comparison analysis approach to evaluate presumed beneficial impact in reducing ambient air quality around Conley Terminal via Massachusetts Port Authority's improvements to the terminal.

- **Rankin Estates Several Residential and Commercial Developments, Massachusetts and Rhode Island; Project Manager/Engineer**, Conducted water resource investigation to evaluate potential stormwater and groundwater impacts that may result from a 270 acre residential development with 126 proposed single family dwellings serviced by individual private wells and on-site wastewater treatment systems (OWTS). Reviewed available documentation pertaining to the existing hydrogeological conditions at the subject property; researched hydrogeological information obtained from available drinking water well records for private wells located in the vicinity of the site; and compiled a water budget analysis for the project.

- **Water Resources Evaluation: Glacier Ridge Mixed Use Development, Project Manager**, Comprehensive water resources evaluation in support of wetland permitting with RIDEM to determine possible impacts the proposed development may have on area wetland and surface water bodies. Project scope includes installation and gauging of nested piezometers, evaluation of water table and bedrock data; evaluation of well logs and well installation reports; completion of pre and post construction water budgets; calculation of groundwater travel times and production of reports and figures detailing the findings

- **Environmental Compliance, Linde, Project Manager**, Project Manager and team member for aiding client in maintaining environmental compliance at various facilities in Maine and Ohio. Aided facilities and updating stormwater compliance permits status. Typical work included: preparation of Notice of Intent, update of Stormwater Pollution Prevention Plans, facility inspections, production of site plans, and filing of permits documents.

- **Due Diligence and Acquisition Support; LS Power LLC; Senior Engineer**, Team member of professionals responsible for evaluation of potential acquisition targets for potential environmental liabilities. Performed site visits and review of documents provided by the seller. Developed reports, site plans, and liability costing matrices, including developing costs to mitigate environmental liabilities. Services include ASTM International Phase I Environmental Site Assessments and detailed compliance audits.
- **Effluent Dilution Study for the Salisbury, Massachusetts Wastewater Treatment Plant; Weston & Sampson Engineers; Project Manager**, Oversight and management of a study of a wastewater treatment plant discharge to an unnamed tidal tributary to the Merrimack River. Effort involved collection of long-term site-specific field data including tidal depth, flow velocity and bathymetry survey; CORMIX dilution modeling scenarios; evaluation of discharge concentrations for copper, nickel, and ammonia; and determining a reasonable compliance scenario for presentation to the state and U.S. Environmental Protection Agency Region 1.
- **Hazardous Materials and Waste Management Plan and Environmental Management System Training, Multiple Locations; Rhode Island Army National Guard; Project Manager**, Responsible for evaluation of existing hazardous waste management plan for all statewide locations and preparation of a revised plan based on current regulations and changes in operating procedures. Additionally, training and testing materials were prepared based on the revised plan for use in training Rhode Island Army National Guard personnel in the proper use of the plan.

Brownfields Site Limited Design Investigation and Remedial Action Work Plan; RIDEM, Westerly, Rhode Island; Project Manager, Managed site investigation including boring and testing for metals and polycyclic aromatic hydrocarbons in soils at site. Project included preparation of a quality assurance project plan, public notice documents, site investigation report, and remedial action work plan.
- **Water Resources Evaluation, Dowling Village Mixed Use Development, North Smithfield, Rhode Island; Project Manager**, Evaluation of water resource impacts resulting from a large commercial development proposed in the Blackstone River watershed. The evaluation included a hydrologic analysis to determine water availability; infiltration testing for stormwater treatment design; overall watershed analysis to determine effect of development on local drinking water reservoirs; a non-point source pollutant loading analysis to quantify potential impacts and choose mitigating strategies resulting in a zero net pollutant impact of the already degraded Blackstone River watershed; and advise developer on stormwater treatment strategies including the use of low impact design techniques and BMPs.
- **Erosion and Sedimentation Control Officer, Central Landfill, Johnston, Rhode Island; Project Engineer**, Responsible for weekly inspection and evaluation of all erosion/sedimentation controls at the landfill; oversight of new BMP design and implementation; weekly reporting of breaches in controls and required repairs; procurement of erosion control materials; oversight of installation and repair of BMPs.
- **Water Resources Evaluation, Village Farm Subdivision, Charlestown, Rhode Island; Principal/Project Manager**, Responsible for evaluation water quantity and quality issues relating to surface water and groundwater resources at proposed development, including a stormwater runoff impact analysis, private well suitability study, nutrient loading analyses, water budget, permitting, and expert testimony before regulatory boards.
- **Water Resources Investigations, Several Residential and Commercial Developments, Massachusetts and Rhode Island; Project Manager/Engineer**, Conducted numerous water resource investigations to evaluate potential stormwater and groundwater impacts that may result

from a proposed development. Projects included review of stormwater drainage system design and proposed discharges and treatment methods; review of potential impacts to groundwater quality, research of site geologic and hydrologic conditions, and water balance calculations; review of available well data and water quality data; installation of test wells; and preparation of a report comparing pre- and post-development conditions.

