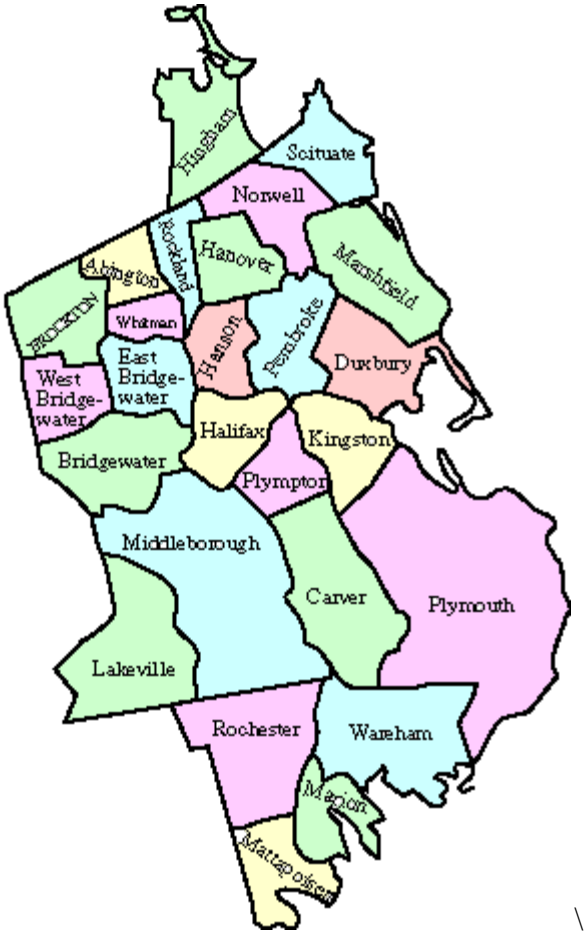
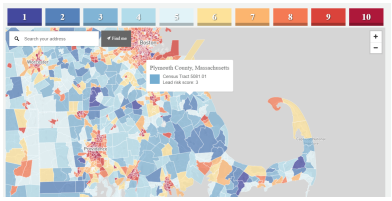
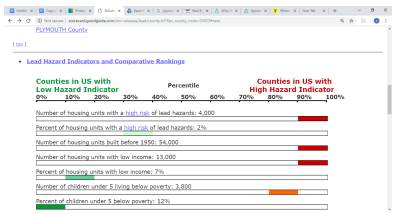
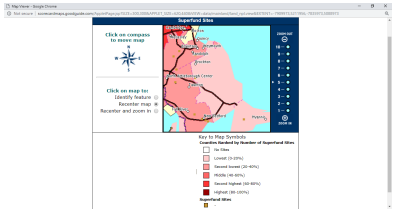
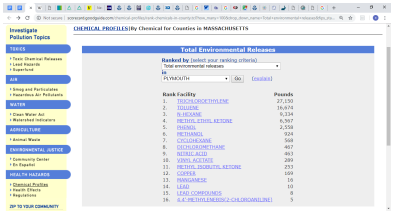
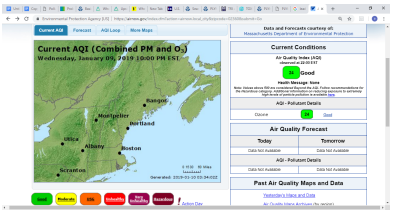
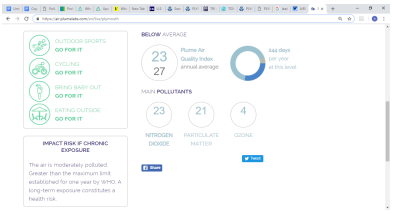
ENVIRONMENTAL HEALTH COMMUNITY PROFILE PLYMOUTH(COUNTY), MA

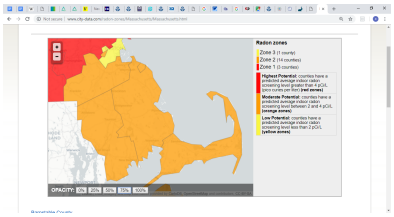
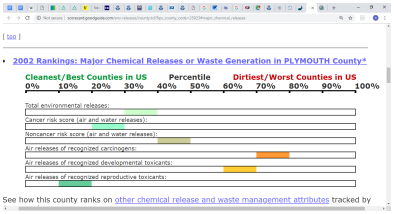
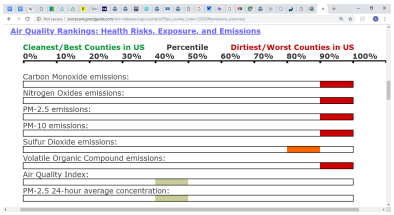


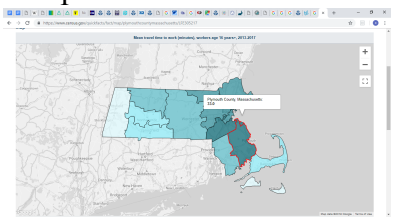
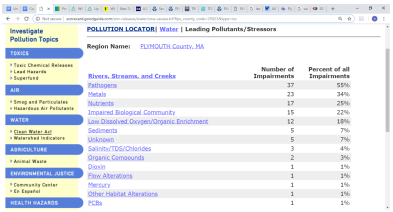
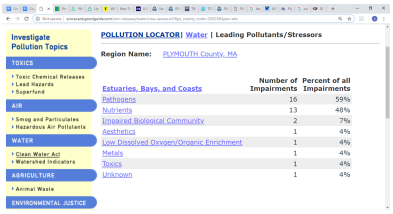
Biomedical Innovations B1

Evidence Log

Evidence Reference Number	Description/Title of Document	Relevant Findings
1. Hazardous Wastes and Dangerous Chemicals	Lead Poisoning https://www.vox.com/a/lead-exposure-risk-map -Lead risk score ranges from 1(low risk) to 10(very high risk of exposure). Map details exposure risk for chosen count.  http://scorecard.goodguide.com/env-releases/lead/county.tcl?fips_county_code=25023#rank -Details high hazard risk for houses  Superfund Sites http://scorecard.goodguide.com/env-releases/land/county.tcl?fips_county_code=25023#rankings -Indicates rank percentage for Superfund Sites in communities 	Lead Poisoning: In Plymouth County, the lead exposure levels are mainly in the 20-30% risk rate, however there are a few outliers that have a risk score of 7-9. 4,000 Plymouth County homes have a high hazard risk of lead but such only makes up 2% of households. Also, because Plymouth has a lot of old houses as part of tourism, there is still some that have remnants of lead paint, etc.which is causing high risk as well. Superfund Sites: Plymouth County is in the lower 20% for current superfund sites. Chemical Environmental Releases: In Plymouth, we have some major chemicals found in the environment. Most affect body systems especially the cardiovascular system as many are carcinogens, toxins, etc.

	Chemical Environmental Releases http://scorecard.goodguide.com/chemical-profiles/rank-chemicals-in-county.tcl?how_many=100&drop_down_name=Total+environmental+releases&fips_state_code=25&fips_county_code=25023 -Details highest rate of hazardous chemicals 	
2. Air Quality http://www.city-data.com/radon-zones/Massachusetts/Massachusetts.htmlhttp://www.city-data.com/radon-zones/Massachusetts/Massachusetts.html	AQI and Ozone https://airnow.gov/index.cfm?action=airnow.local_city&zipcode=02360&submit=Go -Displays current Air Quality Index and Ozone Level  Air Pollution https://air.plumelabs.com/en/live/plymouth -Details main pollutants and current pollution level  Radon Levels	AQI and Ozone: Plymouth has both a good AQI and Ozone Level in which is healthy for humans. Air Pollution: Pollution levels are slightly below average and moderate with the main pollutants being nitrogen and particulate matter; however, it remains at a safe level to perform outside activities Radon Levels: Plymouth has a moderate level for radon which are radioactive fumes that build up in any type of home Air Quality: In Plymouth, the air quality is a bit hazardous as there are high levels of Carbon Monoxide, Nitrogen, and Sulfur. Furthermore, there is

	http://www.city-data.com/radon-zones/Massachusetts/Massachusetts.html -Shows county's radon levels based on high, moderate, and low rates  Air Pollution Emissions/Releases http://scorecard.goodguide.com/env-releases/county.tcl?fips_county_code=25023#major_chemical_releases http://scorecard.goodguide.com/env-releases/cap/county.tcl?fips_county_code=25023#emissions_summary -Percentile for Air Quality. Comparing Plymouth to other US counties on toxins and other chemicals in the air   Transportation Time (Pollution from Fuel) https://www.census.gov/quickfacts/fact/map/plymouthcountymassachusetts/LFE305217	plenty of carcinogens in the air as well. Transportation Time (Pollution from Fuel): Plymouth has the second highest transportation time rate, which corresponds with high air pollution.

