

Bethel Village Wellhead Protection Area Source Water Assessment Update

SUMMARY

This Source Water Assessment focuses on the wellhead protection area for the Bethel Village Water Association Public Water System. This public water system consists of two wells and one storage tank. It has 55 service connections and services a population of 180. The wellhead protection area is 573 acres and located in Hopkinton, RI.

This assessment was originally completed in 2003 and updated in 2022 to identify current pollution risks and provide 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 2020, 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 15 on a scale of 0 to 100 or greater, indicating that the Bethel Village Wellhead Protection Area is at low risk. Note that a low ranking does not mean the source is free from contamination risk. Without sufficient protection, any water supply can become contaminated.

Please note: the results of any current assessment cannot be compared directly to previous assessments given changes in wellhead delineations over the years due to refined hydrogeologic modeling methods and/or due to new contaminants now included in the current analysis such as PFAS.

For further information, please contact Paul Roever of the Bethel Village Water Association at 860-886-2687.

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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REPORT

This report is organized into the following sections:

- **Summary Graphics:**
 - What is a Source Water Assessment?
 - Bethel Village 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.

- **Bethel Village 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.

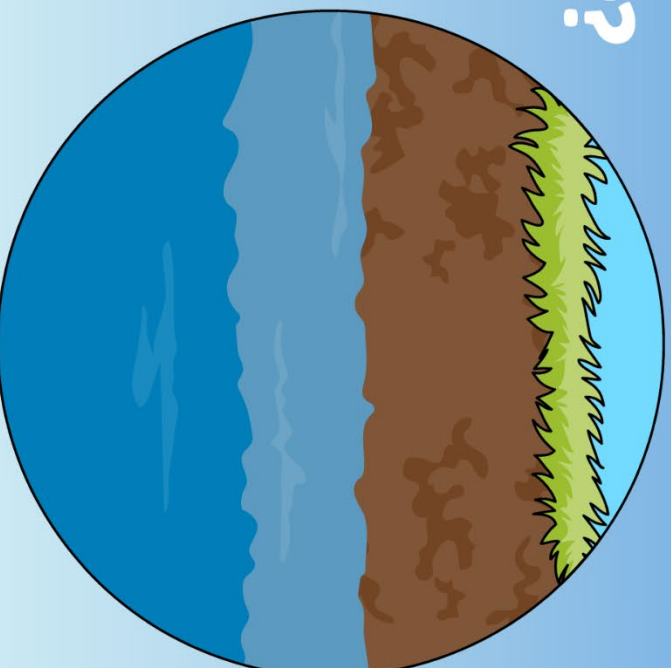
- **Appendix: Documentation**

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 contaminated water and also can help ensure the quantity of water supplies.

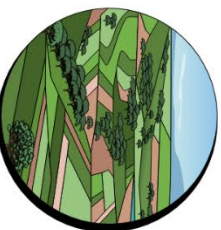


Assessments were completed by the University of RI Cooperative Extension in collaboration with RI Department of Health and funded by the Centers for Disease Control and Prevention.

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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Bethel Village

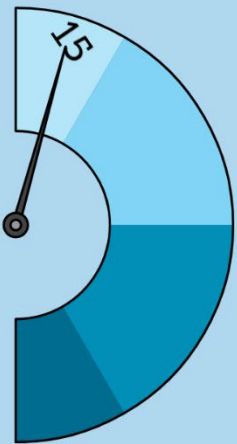
Source Water Assessment

Risk Rating Results

	 Land Uses	 Pollution Sources	 Water Quality Testing
Low	0		
Medium		5	
High			10
Extreme			

Overall Risk

The overall risk ranking is **LOW**. However, a low ranking does not mean the source is free from risk. Without sufficient protection, any water supply can become contaminated.



Routine water quality testing revealed elevated levels of nitrate-nitrogen. Better management of septic systems and reduction in the use of lawn fertilizers could help decrease this pollutant. 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 water's 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

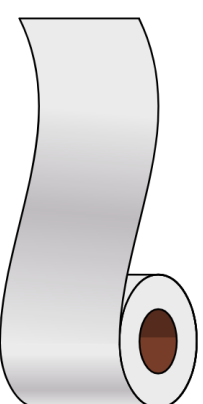
If Your Water Has:

You Can:

Nitrates

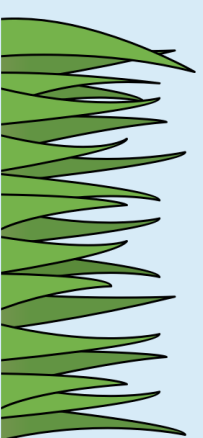
Poor septic system care can add nitrates to local waters! Follow these maintenance practices:

- 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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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

Bethel Village 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.

