Ladd Center Wellhead Protection Area
Source Water Assessment Update

SUMMARY

This Source Water Assessment focuses on the wellhead protection area for the Ladd Center Public Water System. This public water system consists of two wells, and elevated storage tank, and a treatment system. It has four service connections and services a population of approximately 130 persons per day. The wellhead protection area is approximately 749 acres and located in Exeter, RI.

This assessment was originally completed in 2003. This 2022 update identifies current pollution risks and provides information for local land use planning and protection of the water supplies.

This 2022 update utilizes the 2020 land use mapping provided by Rhode Island Geographic Information System (RIGIS), water quality monitoring data from 2015 – 2020, the Sanitary Survey completed by the Rhode Island Department of Health in 2021, and the online Environmental Resource Map managed by the Rhode Island Department of Environmental Management.

The land uses for the wellhead protection area are summarized in both a map in the report and in a table in the appendix. Results of the pollution risk assessment are summarized in the Wellhead Protection Area Risk Spreadsheet in the report. Overall, the wellhead protection area was given a score of 60 on a scale of 0 to 100 or greater, indicating that the Ladd Center Wellhead Protection Area is at high risk. The water supply could become contaminated. Protection efforts are important to safeguard water quality.

Please note: the results of any current assessment cannot be compared directly to previous assessments given changes in wellhead delineations over the years, changes in methods for assessing RIGIS land uses, and/or new contaminants now included in the current analysis such as PFAS.

For further information, please contact William Young or Jimmy Folco, Jr. of the Ladd Center at 401-230-0632.

This assessment was prepared by URI Cooperative Extension NEMO Program in collaboration with the RI Department of Health with funding from the Centers for Disease Control and Prevention.

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Source Water Assessment Update

REPORT

This report is organized into the following sections:

- **Summary Graphics:**
  - What is a Source Water Assessment?
  - Ladd Center Source Water Assessment Risk Rating Results
  - Protect Your Water and Your Health

These are visual summaries of the assessment process, highlights of the results, and actionable steps for consumers. They could be used as potential outreach for water consumers by including in the Consumer Confidence Report and placing in common areas.

- **Understanding the Assessment**

This section explains why the assessment was completed, what was evaluated, and how the assessment should be used.

- **Explanation & Determination of Pollution Risk Factors**

This section explains details of the analyses performed in the assessment.

- **Ladd Center Wellhead Protection Area Risk Spreadsheet**

This section provides the table summarizing the results of all aspects of the assessment. It is the more complete version of the summary graphic that was presented earlier in the Report.

- **Land Use In the Wellhead Protection Area Map**

This map shows various land uses within the wellhead protection area. These land uses are part of the assessment.

- **Appendix: Documentation**

This section provides a summary of the data used in the analyses by risk indicator. It also provides additional information about any contaminants detected in the water.

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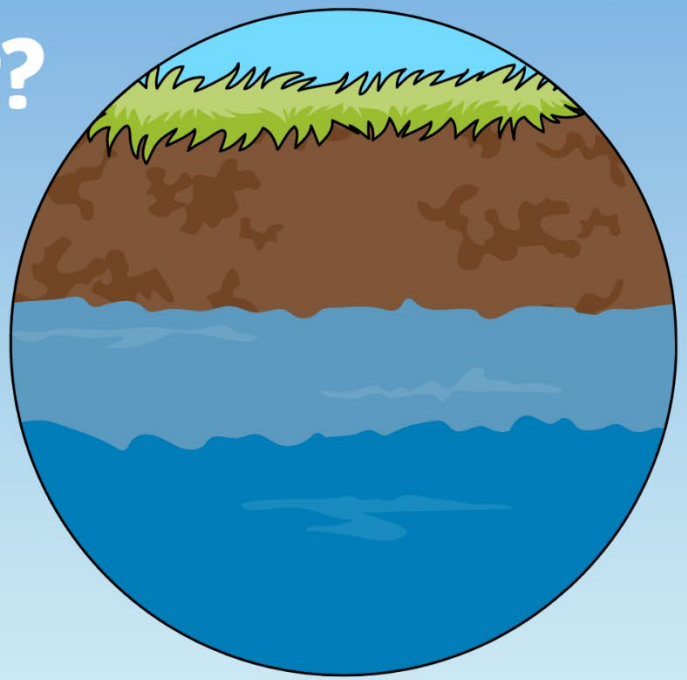
What is a Source Water Assessment?