- **South County Hills Subdivision, South Kingstown Rhode Island; Project Manager/Design Engineer**, Responsible for engineering design, project oversight, and environmental permitting of a 90-lot residential development. Design responsibilities included roadways, stormwater drainage system, water supply system layout., individual septic systems, subdivision lot layout, erosion/sedimentation controls, soil characterization, water table testing, and infiltration testing. Obtained all necessary environmental permits from RIDEM, Rhode Island Coastal Resources Management Council, as well as guiding the client through the municipal permitting process. Additional responsibilities also included development of site plans, surveying, computer aided design and drafting, and representation of clients before state and municipal boards.
- **Nutrient Loading Evaluations, Several Residential and Commercial Developments, Massachusetts and Rhode Island; Project Manager/Engineer**, Nutrient loading projects typically involve evaluation of potential nitrogen and/or phosphorous impacts on surface water bodies and drinking water sources. Nitrogen and phosphorus loading are determined via mass balance models that account for all nutrient sources and sinks. The result is a final concentration or mass loading rate that is compared to the existing water quality parameters and goals for the receiving water body or drinking water source.
- **Stormwater Modeling and Engineering Design, Concrete Plant, Wilmington, Massachusetts; Engineer**, Conducted site survey, soil testing and characterization, watershed analysis, stormwater modeling, and stormwater system design for a proposed concrete processing facility. Design includes development of erosion and sedimentation control plan, stormwater management plan, specification of BMPs, and low impact development design strategies to be implemented for the project.
- **Environmental Site Investigations, Several Locations; Project Manager/Engineer**, Conducted several environmental site investigations including hydrogeological assessments, underground storage tank removals, groundwater and soil sampling and analysis, and environmental site assessments at numerous industrial and commercial sites. Activities typically included site history research, identification of potential contamination sources, analysis of groundwater flow, field screening of soil and water samples, and recommendations for further investigation or remedial action if necessary.
- **Landfill Baseline Construction, Central Landfill, Johnston, Rhode Island; Project Engineer**, Responsible for the design, development, and permitting of construction plans for a 10-acre addition to the landfill liner system at the Central Landfill. The baseliner design was comprised of a double composite landfill liner system with primary and secondary leachate collection systems. Construction plans were designed and developed using AutoCAD and Softdesk software. Responsibilities also included the development of a Storm Water Pollution Prevention Plan for the project and submission of plans, specifications, and permit applications to the RIDEM Waste Management Division.
- **Stormwater Drainage System Designer, Several Development Projects, Rhode Island; Project Manager/Engineer**, Design engineer for several residential developments. Responsible for all aspects of stormwater treatment system design and permitting including: watershed analysis and modeling using TR-55 method; design and layout of lots, roads, and stormwater drainage system; design of drainage system outfalls and basins; design and implementation of erosion and

sedimentation control strategies; design of BMPs stormwater pollutant control methods to be implemented; preparation of design drawings; preparation of applications for permitting by RIDEM and Rhode Island Coastal Resources Management Council; and testimony at meetings and public hearings.