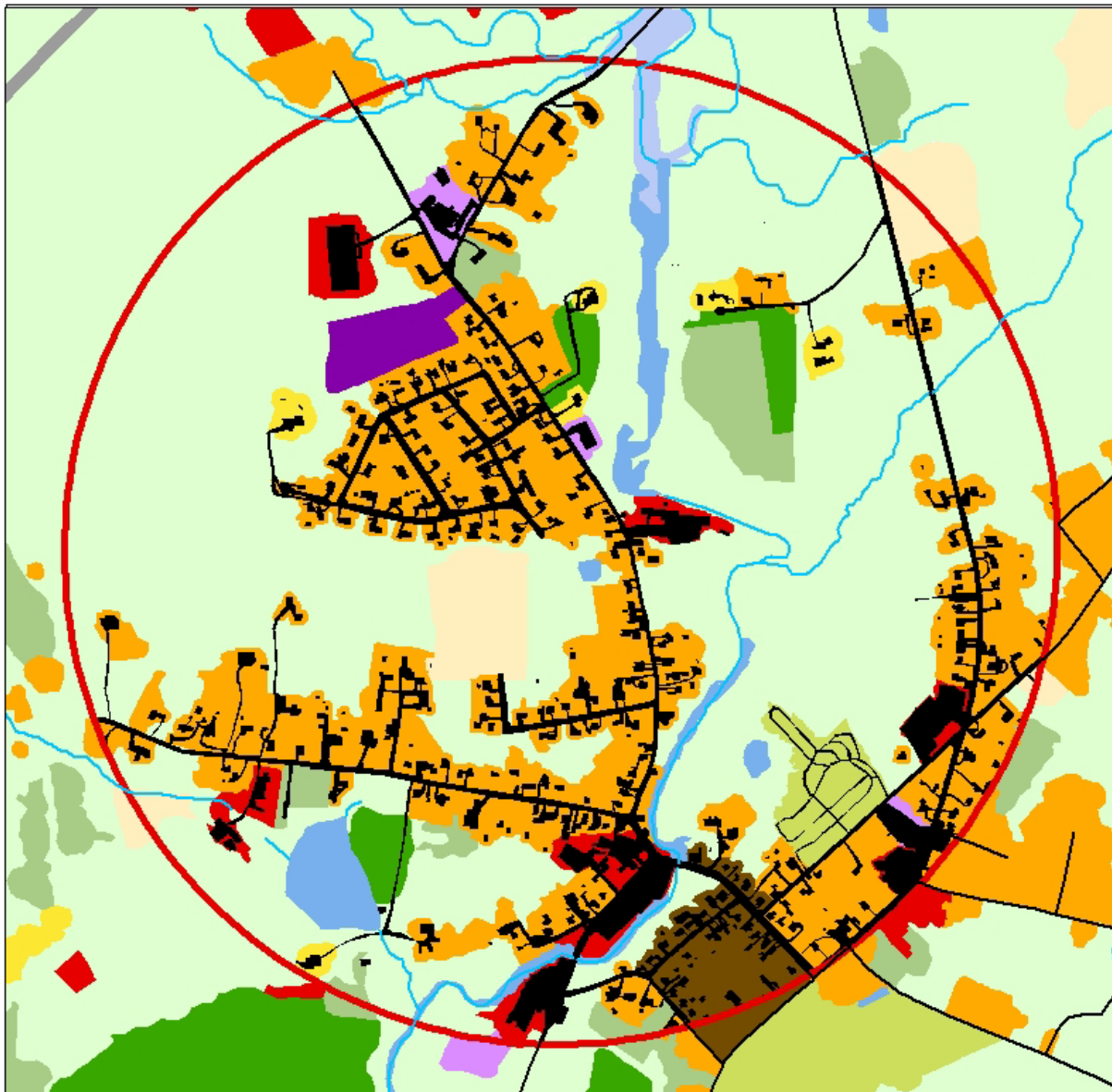
Wellhead Protection Area Risk Spreadsheet

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.