Source waters (including rivers, lakes, streams, and reservoirs) provide water for drinking. Protecting these waters reduces the risk that people will drink contaminanted water and also can help ensure the quantity of water supplies.



Assessments were completed by the University of RI Cooperative Extension in collaboration with RI Department of Health and funded by the Centers for Disease Control and Prevention.

The Safe Drinking Water Act required states to develop Source Water Assessment Programs. These focus on wellhead protection areas: the land surrounding a well that supplies a public water system. Rhode Island's assessments focus on three major risks:

1. Land Uses

What percentage of the wellhead protection area has high-intensity uses such as commercial, industrial, or cropland?

2. Pollution Sources

Are there stormwater outfalls, landfills, underground storage tanks, or other sources of pollution within the wellhead protection area?

3. Water Quality Testing

Did regular monitoring data show levels of contaminants that would be concerning for human health?

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Ladd Center

Source Water Assessment

Risk Rating Results

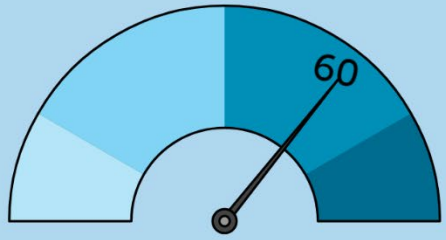
Overall Risk

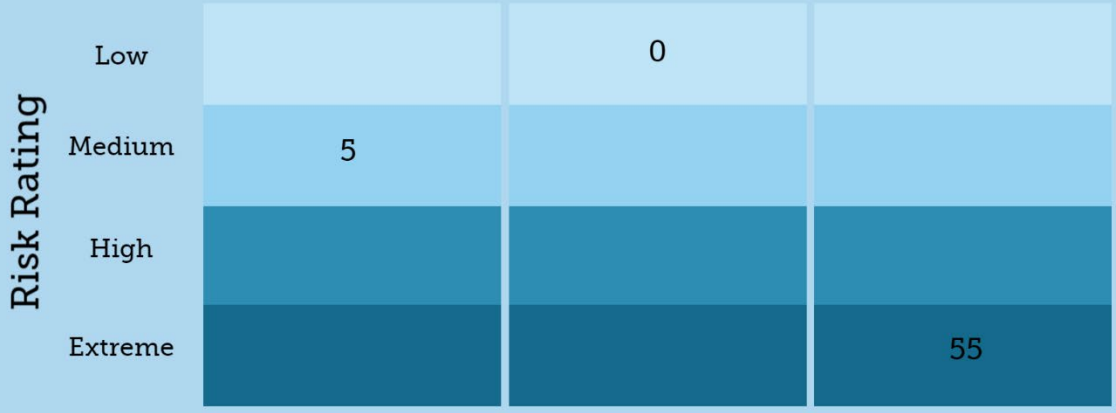
The overall risk ranking is HIGH. Water could become contaminated. Protection efforts are important to safeguard water quality.

Land Uses

Pollution Sources

Water Quality Testing





Routine water quality testing revealed elevated levels of contaminants, including: lead, PFAS, and nitrate-nitrogen. To reduce lead in drinking water, let the water run for one minute after long periods of no use and use only the cold water tap for drinking and cooking. For a list of ways you can protect your water and your health, please visit: web.uri.edu/NEMO

Info

The risk rating table used in this assessment is a screening level tool. Its purpose is to provide a methodology for evaluating risks to the waters people use for drinking and to provide consistency in that analysis across water systems. The full assessment can be found online at: web.uri.edu/NEMO/

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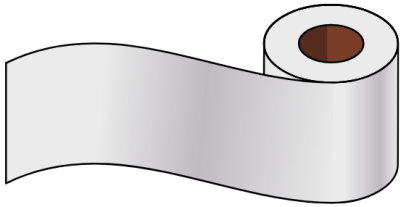
Protect Your Water and Your Health