- **Air Emissions Inventory, Emission Calculations and Permitting, Davis Standard, Stonington, Connecticut; Engineer**, Responsible for inventory, calculation, and permitting of air emissions from surface coating operations at three machine manufacturing facilities. Calculated total volatile organic compound emissions for each facility. Identified and quantified actual emission concentrations and maximum allowable stack concentrations for Hazardous Air Pollutants emitted during coating operations. Completed and submitted permit applications in accordance with Connecticut Department of Environmental Protection regulations.
- **Estuarine Pollutant Loading Analysis, Champlin's Marina, Great Salt Pond, Block Island, Rhode Island; Engineer**, Performed comprehensive review of historic water quality monitoring data, point and non-point source stormwater discharges, watershed dynamics and tidal flushing analysis to determine potential impacts to local shell fishing resources resulting from potential bacterial contamination from gray water discharges from pleasure boats.
- **Phytoremediation/Habitat Restoration, Former Chemical Storage Facility, East Providence, Rhode Island; Engineer**, Managed remediation/restoration of shoreline plant species in area affected by historic toluene release to Narragansett Bay.
- **Environmental Compliance, Stormwater Quality Sampling, ANP Bellingham Power, Bellingham Massachusetts; Project Manager**, Responsible for oversight of collection of stormwater samples at drainage inlets and outfalls from water quality control structures and extended detention stormwater basins and key design points of an onsite stormwater system during power plant construction activities. Samples were analyzed for various water quality parameters and potential pollutants and compared with discharge permit limits and action levels.
- **Site Investigation and Contaminant Plume Characterization, Thomas and Betts (formerly Augat Inc.), Mashpee, Massachusetts; Engineer**, Conducted a phase I site assessment, which indicated the historical use of chlorinated solvents onsite. A subsequent subsurface investigation revealed the presence of trichloroethylene in the groundwater downgradient of the site. Numerous subsequent investigations tracked a solvent contaminant plume in the groundwater several miles from the source. The investigation included: a sub-slab soil gas survey, installation, and sampling of over one hundred monitoring wells; in-field horizontal and vertical profiling of the solvent plume using a mobile gas chromatograph unit, testing of private drinking water wells, oversight of installation of carbon treatment systems on private wells, location and elevation surveying of monitoring wells. Reporting, investigation, and cleanup activities were conducted in compliance with the Massachusetts Contingency Plan.
- **Site Investigation and Remediation, Laidlaw Transit School Bus Terminal, Saugerties, New York; Project Manager**, Contamination resulting from a leaking underground fuel storage tank system at the facility impacted the shallow aquifer and threatening residential drinking supply wells. As part of an interim agreement negotiated with the New York State Department of Environmental Conservation, a subsurface investigation was conducted, soil and groundwater samples were collected and analyzed, and a remedial system consisting of a groundwater recovery well and two granular activated carbon units was installed to prevent off-site migration of petroleum hydrocarbons. Remedial system maintenance and sampling was conducted on a regular basis.
- **Site Investigation and Remediation, The Metropolitan Regional Career and Technical Center, Providence, Rhode Island; Project Manager**, Provided environmental consulting services in

support of the construction of the Metropolitan School in South Providence, Rhode Island. Activities included an environmental site assessment and investigation for the four building sites. The soil at the site has been impacted by lead, arsenic, and polycyclic aromatic hydrocarbons. Site investigation and remedial activities including the preparation of a site investigation report and a remedial action work plan were conducted in compliance with the remedial regulations of the RIDEM. The proposed remedy consisted of a composite cap for the entire site to isolate the impacted soils from potential contact with the public.

- **Landfill Closure Assessment, Jamestown Landfill, Jamestown, Rhode Island; Engineer,** Conducted an assessment of a closed landfill after low levels of volatile organic compounds were detected in several nearby wells at low concentrations. The assumption was that the volatile organic compounds were originating from releases to the landfill. The closure assessment consisted of reviewing the existing data; identifying and filling data gaps; and extensively reviewing historical landfill operations, conducting a detailed evaluation of both overburden and bedrock groundwater flow conditions and water quality both beneath the former landfill and at the property boundaries and preparation of a report of findings.
- **Site Investigation and Remediation, Former School Bus Terminal, Freetown, Massachusetts; Engineer,** A site investigation was conducted at the former school bus terminal. The soils had been impacted by leaking 4,000-gallon diesel fuel underground storage tank that was previously removed from the site. The investigation and subsequent remediation were conducted in compliance with the Massachusetts Contingency Plan. The following activities were conducted, soil borings and monitoring well installation, soil and groundwater sampling and analysis, bedrock monitoring well installation, well pumping tests to determine aquifer properties, identification and location of on-site wetlands, testing of nearby private drinking water wells. The remedial action included installation groundwater recovery and treatment system as part of an interim remedial action. Due to relatively low permeability of the site soils and contaminated bedrock aquifer, a low-flow pneumatic diaphragm pump system was selected. The system was operated and maintained for several years to prevent impacted groundwater in the aquifer from migrating offsite.
- **Atmospheric Nitrogen Loading to Narragansett Bay, Proposed Mixed Use Development, East Providence, Rhode Island; Project Manager—**Performed as evaluated possible impacts to Narragansett Bay due to atmospheric nitrogen loading. The evaluation included: research to determine scientific basis for establishment of an atmospheric loading rate: review of the proposed onsite stormwater treatment system and proposed outfalls, evaluation of proposed stormwater treatment methods including BMPs and low impact design methods, analysis of non-point source stormwater runoff sources. Preparation of a mass balance model, and preparation of a final report of findings.
- **Site Investigation, Remediation, and Monitoring, Philip Services Inc., Hazardous Waste Treatment Facility, Providence, Rhode Island; Project Manager/Engineer,** Conducted a U.S. Environmental Protection Agency-approved Self-Directed Investigation and Remediation of a contaminated soil and groundwater at a site located adjacent to Narragansett Bay. The project included preparation of work plan, health and safety plan, quality assurance project plan; installation of monitoring wells onsite and in Narragansett Bay, tidal gauging and water quality sampling of wells to determine possible impacts to the bay; removal of metals contaminated soil; onsite soil analysis using Niton x-ray fluorescence analyzer; long-term monitoring of groundwater quality; and reporting to U.S. Environmental Protection Agency and RIDEM.