	-Compares areas of Massachusetts in travel transportation time 	
3. Water Quality	Leading Pollutants/Stressors http://scorecard.goodguide.com/env-releases/water/cwa-county.tcl?fips_county_code=25023#cause -Displays percentages for various pollutants in various water supplies    Watershed/Water Bodies Health http://scorecard.goodguide.com/env-releases/water/ -Maps indicate number of impaired water bodies and watershed levels	Leading Pollutants/Stressors: Mainly Pathogens, various water areas are contaminated with a variety of pollutants and stressors. Depending on where the source is located and what it may provide to organisms, they differ but relatively still detail how Plymouth has to deal with many water 'hazards' Watershed/Water Bodies Health: Indicates that Plymouth is in the higher 20% of the US with impaired waterbodies due to the pollutants found within it. High tourism and big forest for animals may damage water. Plus Plymouth is known for their ocean which contains hazards from all over the world and organisms. Watershed health indicates that we do have overall acceptable water quality as compared to other areas on the United States. Plymouth Report: Water Quality Testing indicates that Plymouth has no hazards that needs immediate attention as

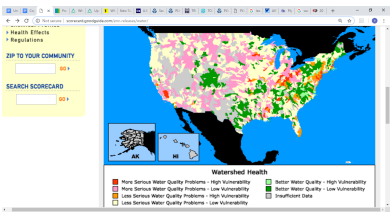
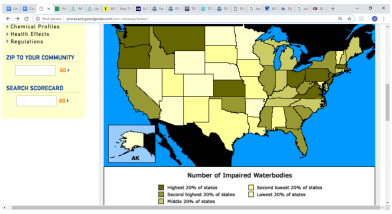
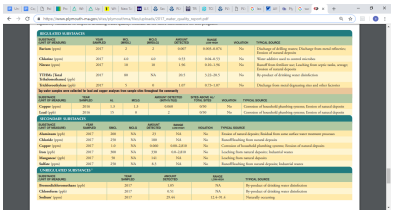
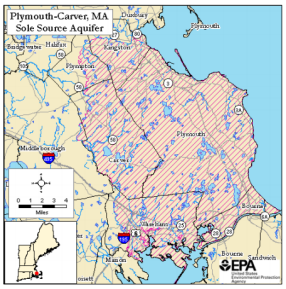
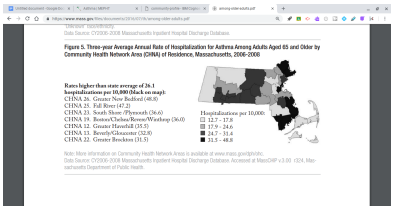
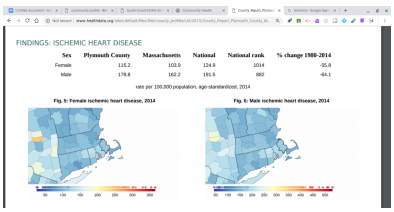
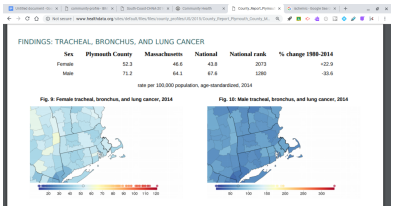
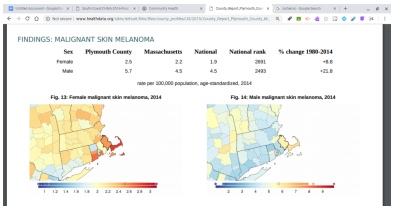
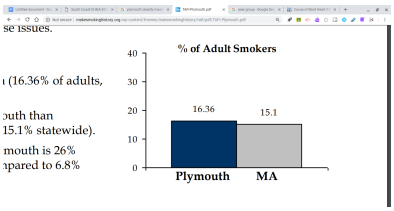
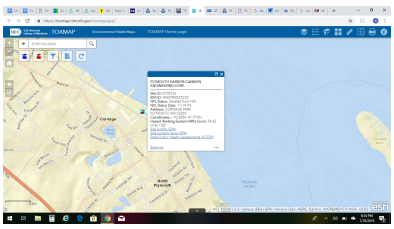
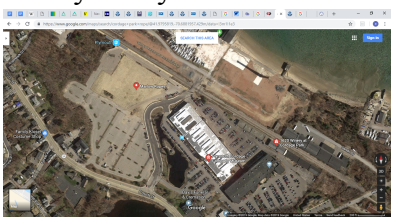
	  Town of Plymouth: Water Quality Report https://www.plymouth-ma.gov/sites/plymouthma/files/uploads/2017_water_quality_report.pdf -File details extensive tests performed on water samples in Plymouth  Entergy's Legacy of Contamination at Pilgrim Nuclear Power Station https://jonesriver.org/getfile/ccbw/2012/10/RAD-REPORT_2017.07.18_VS3.pdf Shows dumping site for nuclear waste and details how it may affect groundwater. Also, shows Plymouth's aquifer which are used for groundwater and underground pipes	nothing violates the protocol/levels. Healthy. Entergy's Legacy of Contamination at Pilgrim Nuclear Power Station: Radioactive pollutants/waste is being dumped at certain sites and leaking illegally into groundwater. Discharges are also causing issues with Plymouth's aquifer which transports drinking water. Also, leaks in underground pipes are being unnoticed and not taken care of by the company.

	 Figure 9. Location of suspected chemical waste dumping site on the Pilgrim property. Underground piping at nuclear facilities is designed to support safety and non-safety related systems including fire protection, emergency diesel generator fuel oil, cooling, gas treatments, salt service water, and more.[50] Some of these pipes and tanks contain industrial process and wastewater contaminated with radionuclides, and degradation of these components can lead to leaks of toxic materials into groundwater and soils.[51]  Figure 6. Plymouth-Carver Sole Source Aquifer. (Source: EPA, www3.EPA.GOV)	
4. Health Status	Asthma Rates in Older Adults https://www.mass.gov/files/documents/2016/07/th/among-older-adults.pdf -Details hospitalization patients based on population of different counties/towns in Massachusetts  Figure 5. Three-year Average Annual Rate of Hospitalization for Asthma Among Adults Aged 65 and Older by Community Health Network Area (CHNA) of Residence, Massachusetts, 2006-2008 Disease Rates http://www.healthdata.org/sites/default/files/files/county_profiles/US/2015/County_Report_Plymouth_County_Massachusetts.pdf -Compares Plymouth to State and nation level with findings in diseases including heart disease and cancer	Asthma Rates in Older Adults: In Plymouth, citizens (older adults) have high rates of asthma when compared to other areas in Massachusetts which may be due to air pollution. Disease Rates/Number of Smokers: Plymouth also has higher rates when compared to Massachusetts in heart disease which may be due to many reasons including smoking -which Plymouth also has a higher rate than Massachusetts' average. Skin cancer is also high because of constant sunlight exposure due to beaches and ozone layer. Also, high lung cancer rate may be due to smoking and air pollution.

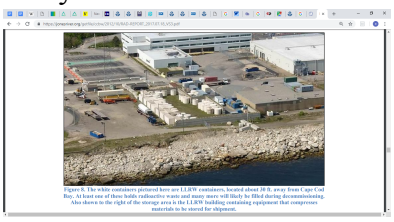
	 FINDINGS: ISCHEMIC HEART DISEASE Sex Plymouth County Massachusetts National National rank % change 1980-2014 Female 115.2 103.9 124.9 1014 -55.8 Male 178.8 162.2 181.5 882 -64.1 rate per 100,000 population, age-standardized, 2014 Fig. 5: Female ischemic heart disease, 2014 Fig. 6: Male ischemic heart disease, 2014  FINDINGS: TRACHEAL, BRONCHUS, AND LUNG CANCER Sex Plymouth County Massachusetts National National rank % change 1980-2014 Female 52.3 46.6 43.8 2073 +22.9 Male 71.2 64.1 67.6 1260 -33.6 rate per 100,000 population, age-standardized, 2014 Fig. 9: Female tracheal, bronchus, and lung cancer, 2014 Fig. 10: Male tracheal, bronchus, and lung cancer, 2014  FINDINGS: MALIGNANT SKIN MELANOMA Sex Plymouth County Massachusetts National National rank % change 1980-2014 Female 2.5 2.2 1.9 2891 +8.8 Male 5.7 4.5 4.5 2493 +21.8 rate per 100,000 population, age-standardized, 2014 Fig. 13: Female malignant skin melanoma, 2014 Fig. 14: Male malignant skin melanoma, 2014 Number of Smokers http://makesmokinghistory.org/wp-content/themes/makesmokinghistory/tafi/pdf/TAFI-Plymouth.pdf -Compares Plymouth to Massachusetts with the rate of smokers living in the area  se issues. (16.36% of adults, outh than 15.1% statewide). mouth is 26% pared to 6.8% % of Adult Smokers 40 30 20 10 0 16.36 15.1 Plymouth MA	
5) Industrial History	Toxmap https://toxmap.nlm.nih.gov/toxmap/app/ -Shows the Cannon Engineering Corp in Plymouth and their hazardness	Toxmap: In Plymouth, there used to be an Engineering Corporation that contained aboveground storage tanks holding polycyclic aromatic hydrocarbons, fuel, motor oils, industrial oils and emulsions, solvents, lacquers, organic and inorganic