If Your Water Has: You Can:

Nitrates

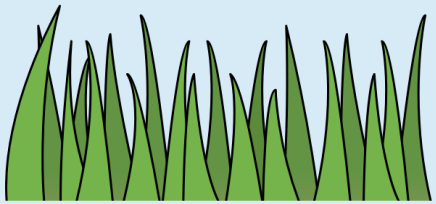
Poor septic system care can add nitrates to local waters! Follow these maintenance practices:

- hire a licensed professional for regular maintenance and pumping;
- don't use a garbage disposal;
- only flush toilet paper;
- don't rinse toxic materials down the drains;
- balance water usage throughout the week.



Following these landscaping practices keeps extra nitrogen out of local waters:

- limit or avoid the use of fertilizers and pesticides;
- don't store chemicals near wells;
- reduce or avoid summer lawn watering;
- avoid de-icing salt in winter.



These tips are offered as part of Rhode Island's Source Water Assessment Program. For additional tips about protecting your water and your health, please visit: web.uri/nemo

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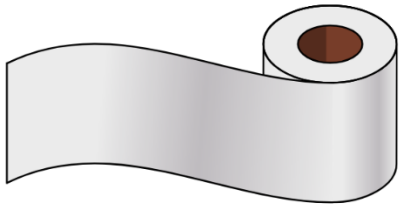
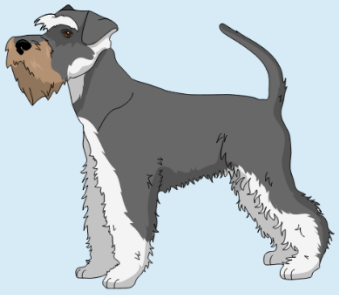
Protect Your Water and Your Health

If Your Water Has:	You Can:
Bacteria	**Poor septic system care can add bacteria to local waters!** Follow these maintenance practices: - hire a licensed professional for regular maintenance and pumping; - don't use a garbage disposal; - only flush toilet paper; - don't rinse toxic materials down the drains; - balance water usage throughout the week.



Controlling stormwater runoff can keep bacteria out of local waters:

- direct rainwater onto grass or vegetated areas - not pavement;
- collect rainwater with a rain barrel;
- pick up dog waste!



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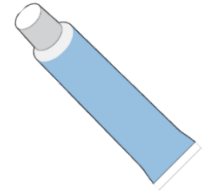
Protect Your Water and Your Health

If Your Water Has: You Can:

PFAS

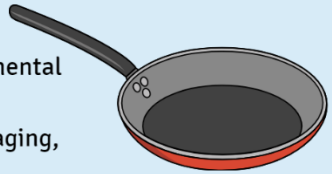
Understand more about these chemicals to help you protect your health:

- PFAS are a group of manufactured chemicals that have been used in industry and consumer products since the 1940s.
- A significant concern is that they break down very slowly, so they can accumulate in people and the environment over time.
- Human studies have found associations between some PFAS chemicals and effects on the immune system, the cardiovascular system, human development, and cancer.



Limit exposure through drinking water and other sources:

- Ask your water system to describe actions taken to limit PFAS.
- Install water filtration designed to limit PFAS.
- Avoid eating fish from contaminated waterways. RIDOH, Office of Environmental Health Risk can guide you.
- Learn more about consumer products that contain PFAS, such as food packaging, cosmetics, non-stick cookware, and stain-resistant fabrics.
- Visit: atsdr.cdc.gov/pfas for more information.



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UNDERSTANDING THE ASSESSMENT

WHY WAS THE ASSESSMENT DONE?

The Safe Drinking Water Act (SDWA) Amendments of 1996 required states to develop and implement source water assessment programs (SWAPs) to analyze existing and potential threats to the quality of the public drinking water throughout the state. Using these programs, most states have completed source water assessments for every public water system -- from major metropolitan areas to the smallest towns. Even schools, restaurants, and other public facilities that have wells or surface water supplies have been assessed. A source water assessment is a study and report, unique to a water system, that provides basic information about the water used to provide drinking water. States are working with local communities and public water systems to identify protection measures to address potential threats to sources of drinking water. In Rhode Island, the Department of Health's Center for Drinking Water Quality administers the Source Water Assessment Program.