Wellhead Protection Area Risk Indicators	Rating Categories				WHPA Data	
	Low 0	Medium 5	High 10	Extreme 25	Results	Rating
Wellhead Protection Area Land Use						
1. High Intensity Land Use (GIS) Existing or Potential Pollution Sources	< 10%	10% - 24%	25% - 40%	> 40%	8.15%	0
Water Quality						
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	0.3	5
4. History of contaminant detects within last 5 years*						
4. History of contaminant detects within last 5 years*	Trace	< 1/2 MCL	> 1/2 MCL	Violation	No Detects	0
5. Source water bacteria detects within last 5 years	None	Total Coliform Detect	Fecal Coliform Detect: Cause Identified and Corrected	Fecal Coliform Violation	No Detects	0
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	3.8 mg/L	10
Overall Ranking: Sum of all risk ratings	0-19	20-59	60-100	>100		15

*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



Bethel Village Wellhead Protection Area

Well Head Protection Area	Airports, Railroads, Divided Highways >200', and Other Transportation	Idle Agriculture, Pasture, and Power Lines
Roads	Beaches, Mines, Quarries, Gravel Pits, Mixed Barren Areas, Sandy Areas and Rock Outcrops	Institutional and Water and Sewage Treatment
Streams and Rivers	Forest and Brushland	Low Density Residential
Impervious (roads, buildings, driveways, pools, etc.)	Developed Recreation and Cemeteries	Medium-Medium Low Density Residential
	Commercial, Commercial/Industrial Mixed, Commercial/Residential Mixed, and Industrial	Transitional Areas (urban open) and Vacant Land
	Cropland (tillable), Orchards, Groves, Nurseries, and Confined Feeding Operations	Waste Disposal (landfills, junkyards, etc.)
	Ground-mounted Solar Energy Systems; Wind Energy Systems	Water
	High-Medium High Density Residential	Wetland

July 2022
 Data Sourced from RIGIS:
 2020 Landuse, Freshwater
 Rivers and Streams, e-911 Roads,
 Groundwater- CWHPA

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APPENDIX: DOCUMENTATION

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

Descr_2020	Acres
Brushland (shrub and brush areas, reforestation)	26.32
Cemeteries	8.25
Commercial (sale of products and services)	3.98
Commercial/Residential Mixed	1.63
Cropland (tillable)	9.42
Deciduous Forest (>80% hardwood)	176.65
Ground-mounted Solar Energy Systems	6.13
Industrial (manufacturing, design, assembly, etc.)	16.06
Institutional (schools, hospitals, churches, etc.)	5.05
Low Density Residential (>2 acre lots)	5.90
Medium Density Residential (1 to 1/4 acre lots)	131.69
Medium High Density Residential (1/4 to 1/8 acre lots)	12.06
Medium Low Density Residential (1 to 2 acre lots)	15.42
Mixed Forest	67.58
Pasture (agricultural not suitable for tillage)	15.30
Softwood Forest (>80% softwood)	38.06
Transitional Areas (urban open)	12.92
Vacant Land	0.37
Water	16.56
Water and Sewage Treatment	0.09
Wetland	3.18

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 7/31/2022Inner Protective Radius=400' Radius
around each well

Regulated Facilities	Drilled Well #1		Drilled Well #2	
	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 (2)	0	2	0	2
2021 RIDEM Site Investigation and Remediation	0	0	0	0
RIPDES Permit (1)	0	1	0	1
Stormwater Outfall (3)	0	3	0	3
Storage Tank Above Ground (2016) (1)	0	1	0	1
Storage Tank Underground (2021) (3)	0	3	0	3
Storage Tank Underground LUST (2021) (2)	0	2	0	2
Stormwater Multi-Sector General Permit	0	0	0	0
Closed Landfill	0	0	0	0
Dams (4)	0	4	0	4
Stormwater Construction general permit (1)	0	1	0	1
Wastewater treatment facility discharge	0	0	0	0
TOTAL	0	17	0	17
WHPA Acres		572.64		572.64
400' Radius Acres		11.58		11.58
WHPA Acres-Inner Radius		561.06		561.06
Sources/Acre		0.03		0.03
Sources/Acre*10=Rating Score		0.30		0.30

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

Testing Year	Analyte	mg/L	
2016	NITRATE-NITRITE (mg/L)	3.12	
2017	NITRATE-NITRITE (mg/L)	2.98	
2019	NITRATE-NITRITE (mg/L)	1.14	3.8
2020	NITRATE-NITRITE (mg/L)	3.63	

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
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

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