Plymouth Cordage Company
https://www.google.com/maps/search/cordage+park+rope/@41.9795819,-70.6881957,429m/data=!3m1!1e3
-Location of the old rope factory in Plymouth



Pilgrim Nuclear Power Plant
https://jonesriver.org/getfile/ccbw/2012/10/RAD-REPORT_2017.07.18_VS3.pdf
-Shows dumping sites, wasebins, and details about pollution for the power plant in Plymouth



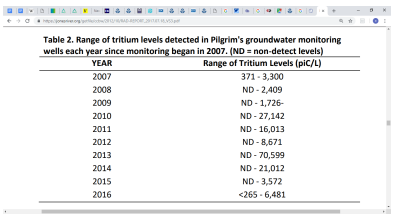


Table 2. Range of tritium levels detected in Pilgrim's groundwater monitoring wells each year since monitoring began in 2007. (ND = non-detect levels)

YEAR	Range of Tritium Levels (piC/L)
2007	371 - 3,300
2008	ND - 2,409
2009	ND - 1,726-
2010	ND - 27,142
2011	ND - 16,013
2012	ND - 8,671
2013	ND - 70,599
2014	ND - 21,012
2015	ND - 3,572
2016	<265 - 6,481

chemicals, cyanide and plating wastes, plating sludge, oily solids, pesticides, and clay and filter media with chemicals on site. It also transported and stored hazardous wastes. Currently, it is above the 50th percentile for hazard risk.

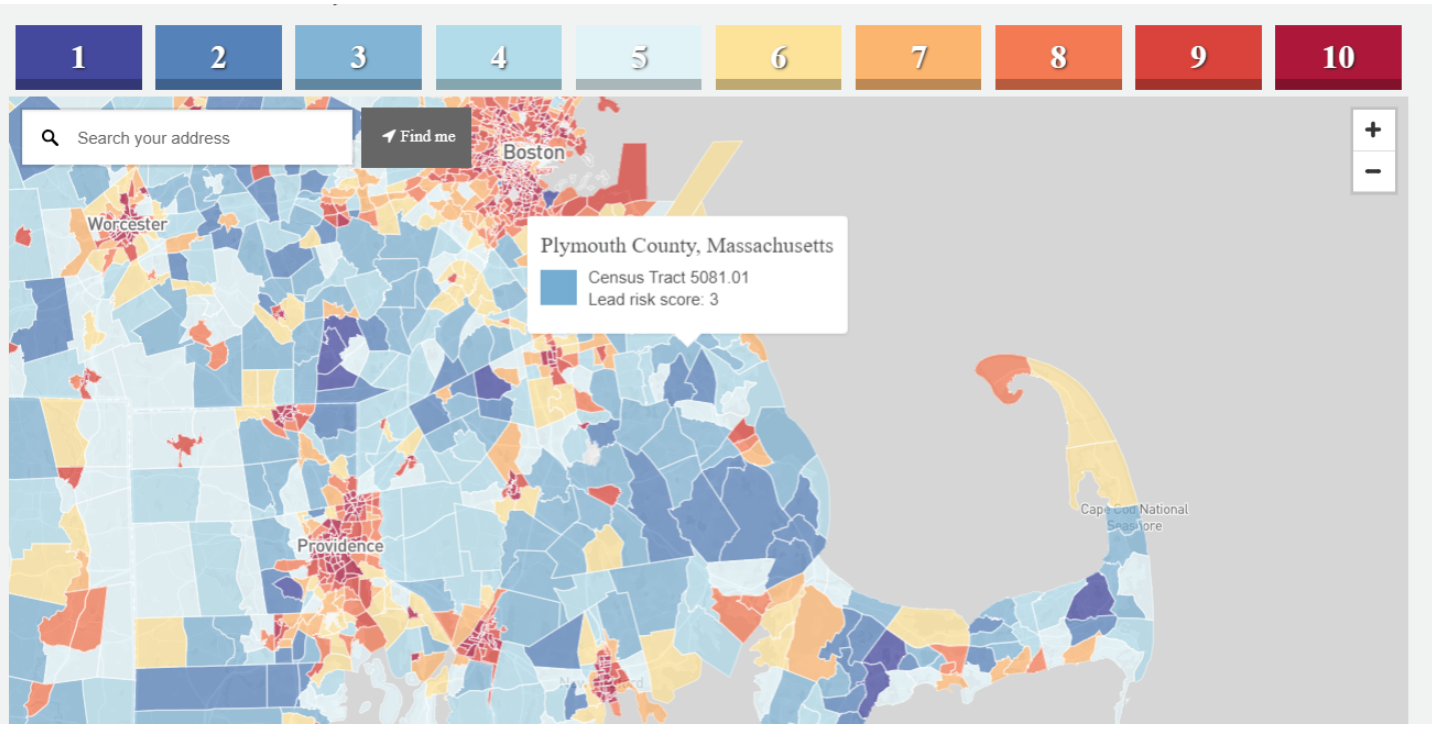
Plymouth Cordage Company: As for the cordage company, such is a rope making factory that used a smokestack which released pollution into the air including soot, dust, smoke, and harmful gases (carbon monoxide and sulfur dioxide).

Pilgrim Nuclear Power Plant: The nuclear power plant contains certain dumping sites and the company has been subjected to illegal activity because of constant leakages and dumping of nitrogen which enters groundwater and the soil nearby. Also, it has waste containers located close to the bay which may have leakages into the water. Promotes algal growth and organism decay. Also, the chemical Tritium continues to grow in their level of exposure in groundwater which is bad since such can cause damage to the human body, including harmful genetic mutations, cancers, benign tumors, cataracts, birth defects, and reproductive, immune and endocrine system disorders.

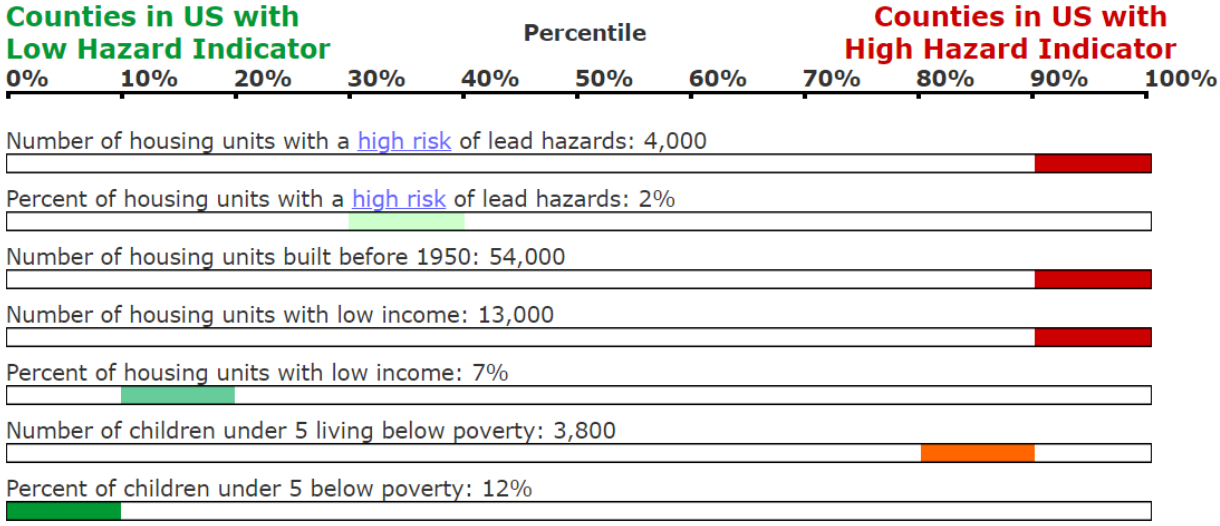
	 Figure 5. Northern side of the Pilgrim site. Yellow arrows point to the wastewater treatment building and the leaching field just off Rocky Hill Rd., Plymouth.	These impacts can affect humans as well as plants and wildlife.