WHAT AREA WAS EVALUATED FOR THIS ASSESSMENT?

The source water protection area, the area evaluated for this assessment, is the critical area surrounding a public water supply well or an intake on a surface source. For a public water supply well, this is the wellhead protection area (WHPA). The WHPA is the estimated area from which groundwater and surface water will flow from under severe pumping conditions. This can also be stated as the maximum estimated area that water withdrawn from the well will ever be drawn from. For most bedrock wells, this area is a volume dependent circle. For wells in sand and gravel this area is generally not a circle, but an irregular shape determined by sedimentary deposits and pumping rate. The source protection area for surface water sources is generally the watershed of the surface waterbody.

WILL THE POTENTIAL CONTAMINATION SOURCES IDENTIFIED IN THE SANITARY SURVEY CONTAMINATE MY SOURCE?

Potential contamination sources identified in sanitary surveys are facilities that typically use, produce, handle or store contaminants of concern, which, if improperly managed, could find their way to a source of public drinking water. It is important to understand that a release may never occur from a potential contamination source, provided it is using good management practices. Many potential contamination sources are regulated at the federal level, the state level, or both, to reduce the risk of a release. There are several methods that water systems can use to manage potential contamination sources. These often involve educational visits and inspections of stored materials.

HOW SHOULD THIS ASSESSMENT BE USED?

This assessment should be used to plan for improved protection of public drinking water sources. Additional information may also be useful such as identification of the 100-year flood plain, tax map information, soils information or high-density development areas. This assessment is a good starting place for planning protection programs. Communities should act now to protect valuable water supply resources; once contamination occurs clean-up is costly and sometimes technically infeasible. Additionally, unprotected watersheds and wellheads can lead to deterioration of water quality that may eventually lead to higher treatment costs.

EXPLANATION & DETERMINATION OF POLLUTION RISK FACTORS

Overview

This Source Water Assessment was completed using the *Guide to Updating Source Water Assessments and Protection Plans, Version 3 - 2010* (Guide). All risk indicator ratings were obtained from the *Guide*. A summary of methods as well as calculated risks is presented here.

Risk Indicator Category 1: High Intensity Land Use

High intensity land use was determined using Rhode Island GIS (RIGIS) land use data (2020 data). Land uses within the WHPA were calculated using ArcMap 10 (ESRI). The percentage of high intensity land use in the WHPA under study is then compared to the rating scale for risk indicator 1, High Intensity Land Use.

Risk Indicator	**Rating**			
	Low (0)	Medium (5)	High (10)	Extreme (25)
1. High Intensity Land Use	<10%	10-24%	25-50%	>50%

Risk Indicator Category 2: Pollution Sources Within Inner Protective Radius and Per Acre Throughout the WHPA

Information on the presence or absence of pollution sources within the inner protective radius of the wells and WHPAs under study were determined using the Rhode Island DEM Environmental Resource Map.

Additionally, Sanitary Surveys were obtained through the Rhode Island Department of Health (RIDOH).

The number of pollution sources in the 400’ Inner Protective Radius of each well and WHPA Outside of the IPR were compared to the rating scale and ranked for Risk Indicator 2- Pollution Sources Within Inner Protective Radius and Risk Indicator 3 -Per Acre Throughout the WHPA, respectively.

Risk Indicator	**Rating**			
	Low (0)	Medium (5)	High (10)	Extreme (25)
1. Pollution sources within inner protective radius (400 ft of 200 ft of well)	0	1	2-3	>3
2. Pollution sources per acre throughout WHPA, excluding inner protective radius (multiply by 10)	<0.1	0.1-0.5	0.5-1	>1

Risk Indicator Category 3: History of Contaminant, Bacteria, and Nitrate-Nitrogen Detections

Laboratory results for samples collected from the wells during regular, required monitoring were obtained from Rhode Island Department of Health (RIDOH) and used to determine risk factors 4, 5 and 6. Only the well with the highest risk rating score within each WHPA is used to report these risk factors.