Employment History

- Employer – RPS Inc.(Wakefield, RI)
Dates of Employment—November 2019 – Present
Title—Manager I
- Employer—EA Engineering, Science, and Technology, Inc., PBC (Warwick, Rhode Island)
Dates of Employment—May 2015 – November 2019
Title—Engineer III
- Employer—Earth-101, LLC
Dates of Employment—June 2010 – December 2013
Title—Principal
- Employer—Arcadis Inc. (previously, LFR Inc.)
Dates of Employment—August 1995 – April 2010
Title—Principal/Operations Manager
- Employer—Rhode Island Resource Recovery Corporation
Dates of Employment—January 1994 – August 1995
Title—Project Engineer
- Employer—Raymond Schwab Associates Inc.
Dates of Employment—January 1988 – July 1993
Title—Associate Civil Engineer

Water Resources Experience Matrix

Project	Project Type	Location	Hydrologic Assessment	Water Availability	Nitrogen GW	Surface Water Impacts	Mounding	Infiltration	Atmospheric Impacts	Expert Witness testimony
Village Farm	Residential Subdivision	Charlestown, RI	x	x	x					x
Ninigret Hamlet	Residential Subdivision	Charlestown, RI	x	x	x					
Tamanaco Subdivision	Residential Subdivision	Charlestown, RI	x		x					
South County Golf Course	Golf Course	South Kingstown, RI	x		x					
Dowling Village	Mixed Use Development	North Smithfield, RI	x		x	x	x	x		x
Lilly prov. SW NL		Providence, RI	x		x				x	
Walmsley Lane	Residential Subdivision	North Kingstown, RI	x	x	x					
Chevron	Mixed Use Development	East Providence, RI	x		x				x	
Goose Nest	Residential Subdivision	North Kingstown, RI	x	x	x					
Champlins Marina	Marina Expansion	Block Island, RI	x			x				x
Oak Hill Estates II	Residential Subdivision	Richmond, RI	x	x						
Canochet woods Carr HOP - WA	Residential Subdivision	Hopkinton, RI	x	x						x
Loves Travel Stop	Commercial Development	Hopkinton, RI	x	x						x
Fletcher Meadow NK	Residential Development	North Kingstown, RI		x						
Kings Grant West	Residential Development	Westerly, RI		x						
Pine Ridge	Residential Subdivision	Coventry, RI	x	x						
Brookhaven I & 2	Residential Subdivision	Coventry, RI	x	x						x
Heritage Estates Cov WA	Residential Subdivision	Coventry, RI	x	x						x
Quarry Hill Blackstone MA WA	Residential Subdivision	Blackstone, MA	x	x						x
	Residential Subdivision	South Kingstown, RI	x							

Project	Project Type	Location	Hydrologic Assessment	Water Availability	Nitrogen GW	Surface Water Impacts	Mounding	Infiltration	Atmospheric Impacts	Expert Witness testimony
Kingston Reserve Mounding SK	Residential Subdivision	South Kingstown, RI	x				x			
Richmond Hills	Residential Subdivision	Richmond, RI	x	x						x
Botka Woods	Residential Subdivision	Charlestown, RI	x	x						
Integlia Infiltration	Commercial Development	Warwick, RI	x				x	x		x
Lippit Farms	Residential Subdivision	Cranston, RI	x	x						x
Fieldstone Subdivision	Residential Subdivision	Westerly, RI	x	x						x
Brushy Brook Subdivision	Residential Subdivision	Hopkinton, RI	x	x	x					x
Fieldstone Subdivision	Residential Subdivision	South Kingstown, RI	x	x	x					
Rankin Estates	Subdivision	North Smithfield, RI	x	x						
Glacier Ridge	Mixed use subdivision	Glocester	x	x		x				
Nooseneck Solar	Solar Development	West Greenwich, RI	x			x				x
Pinewood Village	Residential Development	North Kingstown, RI	x		x					
Douglas Pike Solar	Solar Development	North Smithfield, RI	x			x				x
Village Walk	Residential Development	Charlestown, RI	x			x				x
Iron Mine Solar	Solar Development	North Smithfield	x	x		x				x



Contact

55 Village Square Drive
South Kingstown RI 02879