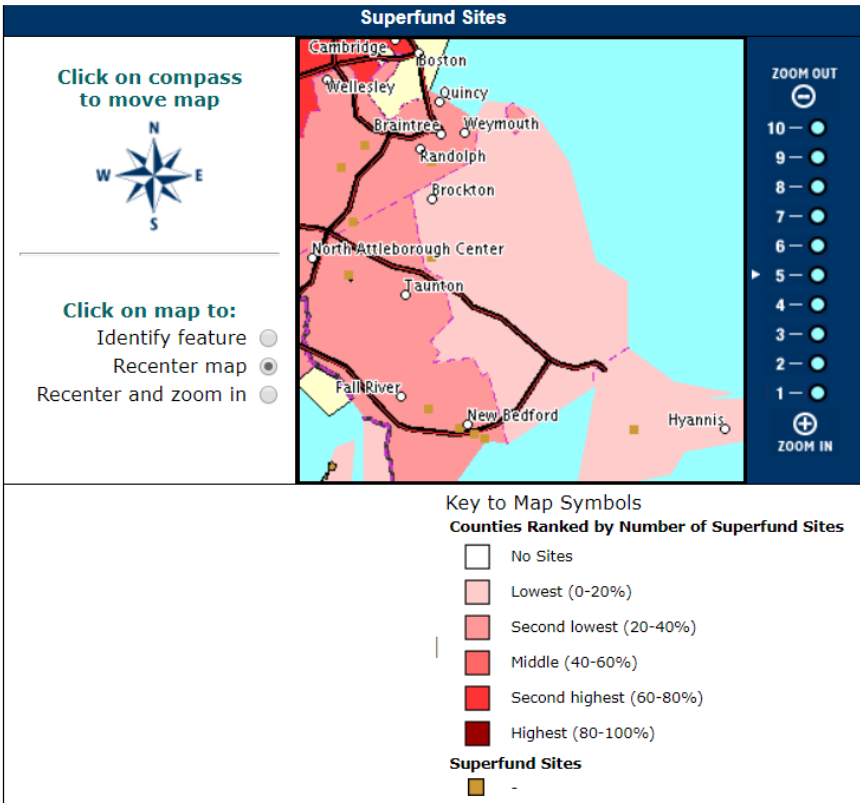
1) Hazardous Waste Sites and Dangerous Chemicals

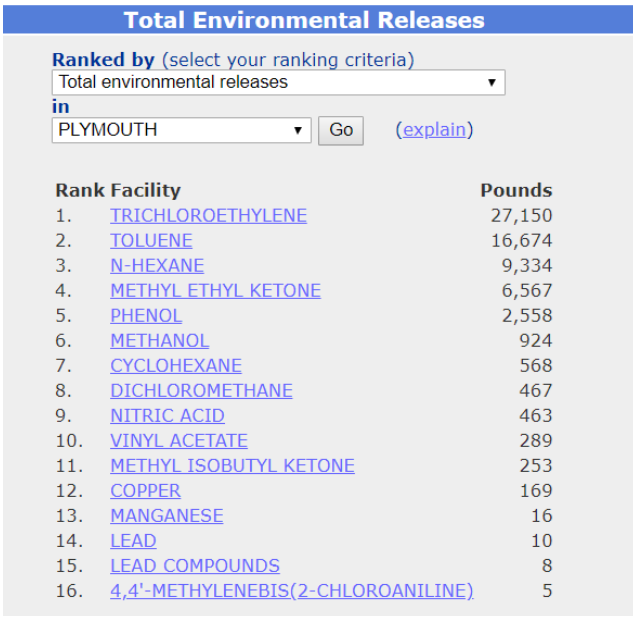
Due to the wide area known as Plymouth, MA, there are many sites that fall victim to hazardous wastes. One known issue is the chemical lead. Due to many old houses in America's hometown and the poorer regions that cannot afford home renovations, lead paint is still prevalent in some places as residue on walls or in dust particles. Unfortunately, a buildup of lead in the human body is quite dangerous, especially for children who often ingest the particles, as it affects multiple body systems and could result in death. Luckily, however, Plymouth has scraped houses of having such chemical and passed a law for current homes being built so now about 90% of the county has a low risk score of 1-2 on a scale of 10; but outliers still remain as some communities hold a rate of 7-9. To continue, superfund sites are seen all over the country. Not as common in Plymouth, there is currently only one area that is labelled as such (Plymouth Harbor/Cannon Engineering Corp), as the county is in the lowest with 0-20%. A Superfund site is basically a site in which has been identified by the EPA as hazardous to humans and the environment and is subjected to cleanup. Lastly, there are many chemicals identified that are released in the environment. The top three being: Trichloroethylene, Toluene, and N-Hexane. Overall, these chemicals include carcinogens, toxins, etc and greatly damage the human body if absorbed, ingested, or inhaled too frequently. One of the major negative effects is on the cardiovascular system, as the blood carries such around the body and infects organs or generates diseases.



ead Hazard Indicators and Comparative Rankings







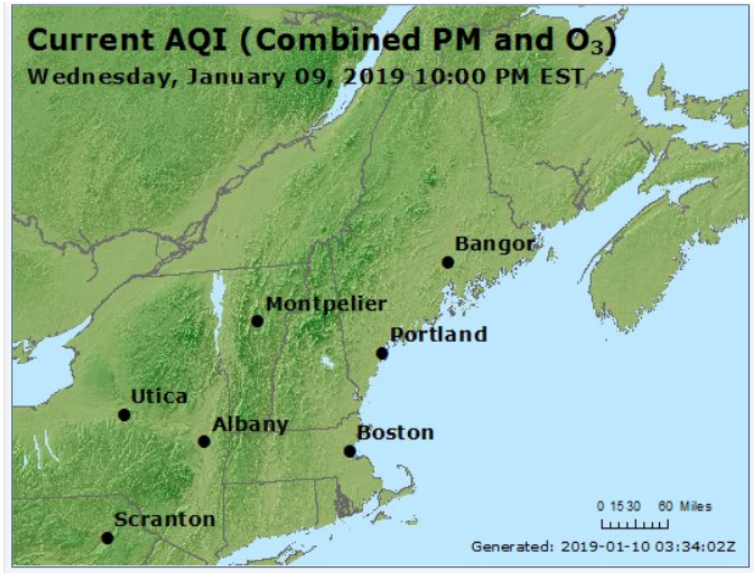
Total Environmental Releases

Ranked by (select your ranking criteria)
Total environmental releases
in
PLYMOUTH Go (explain)

Rank	Facility	Pounds
1.	TRICHLOROETHYLENE	27,150
2.	TOLUENE	16,674
3.	N-HEXANE	9,334
4.	METHYL ETHYL KETONE	6,567
5.	PHENOL	2,558
6.	METHANOL	924
7.	CYCLOHEXANE	568
8.	DICHLOROMETHANE	467
9.	NITRIC ACID	463
10.	VINYL ACETATE	289
11.	METHYL ISOBUTYL KETONE	253
12.	COPPER	169
13.	MANGANESE	16
14.	LEAD	10
15.	LEAD COMPOUNDS	8
16.	4,4'-METHYLENEBIS(2-CHLOROANILINE)	5

2) Air Quality

One of the more important environmental topics is air quality as we breathe such in every second of the day. For Plymouth, the air quality index is relatively good, sitting around a 24; meaning the general public will not have to worry about their respiratory conditions or sensitivity. However, Plymouth still does have many poor qualities about their air. Overall, although the AQI is on an acceptable level, it is low for the nation. Furthermore, the pollution in the air is slightly hazardous. Currently, nitrogen, particulate matter, and the ozone are the main polluters. Nitrogen is a gas in which is created through road traffic and burning of fossil fuels. It contributes to the formation of ozone and particulate matter, and may cause irritations to the respiratory system. As for ozone, it is another harmful air quality that is caused by cars and power plants in which makes complications in the chest -scar tissue, pain, coughing, etc. And particulate matter is a very harmful mixture of solids and liquids (smoke, soot, pollen, dust, liquid droplets) that can damage both heart and lungs; and even cause premature death. To continue, the chemical Radon is another semi-issue that Plymouth has, as it stands in the moderate range. Such is a radioactive fume that build up in any type of homes; which is an issue since Plymouth is constantly expanding its household maximum. Overall exposure to such can generate Radon poisoning which can lead to lung cancer. So, constant checks of one's home is needed in order to ensure Radon is not leaking into the building. Lastly, Plymouth air quality is more hazardous than good because of the high levels in Carbon Monoxide, Sulfur, Carcinogens, and as stated previously Nitrogen. Carbon Monoxide is known to cause death as it creates a decrease in oxygen levels within the body. Sulfur is also very toxic and can cause death if inhaled for too long/not treated. Carcinogens are mainly known to cause issues in body cells that result in cancer. Additionally, one reason for poor quality in air is due to transportation, especially those that burn fuel. Out of all of Massachusetts, Plymouth has the second highest transportation time rate which alone corresponds to the high pollution.