Risk Factor - History of contaminant detections within the last five years

This was determined by reviewing all contaminant detections in the laboratory records (excluding bacteria, nitrogen). A risk rating for each contaminant above the detection limit was then assigned based on the Maximum Contaminant Level (MCL). The MCL is based on either Rhode Island or EPA drinking water standards and advisory levels. The highest risk rating observed was used to set the total risk rating for the WHPA.

Risk Factor - Source water bacteria detections within the last five years

This was determined by viewing all available bacteria data in the laboratory record for all the wells in the WHPA. The number of bacteria sample detections were used to determine the risk rating.

Risk Factor - Maximum nitrate-nitrogen (N03-N) concentration in the last five years

This was determined by viewing all detections of nitrate-nitrogen in the laboratory record for all the wells in the WHPA.

Risk Indicator	**Rating**			
	Low (0)	Medium (5)	High (10)	Extreme (25)
1. History of contaminant detections within the last 5 years	Trace (Maximum value is less than 10% of MCL)	Less than ½ MCL	Greater than ½ MCL	Greater than MCL (violation)
2. Source water bacteria detections within the last 5 years	Less than 5% of samples have detected total coliform in last 5 years	Greater than 5% of samples have detected total coliform	One or more Fecal coliform sample exhibits a detection	One or more Fecal coliform samples is above water quality standards
3. Maximum nitrate-nitrogen (N03-N) concentration in the last 5 years	<0.5 mg/L N03-N	0.5-2 mg/L N03-N	2-5 mg/L N03-N	>5 mg/L N03-N

Ladd Center Wellhead Protection Area
Assessment Results

The table on the next page summarizes the results of the analyses.

Additional information about the wellhead protection area data shown in that table (such as the specific high-intensity land uses noted, the types of pollution sources throughout the wellhead protection area, and the actual water quality monitoring data) can be found in the Appendix.

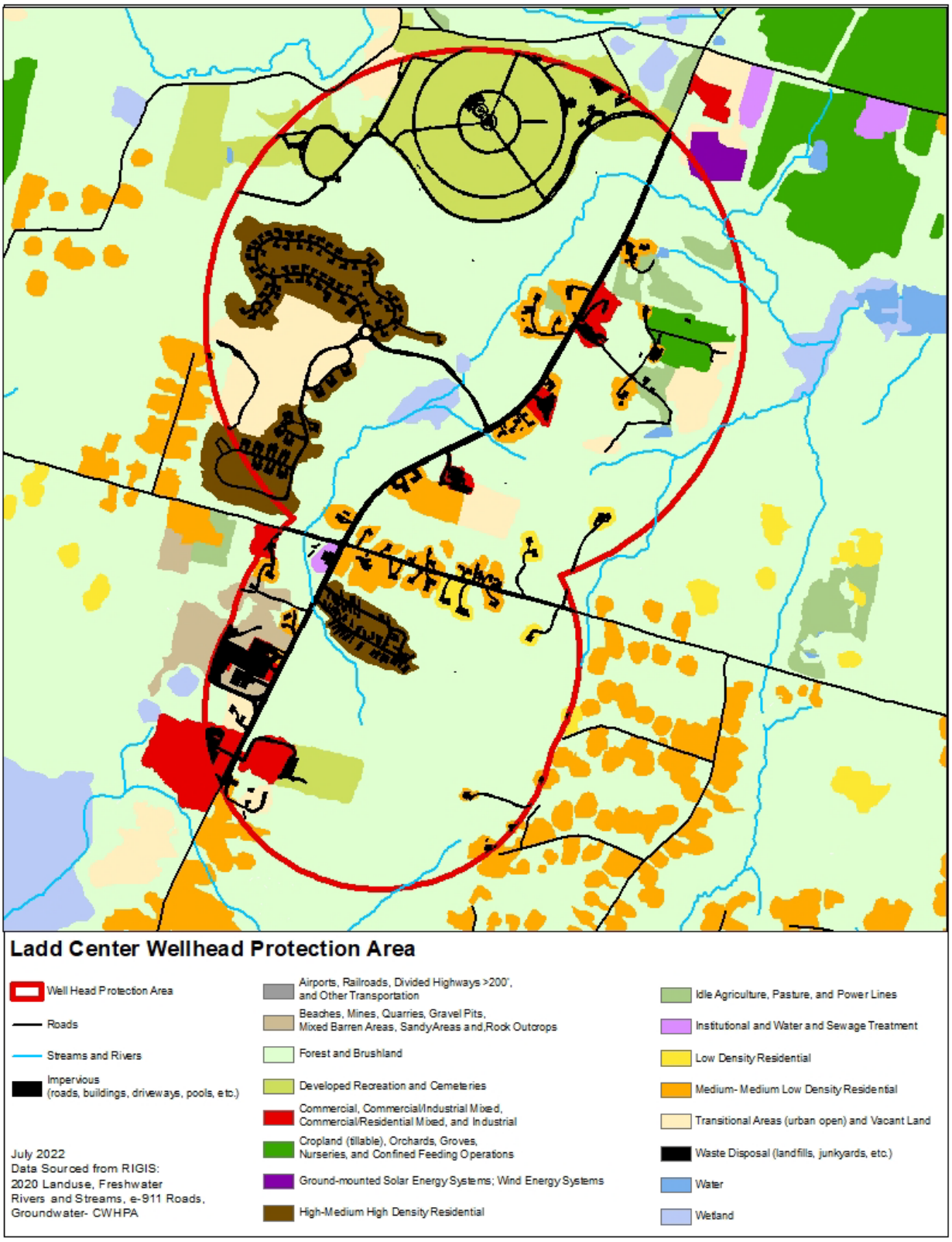
Wellhead Protection Area Risk Spreadsheet

