

Executive Summary

This report compiles and synthesizes research related to the conditions and standards that affect potable water quality in Truro and in areas with similar geophysical and water use profiles in the Outer Cape area.¹ It does not analyze well water data and relies on extant reports to establish these levels.

In presenting the scientific evidence available we have relied upon three sources of data:

- Scientific data drawn from research reported in legitimate, peer-reviewed journals and publications
- Regulatory data where official agencies at various levels of government set regulations and, in many instances, maintain data related to same
- Consultative and Policy reports, usually prepared by experts, who may collect original data but who all interpret scientific and empirical evidence for policy- and decision-makers.

A lead indicator of water quality and water supply contamination is the levels of nitrate found in well water, the predominant source of domestic and commercial water in Truro. Drinking water contamination takes the form of nitrates and other organic wastewater compounds and chemicals that are mostly undetectable by taste and smell; nitrates are both easier and less costly to measure than other compounds and chemicals. Additionally, nitrates are found to be an “early detection” marker for other contaminants and serve as an effective warning sign of additional contaminants in drinking water supplies. Nitrate levels are measured in terms of milligrams per liter of water (mg/L) interchangeably with parts per million (ppm). This report uses “mg/L” but both metrics are referenced below.

Truro’s Water Supply Sources

Most of Truro’s drinking water comes from private wells drilled from the aquifer beneath us. In Truro, the aquifer consists of two “lenses” - or underground pools of fresh ground water - that float above the salt water below. The Pamet River, flowing from Ballston Beach to Cape Cod Bay, divides the lens into the **Pamet Lens** to the north and the **Chequesset Lens** to the south.

Because the aquifer is fairly close to the surface in many parts of Truro and thus easily reachable by drilling, these groundwater lenses can and do provide potable water resources. Ponds throughout Truro provide a good indication of the top of the aquifer, which at its highest is about 5 feet above sea level and is generally about 200 feet deep.

Groundwater in the aquifer is mostly the result of rainfall that slowly filters down to the aquifer with every rain. Other contributors to groundwater include **runoff from hard surfaces such as roofs and paved areas** which contribute salts, petrochemicals and other solvents in the runoff; **on-ground open-air storage of toxic materials** such as asphalt, brick, concrete and pressure-treated wood; and **wastewater from septic tanks and cesspools and their overflow**, which “leach” into the soil and likewise filter into groundwater over time, contributing organic (human) and chemical waste mixed in residential and commercial effluence and wastewater. Cesspool leaching finds its way easily into the aquifer and at proportionately greater densities. It is estimated that 10% of Truro homes still have outdated cesspools or otherwise failed septic systems.

Standards and Regulations for Truro’s Water Supply

Eighty-five percent (85%) of Truro’s homes get their water from private wells. Yet private wells are not regulated by the Cape-wide, state or federal authorities, including the EPA. The Cape Cod Commission issues policy guidelines and recommendations, but **the local Board of Health determines acceptable levels of drinking water contamination.**

According to Truro’s Board of Health, water quality in certain areas in the Town of Truro is degraded. Excessive nitrogen loading in our watersheds has been identified as a major cause of this degradation. The primary source of excess nitrogen is reported to be wastewater from on-site septic systems.

Although the federal EPA does not regulate private wells and Truro’s largest supply of potable water is obtained through private wells, **Truro’s Board of Health currently relies on the EPA standard of 10 mg/L for municipal water**

¹ The Outer Cape includes the towns of Provincetown, Truro, Wellfleet, and Eastham.

systems (not wells) as the safe upper limit of nitrates in drinking water. The EPA standard was adopted in 1962 based on a federal study of nitrates and other contaminants in reliance on data from 1951 to determine nitrate level contribution to methemoglobinemia (“blue baby syndrome”). This standard, unchanged since 1962, cited 10 mg/L as the threshold for blue baby syndrome; at no time has the EPA stated that this level is safe for private wells.

Extensive research, most notably since 1996, shows serious health consequences at levels of 5 mg/L - half the EPA’s 10 mg/L - and less. To illustrate but not exhaust the known impact, research associates levels of 5 mg/L with non-Hodgkins lymphoma, bladder and thyroid cancer, and birth defects, and some of these consequences are associated with nitrate levels as low as 0.9 to 3.87 mg/L; other cancers (e.g., colorectal cancer) have been found at and around a nitrate loading level of 1 mg/L. Many other serious health impacts have been identified in the research. The evolution in the scientific understanding of the adverse effects of nitrate contamination has significantly advanced since 1962, with notable changes since 1996: the trend is clear that low levels of nitrates in groundwater have adverse effects on health and that nitrate levels above 5mg/L present unacceptable and multiple challenges to public health.

In the intervening almost 60 years since the EPA adopted its 10 mg/L standard, numerous entities and studies, including by the University of Massachusetts, have recommended that standard be reduced to 5 mg/L. More recent research has looked at the long-term effect of nitrates and related contaminants and found significantly more risks to health. In the most recent decade, non-profit research firms including the *Environmental Work Group* and *Silent Spring Institute*, have recommended nitrate standards be reduced to 1 mg/L. Other than the EPA and those who adhere to its high tolerance level, no longer do studies recommend levels as high as 10 mg/L.

Truro’s current Local Comprehensive Plan calls for continuing review by the Board of Health of nitrate concentration standards to ensure they adequately address potential groundwater pollution problems. As recently as 2014 and 2018, the Town of Truro hired the consulting firm of Weston & Sampson to study Truro’s water and to understand the cumulative effects of nitrogen (nitrate) loading on groundwater quality. Sampling data obtained in 2007-2011 shows that 1181 samples were taken identifying 45 lots with nitrate concentrations above 5 mg/L and 2 lots revealing concentrations above 10 mg/L. In 2012-17 another 1400 samples were tested, generally corroborating earlier findings and trends. As a result, W&S identified parts of North Truro and the Pamet River basin as particular areas of concern. Their results, guidance on safety and mitigation, and recommendations are summarized later in this paper.

Other Effects of Excessive Nitrate Levels

Once drinking water is contaminated by excess levels of nitrates or other health-harming agents, the remedies are costly and irreversible: to construct a public water supply system, including large wells for supply, water filtration plants, water towers, underground water mains, and wastewater treatment facilities.

As expensive as a city-like water infrastructure is to build and maintain, and as much as it needs to be funded by significantly increased taxes, another economically devastating consequence is the decrease in property values due to polluted drinking water. Per the Cape Cod Commission, a 1% increase in nitrogen is associated with a decrease in home prices of 0.6% on average. In Truro’s case, the total value of its homes is on the order of \$2.3 billion. A mere 2% increase in nitrogen would then, according to this model, reduce home values by about \$28 million. Allowing the current Board of Health standard of 10 mg/L doubles the level science now establishes as a threshold for multiple health impacts: 5 mg/L. The corresponding rise in allowable nitrate levels could have adverse economic impacts of considerable magnitude.

Conclusion

Since 1996, increasing evidence of harmful effects of nitrate concentrations on human health are found at ever lower levels; the arc of this trend has been consistent and irrefutable, finding significant health consequences at and below nitrate levels of 5 mg/L. Well below current EPA and Truro Board of Health standard of 10mg/L, these findings warrant consideration and possible revision to reset local standards consistently with current scientific evaluations for nitrate and nitrate loading levels at or under 5 mg/L as a pressing local matter. In addition, it is now evident that nitrates serve as a marker for human activity, the source of other harmful organic and chemical contaminants, many of which are not easily reducible and pose serious risks of cancer and other health problems to residents.