Good | Moderate | USG | Unhealthy | Very Unhealthy | Hazardous | ! Action Day

Current Conditions

Air Quality Index (AQI)
observed at 22:00 EST

24 **Good**

Health Message: None

Note: Values above 500 are considered Beyond the AQI. Follow recommendations for the Hazardous category. Additional information on reducing exposure to extremely high levels of particle pollution is available here.

AQI - Pollutant Details		
Ozone	24	Good

Air Quality Forecast

Today	Tomorrow
Data Not Available	Data Not Available
AQI - Pollutant Details	
Data Not Available	Data Not Available

Past Air Quality Maps and Data

Yesterday's Maps and Data

Air Quality Maps Archives (by region)

OUTDOOR SPORTS
GO FOR IT

CYCLING
GO FOR IT

BRING BABY OUT
GO FOR IT

EATING OUTSIDE
GO FOR IT

IMPACT RISK IF CHRONIC EXPOSURE

The air is moderately polluted. Greater than the maximum limit established for one year by WHO. A long-term exposure constitutes a health risk.

BELOW AVERAGE

23
27
Plume Air Quality Index annual average

244 days per year at this level

MAIN POLLUTANTS

23	21	4
NITROGEN DIOXIDE	PARTICULATE MATTER	OZONE

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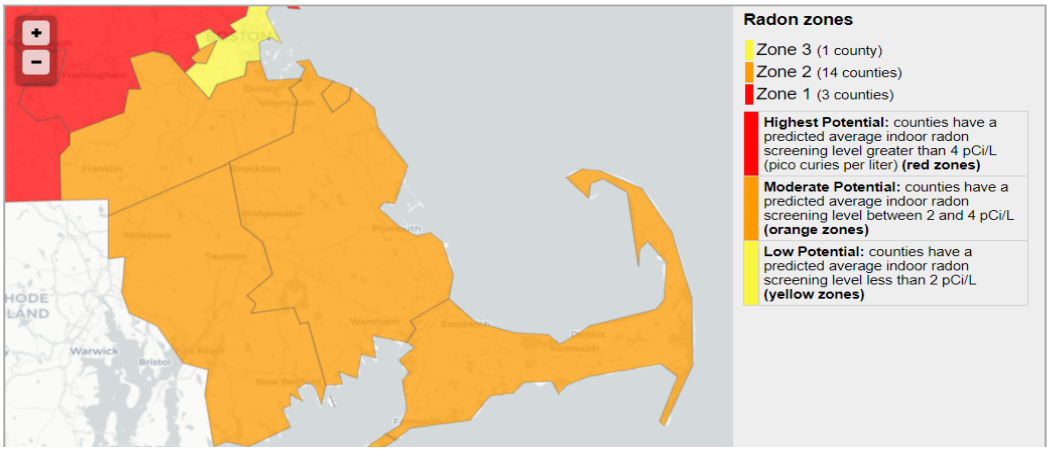
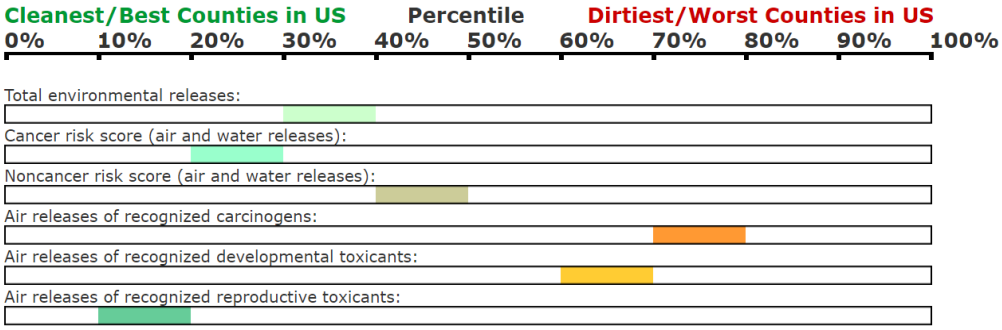
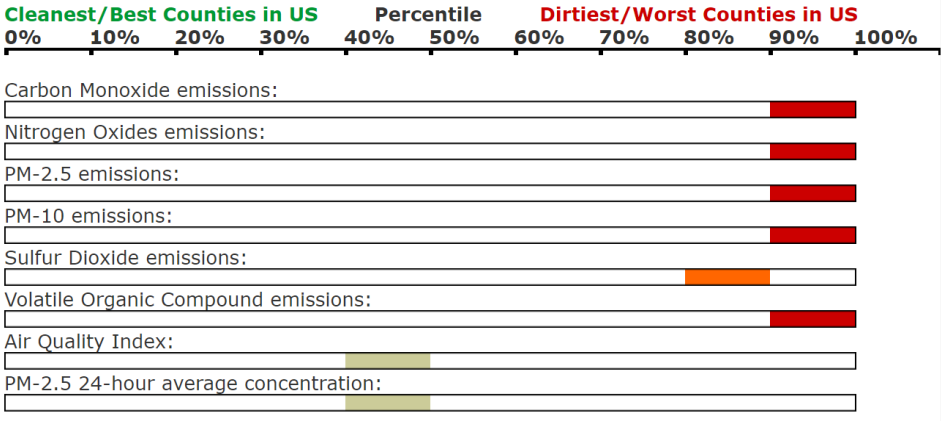


- 2002 Rankings: Major Chemical Releases or Waste Generation in PLYMOUTH County*



Air Quality Rankings: Health Risks, Exposure, and Emissions



3)Water Quality

Being America's hometown, tourists often find themselves in Plymouth and lurking along the shoreline of the few wondrous beaches. However, it may not be entirely clean. With a few rivers and lakes, there have been much impairments of pollution in which would run-off into neighboring beaches and rest along the bays. The main issues are typically pathogens, algal blooms, and metal. Due to swimming being a popular activity in Plymouth, many would enter the water and could ingest some of it which can lead to diseases and effect body systems negatively

due to all of the bacteria and decaying organisms from increased algal blooms resting under the surface. Overall, the sources all differ with what they contain for stressors, but the variety shows how Plymouth can have a series of issues when it comes to water supply. To continue, these collections of water on the surface are known as water bodies and Plymouth has been indicated to be apart of the higher 20% (in the US) for those impaired due to pollutants. Such can be because of the high tourism level, extensive animal species that dwell nearby, and the ocean which contains hazards from all over the world. However, the watershed level (drain of runoff from rivers into larger bodies of water) for Plymouth is relatively healthy when compared to other areas of the United States. To be more in detail about the drinking water found in this county, the town conducted a water testing for various hazard substances, from copper to chloride, and nothing violated the safety standards -therefore, everything was healthy. However, a test on lake water near a polluted shut-down pond indicated that there were substances in the water, yet the level of it was not determined. Additionally, due to the nearby power plant that has been known to violate protocol, radioactive pollutants and waste are being leaked and/or dumped into certain sites and entering groundwater through soil absorption(where Plymouth's drinking water is sourced). Discharges from pipes are also causing issues for the aquifer which delivers water to households, and the leaks are still not taken care of by the company; which only raises hazards for Plymouth since these underground pipes were meant for safety and protection from radioactivity in water.