The risk rating table used in this assessment is a screening level tool. Its purpose is to provide a methodology for evaluating risks to the waters people use for drinking and to provide consistency in that analysis across water systems.

	Rating Categories				WHPA Data	
Wellhead Protection Area Risk Indicators	Low 0	Medium 5	High 10	Extreme 25	Results	Rating
Wellhead Protection Area Land Use						
1. High Intensity Land Use (GIS)	< 10%	10% - 24%	25% - 40%	> 40%	11.45%	5
Existing or Potential Pollution Sources						
2. Pollution sources within inner protective radius (400' or 200') of well	0	1	2-3	> 3	0	0
3. Pollution sources per acre throughout WHPA, excluding inner protective radius. Multiply this number by 10.	< 0.1	0.1 - 0.5	0.5 - 1	> 1	0.09	0
Water Quality						
4. History of contaminant detects within last 5 years*	Trace	< 1/2 MCL	> 1/2 MCL	Violation	0.164 mg/L Lead; 30.23 ppt PFAS; 0.0027 mg/L Chlordane (banned in 1988)	25
5. Source water bacteria detects within last 5 years	None	Total Coliform Detect	Fecal Coliform Detect: Cause Identified and Corrected	Fecal Coliform Violation	1 TCR	5
6. Maximum nitrate-nitrogen (NO3-N) concentration in last 5 years	< 0.5 mg/L	0.5 - 2 mg/L	2 - 5 mg/L	> 5 mg/L	5.1 mg/L	25
Overall Ranking: Sum of all risk ratings	0-19	20-59	60-100	>100		60

*Note that July 2022 Rhode Island adopted H7233 authorizing RIDOH to establish MCLs for PFAS in drinking water and to set interim standards. The interim drinking water standard level of twenty parts per trillion (20 ppt) has been established and is used in this analysis. On or before July 1, 2023, all public water systems in the state (except transient, non-community) shall conduct monitoring for PFAS.

Land Use in the Wellhead Protection Area



Ladd Center Wellhead Protection Area
Source Water Assessment Update

APPENDIX: DOCUMENTATION

Land Use Categories (Wellhead Protection Area Risk Indicator Category 1)