POLLUTION LOCATOR| Water | Leading Pollutants/Stressors

Region Name: PLYMOUTH County, MA

Rivers, Streams, and Creeks	Number of Impairments	Percent of all Impairments
Pathogens	37	55%
Metals	23	34%
Nutrients	17	25%
Impaired Biological Community	15	22%
Low Dissolved Oxygen/Organic Enrichment	12	18%
Sediments	5	7%
Unknown	5	7%
Salinity/TDS/Chlorides	3	4%
Organic Compounds	2	3%
Dioxin	1	1%
Flow Alterations	1	1%
Mercury	1	1%
Other Habitat Alterations	1	1%
PCBs	1	1%

POLLUTION LOCATOR| Water | **Leading Pollutants/Stressors**

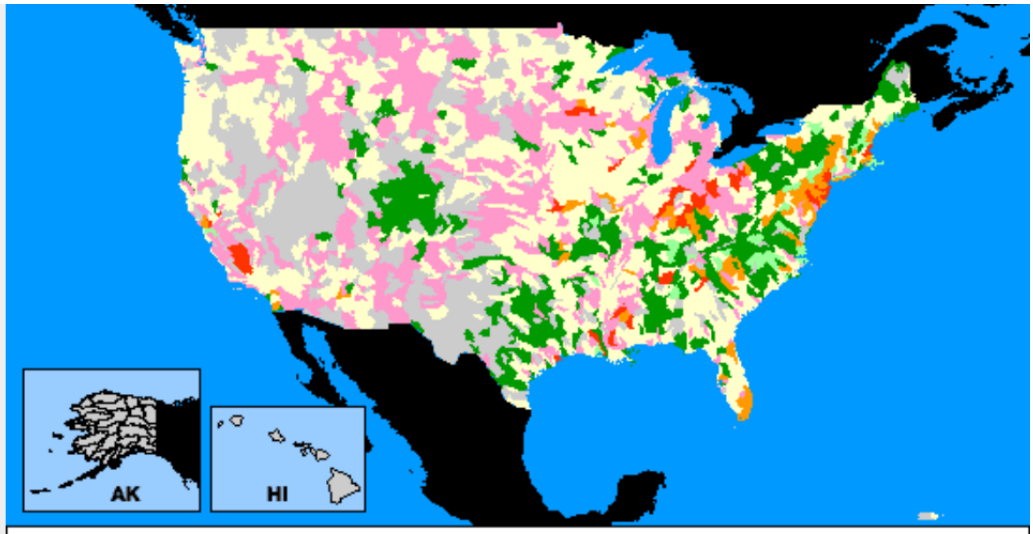
Region Name: PLYMOUTH County, MA

Lakes, Reservoirs, and Ponds	Number of Impairments	Percent of all Impairments
Noxious Aquatic Plants	131	72%
Nutrients	34	19%
Sediments	33	18%
Metals	12	7%
Low Dissolved Oxygen/Organic Enrichment	11	6%
Pathogens	10	6%
Impaired Biological Community	9	5%
Organic Compounds	5	3%
Salinity/TDS/Chlorides	4	2%
Aesthetics	1	1%

POLLUTION LOCATOR| Water | **Leading Pollutants/Stressors**

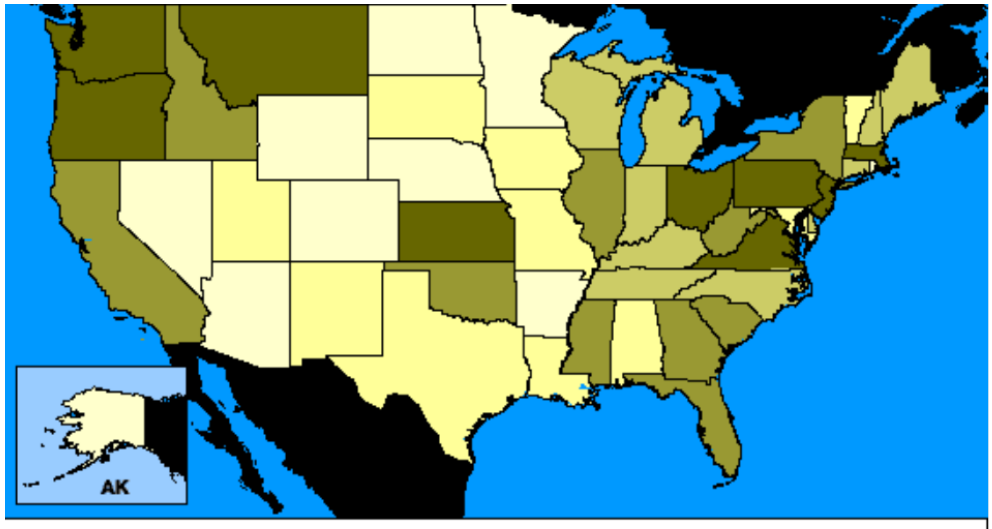
Region Name: PLYMOUTH County, MA

Estuaries, Bays, and Coasts	Number of Impairments	Percent of all Impairments
Pathogens	16	59%
Nutrients	13	48%
Impaired Biological Community	2	7%
Aesthetics	1	4%
Low Dissolved Oxygen/Organic Enrichment	1	4%
Metals	1	4%
Toxics	1	4%
Unknown	1	4%



Watershed Health

- More Serious Water Quality Problems - High Vulnerability
- More Serious Water Quality Problems - Low Vulnerability
- Less Serious Water Quality Problems - High Vulnerability
- Less Serious Water Quality Problems - Low Vulnerability
- Better Water Quality - High Vulnerability
- Better Water Quality - Low Vulnerability
- Insufficient Data



Number of Impaired Waterbodies

- Highest 20% of states
- Second highest 20% of states
- Middle 20% of states
- Second lowest 20% of states
- Lowest 20% of states

REGULATED SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	MCL [MRDL]	MCLG [MRDLG]	AMOUNT DETECTED	RANGE LOW-HIGH	VIOLATION	TYPICAL SOURCE
Barium (ppm)	2017	2	2	0.007	0.003–0.074	No	Discharge of drilling wastes; Discharge from metal refineries; Erosion of natural deposits
Chlorine (ppm)	2017	4.0	4.0	0.53	0.04–0.53	No	Water additive used to control microbes
Nitrate (ppm)	2017	10	10	1.96	0.10–1.96	No	Runoff from fertilizer use; Leaching from septic tanks, sewage; Erosion of natural deposits
TTHMs [Total Trihalomethanes] (ppb)	2017	80	NA	20.5	3.22–20.5	No	By-product of drinking water disinfection
Trichloroethylene (ppb)	2017	5	0	1.07	0.73–1.07	No	Discharge from metal degreasing sites and other factories

Tap water samples were collected for lead and copper analyses from sample sites throughout the community

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AL	MCLG	AMOUNT DETECTED (90TH%TILE)	SITES ABOVE AL/ TOTAL SITES	VIOLATION	TYPICAL SOURCE
Copper (ppm)	2016	1.3	1.3	0.060	0/30	No	Corrosion of household plumbing systems; Erosion of natural deposits
Lead (ppb)	2016	15	0	2	0/30	No	Corrosion of household plumbing systems; Erosion of natural deposits

SECONDARY SUBSTANCES

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	SMCL	MCLG	AMOUNT DETECTED	RANGE LOW-HIGH	VIOLATION	TYPICAL SOURCE
Aluminum (ppb)	2017	200	NA	23	NA	No	Erosion of natural deposits; Residual from some surface water treatment processes
Chloride (ppm)	2017	250	NA	180	NA	No	Runoff/leaching from natural deposits
Copper (ppm)	2017	1.0	NA	0.060	0.00–2,810	No	Corrosion of household plumbing systems; Erosion of natural deposits
Iron (ppb)	2017	300	NA	330	0.0–2,810	No	Leaching from natural deposits; Industrial wastes
Manganese[1] (ppb)	2017	50	NA	141	NA	No	Leaching from natural deposits
Sulfate (ppm)	2017	250	NA	8.3	NA	No	Runoff/leaching from natural deposits; Industrial wastes

UNREGULATED SUBSTANCES [2]

SUBSTANCE (UNIT OF MEASURE)	YEAR SAMPLED	AMOUNT DETECTED	RANGE LOW-HIGH	TYPICAL SOURCE
Bromodichloromethane (ppb)	2017	1.05	NA	By-product of drinking water disinfection
Chloroform (ppb)	2017	0.51	NA	By-product of drinking water disinfection
Sodium[3] (ppm)	2017	29.44	12.4–91.4	Naturally occurring

Figure 9. Location of suspected chemical waste dumping site on the Pilgrim property.

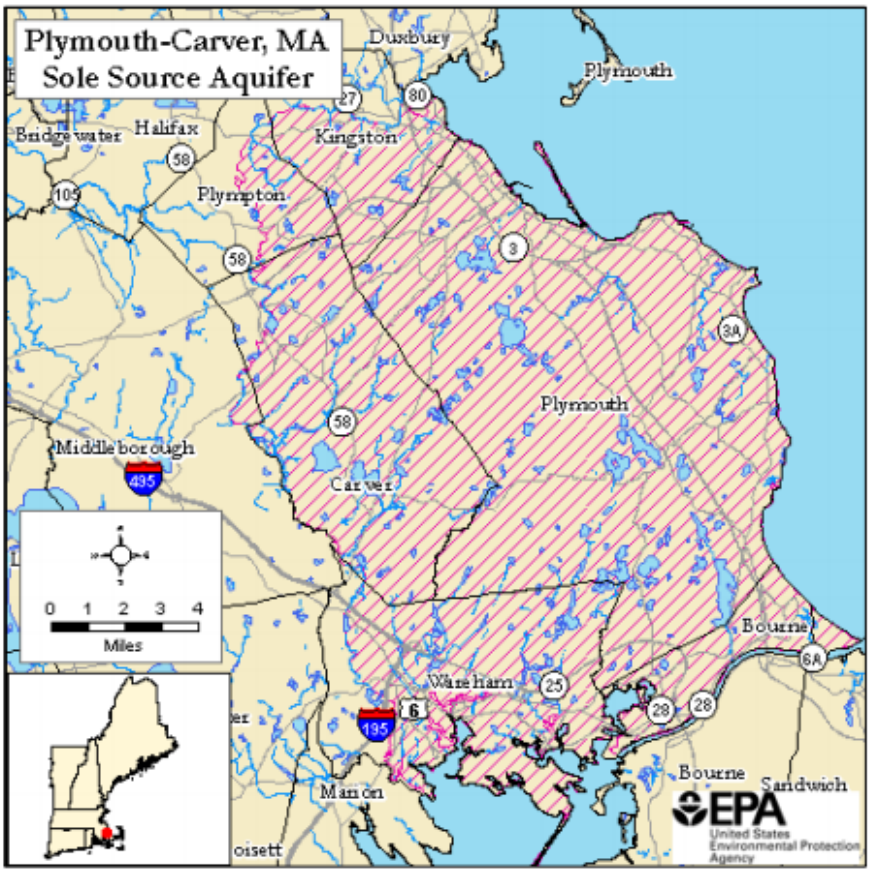


Figure 6. Plymouth-Carver Sole Source Aquifer. (Source: EPA, www3.EPA.GOV)

4.1.3 Local Water Sample

Contaminant	**Short Term Effects**	**Long Term Effects**	**Present in Local Water?**
Mercury	Headache, Nausea, Chest Pain, Increased Heart Rate	Tremor, Anorexia, Fatigue, Forgetfulness	No
Lead	Tired, Loss of Appetite, Headache, Abdominal Pain	Depression, Nauseous, Forgetful, Irritable	No
Radon	Cough, Chest Pain, Wheezing	Lung Cancer	Present
Chlorine	Eye Irritation, Vomiting, Cough	Fluid in Lungs	No
Chromium	Cough, Nose Bleed, Nausea	Kidney/Liver Damage, Eczema,	No

		Dermatitis	
Copper	Vomiting, Stomach Cramps, Headache	Liver Damage, Kidney Disease	No
Cyanide	Weakness, Nausea, Rapid Breathing	Breathing Difficulties, Enlarged Thyroid	No
Nitrates	N/A	Baby Blue Syndrome, Diuresis, Hemorrhaging of Spleen	No
Phosphates	None	Kidney/Liver/Heart Disease, Respiratory Irritation	No
Silica	None	Lung Infection, Kidney Disease	Yes
Sulfide	None	Reduced Motor Functions, Lung Buildup	No
Ammonium Nitrogen	None	Respiratory Distress or failure	No
pH	None	Cancer, Memory Problems, High Blood Pressure	pH of 5
Iron	None	Liver/Heart/ Pancreatic Damage, Diabetes	No

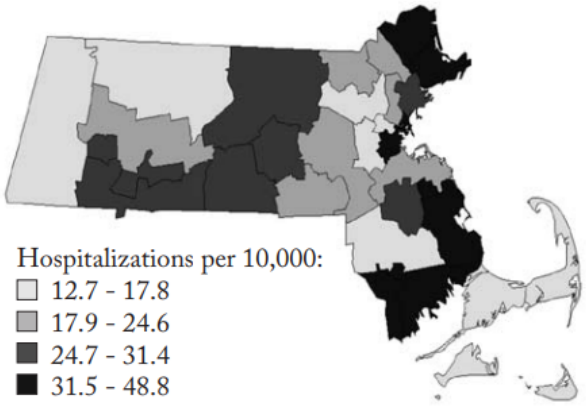
4) Health Status

The county of Plymouth unfortunately falls short on the topics of health. To begin, Plymouth has very high rates when addressing victims of asthma (specifically older adults). The town stands at number 3 when compared to other areas of Massachusetts, with 36.5 hospitalizations per 10,000 people. Such may be due to many complications, more frequently pollutants in the air which Plymouth has a high rate in for various chemicals. Continuing, when comparing Plymouth with Massachusetts, the county has higher rates in heart disease, lung cancer, and skin cancer. All which can be triggered by pollutants in the town's air, especially Trichloroethylene, along with issues in the water like pathogens and dead fish. Skin cancer is

also quite prevalent because of citizens' constant exposure to the sun as there are many nearby beaches and lakes; also the ozone layer may not be absorbing as well as before due to the many pollutants. Lastly, Plymouth has 1.26% more smokers than the Massachusetts' average, which may not seem like a big difference but still poses a threat as the carcinogens released pollute the air and cause more hazardous issues. Furthermore, the high lung cancer rate that can be seen with Plymouth may be due to the advanced rate of smokers in the town.

Figure 5. Three-year Average Annual Rate of Hospitalization for Asthma Among Adults Aged 65 and Older by Community Health Network Area (CHNA) of Residence, Massachusetts, 2006-2008

Rates higher than state average of 26.1 hospitalizations per 10,000 (black on map):
CHNA 26. Greater New Bedford (48.8)
CHNA 25. Fall River (47.2)
CHNA 23. South Shore /Plymouth (36.6)
CHNA 19. Boston/Chelsea/Revere/Winthrop (36.0)
CHNA 12. Greater Haverhill (35.5)
CHNA 13. Beverly/Gloucester (32.8)
CHNA 22. Greater Brockton (31.5)



FINDINGS: ISCHEMIC HEART DISEASE

Sex	Plymouth County	Massachusetts	National	National rank	% change 1980-2014
Female	115.2	103.9	124.9	1014	-55.8
Male	178.8	162.2	191.5	882	-64.1

rate per 100,000 population, age-standardized, 2014

Fig. 5: Female ischemic heart disease, 2014

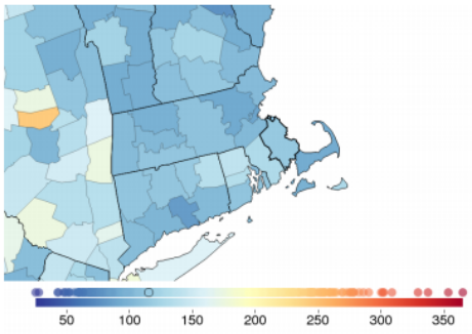
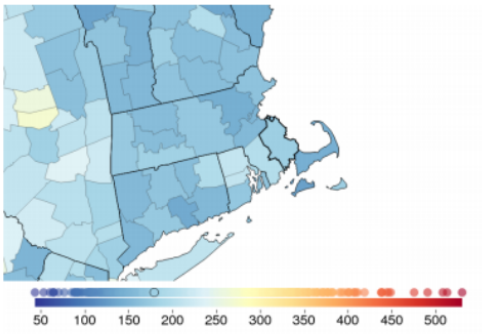


Fig. 6: Male ischemic heart disease, 2014



FINDINGS: TRACHEAL, BRONCHUS, AND LUNG CANCER

Sex	Plymouth County	Massachusetts	National	National rank	% change 1980-2014
Female	52.3	46.6	43.8	2073	+22.9
Male	71.2	64.1	67.6	1280	-33.6

rate per 100,000 population, age-standardized, 2014

Fig. 9: Female tracheal, bronchus, and lung cancer, 2014

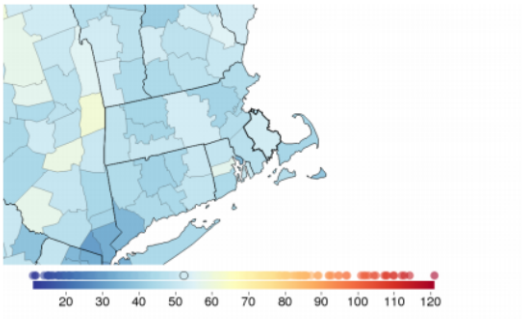
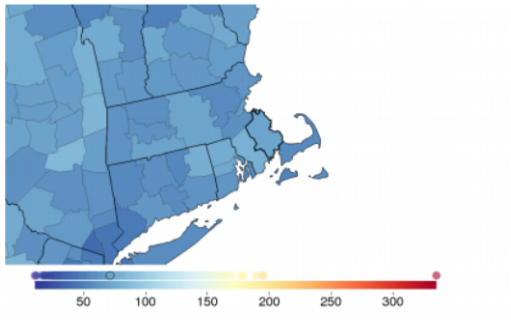