Descr_2020	Acres
Brushland (shrub and brush areas, reforestation)	0.47
Cemeteries	83.51
Commercial (sale of products and services)	16.05
Cropland (tillable)	5.58
Deciduous Forest (>80% hardwood)	373.77
Developed Recreation (all recreation)	7.44
Ground-mounted Solar Energy Systems	0.43
High Density Residential (<1/8 acre lots)	11.56
Idle Agriculture (abandoned fields and orchards)	1.64
Industrial (manufacturing, design, assembly, etc.)	3.67
Institutional (schools, hospitals, churches, etc.)	1.34
Low Density Residential (>2 acre lots)	6.79
Medium Density Residential (1 to 1/4 acre lots)	23.06
Medium High Density Residential (1/4 to 1/8 acre lots)	45.42
Medium Low Density Residential (1 to 2 acre lots)	18.56
Mines, Quarries and Gravel Pits	10.14
Mixed Forest	54.06
Orchards, Groves, Nurseries	2.08
Pasture (agricultural not suitable for tillage)	9.59
Softwood Forest (>80% softwood)	17.84
Transitional Areas (urban open)	43.77
Vacant Land	5.28
Water	0.85
Wetland	5.59

Source: Rhode Island GIS (RIGIS) data (2020)

High-intensity land uses highlighted

Existing or Potential Pollution Sources (Wellhead Protection Area Risk Indicator Category 2)

Source: RI Environmental Map, DEM

As of 7/31/2022

Inner Protective Radius=400' Radius around each well	*Well #2*		*Gravel Packed Well #3*	
Regulated Facilities	***IPR (400')***	***Outside IPR***	***(400')***	***Outside IPR***
CERCLIS	0	0	0	0
Environmental Land Use Restriction	0	0	0	0
EPA Superfund	0	0	0	0
EPCRA Tier II	0	0	0	0
2021 RIDEM Site Investigation and Remediation	0	0	0	0
RIPDES Permit	0	0	0	0
Stormwater Outfall (5)	0	5	0	5
Storage Tank Above Ground (2016)	0	0	0	0
Storage Tank Underground (2021) (2)	0	2	0	2
Storage Tank Underground LUST (2021)	0	0	0	0
Stormwater Multi-Sector General Permit	0	0	0	0
Closed Landfill	0	0	0	0
Dams	0	0	0	0
Stormwater Construction general permit	0	0	0	0
Wastewater treatment facility discharge	0	0	0	0
TOTAL	**0**	**7**	**0**	**7**
WHPA Acres		**748.51**		**748.51**
400' Radius Acres		**11.58**		**11.58**
WHPA Acres-Inner Radius		**736.93**		**736.93**
Sources/Acre		**0.009**		**0.009**
Sources/Acre*10=Rating Score		**0.09**		**0.09**

Water Quality Monitoring: Detects Only (Wellhead Protection Area Risk Indicator Category 3)

Testing Year	Analyte	Concentration				
		ng/L				
2017	TOTAL PFAS*	30.23				
2019	TOTAL PFAS*	24.17				
		ug/L				
2015	CHLORDANE	0.27				
2019	CHLORDANE	0.255				
		Concentration MSR: 0 or 1, where 1 is a detect				
2018	COLIFORM (TCR)	1	1			
		mg/L				
2015	NITRATE-NITRITE	0.57	3.5			
2016	NITRATE-NITRITE	0.88	3.9			
2017	NITRATE-NITRITE	1	5.1			
2020	NITRATE-NITRITE	0.454	3.54			
2020	LEAD	0.0153	0.021	0.1643		
*PFDA+ PFNA+PFOS+PFOA+PFHxS+PFHpA						

Source: RI Department of Health

Contaminant	Maximum Contaminant Level (MCL)	Potential health effects from long-term exposure above the MCL	Common sources of contaminant in drinking water
Lead	Action Level = 0.015	Infants and children: delays in physical or mental development, attention span, and learning abilities Adults: kidney problems and high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits
Nitrate (measured as nitrogen)	10 mg/L	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, could die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits

Contaminant	Maximum Contaminant Level (MCL)	Potential health effects from long-term exposure above the MCL	Common sources of contaminant in drinking water
Total Coliforms		Coliforms are bacteria that indicate that other, potentially harmful bacteria may be present such as fecal coliforms or *E. coli.*	Naturally present in the environment; indicative of other bacteria from human or animal fecal waste

Source: *National Primary Drinking Water Regulations. (2009).* EPA 816-F-09-004

For more information about PFAS, please visit: https://health.ri.gov/healthrisks/contaminants/about/pfas/