Fig. 10: Male tracheal, bronchus, and lung cancer, 2014



FINDINGS: MALIGNANT SKIN MELANOMA

Sex	Plymouth County	Massachusetts	National	National rank	% change 1980-2014
Female	2.5	2.2	1.9	2691	+8.8
Male	5.7	4.5	4.5	2493	+21.8

rate per 100,000 population, age-standardized, 2014

Fig. 13: Female malignant skin melanoma, 2014

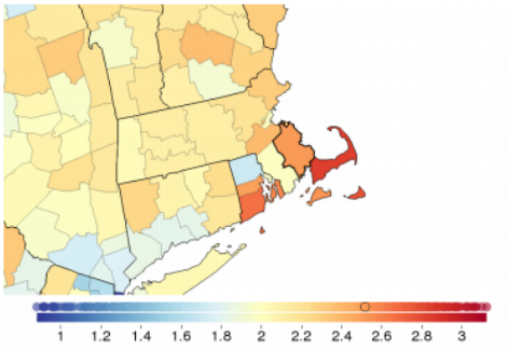
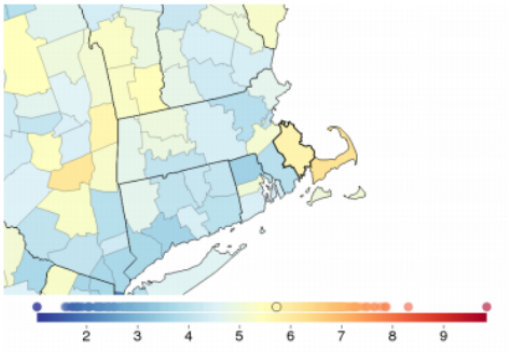
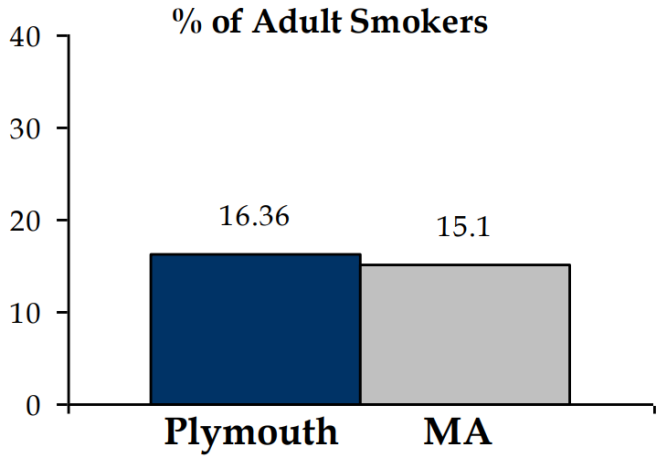


Fig. 14: Male malignant skin melanoma, 2014





5) Industry History

Although Plymouth may not seem like a booming industry county, it previously had a few strong businesses and factories and currently stands with a nuclear power plant that is facing issues. To start, returning back to the idea of superfund sites, there used to be a Plymouth Harbor/Cannon Engineering Corporation which had aboveground tanks that held various substances some of which are toxic, including: hydrocarbons, fuel, oils, cyanide, pesticides, etc. This industry also took the initiative to transport and store hazardous wastes from other areas. Luckily, it was deemed to hazardous and flagged as a superfund for cleanup in the area it occupied. Although it has since been removed from the EPA list, the current hazard risk is above the 50%. Another industry that affected the environment of Plymouth, is an old rope factory from the 1800s known as Plymouth Cordage Company. There, they would often utilise a smokestack while the factory was running. A smokestack is overall a chimney that exhausts chemicals from the working rooms. By releasing the pollution into the air (soot, dust, smoke, harmful gases such as Carbon Monoxide and Sulfur), it lingered and damaged the quality which is reflecting on current times as the air quality now is below average for Plymouth when compared to Massachusetts or even the nation. The last well-known industry is the Pilgrim Nuclear Power Plant. Typically, such would be often monitored to ensure safety standards are met and no harm in brought upon neighboring communities, but that is not the case for Plymouth's power plant. It has been brought to the attention of higher state/town officials that certain dumping sites are being used which is affecting the soil and groundwater as the radioactive waste is being absorbed into the Earth. Furthermore, the company has been scrutinized to performing illegal activity because of the constant leakages and dumping of Nitrogen; also because of where their waste containers are placed. Such are extremely close to the bay/shoreline which causes concerns since these areas are now involved in potential leaks and dumping, which causes rising sea level, water degradation, storm surge, and algal bloom promotion(higher organism death rate). The last fact about the nuclear power plant is on a specific chemical known as Tritium. Testings have been

completed yearly on groundwater to determine if the radioactive substance has been leaking into the system due to unchecked pipes and unfixed problems by the company, and every year the level increases. Such exposure is highly serious as it causes major issues such as: genetic mutation, immune disorders, cancer, cataracts, etc.

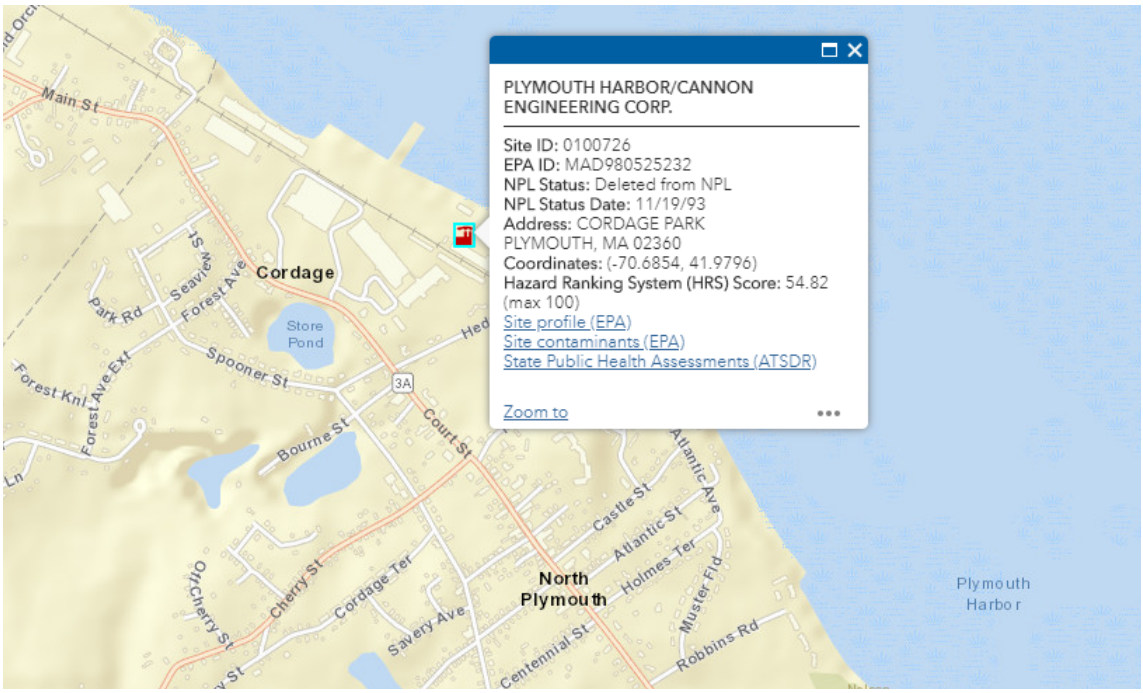


Figure 8. The white containers pictured here are LLRW containers, located about 30 ft. away from Cape Cod Bay. At least one of these holds radioactive waste and many more will likely be filled during decommissioning. Also shown to the right of the storage area is the LLRW building containing equipment that compresses materials to be stored for shipment.

Table 2. Range of tritium levels detected in Pilgrim's groundwater monitoring wells each year since monitoring began in 2007. (ND = non-detect levels)

YEAR	Range of Tritium Levels (piC/L)
2007	371 - 3,300
2008	ND - 2,409
2009	ND - 1,726-
2010	ND - 27,142
2011	ND - 16,013
2012	ND - 8,671
2013	ND - 70,599
2014	ND - 21,012
2015	ND - 3,572
2016	<265 - 6,481

Figure 5. Northern side of the Pilgrim site. Yellow arrows point to the wastewater treatment building and the leaching field just off Rocky Hill Rd., Plymouth.