

Town of Hull

Water Study Task Force

Report on Groundwater Quantity and Quality

FINAL COPY

Adopted by Hull Board of Supervisors
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Acknowledgements

Town of Hull Water Study Task Force

John Holdridge – Hull Town Board, Task Force Co-Chair

Mel Bembenek – Hull Town Board, Task Force Co-Chair

Patty Amman – Recording Secretary

Town of Hull Citizen Members

Gwynne Bablitch

Phil Gjevre

Gladys Laug

Harry Obremski

Robert Perkins (resigned December, 2011)

Russ Prusak

David Schmidt

Tim Zimmerman

Advisory Members

William DeVita - Water and Environmental Analysis Laboratory, Laboratory Manager

Paul McGinley - UWSP College of Natural Resources, Associate Professor

Ray Schmidt – Portage County Water Quality Specialist

Report on Well 11

Patrick Planton - Short Elliott Hendrickson Inc., Appleton, WI, Engineer

Preface

John Holdridge

Report Summary

Amy Nitka – UWSP Graduate Student, Portage County AmeriCorps Groundwater Technician

Edited by

William DeVita

John Holdridge

Paul McGinley

Credit for Figures and Tables

Patrick Planton – Figures 6 and 7 Well 11 estimates and test-pump

Portage County Planning & Zoning GIS Department – Figures 3, 4, 8, 15 Town of Hull Maps

Amy Nitka – all other Figures and Tables

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Executive Summary

Safe and uncontaminated drinking water is becoming a major public health goal both in Wisconsin and the entire United States. In the Town of Hull, as in the other 16 towns in Portage County and the over 1,700 towns in Wisconsin, people rely on individual household wells for their drinking water. Water coming from those wells is not regulated by government. Standards as guidelines have been set, but individual householders have to monitor their drinking water and take remedial action when necessary. Stevens Point and other cities and villages in Wisconsin have mandated water quality standards that must be met. Stevens Point has eight wells to monitor, and these wells are strictly regulated by the state and federal government. On the other hand, the Town of Hull has over 2,000 individual household wells and no government regulation. For Hull officials to determine the quality of over 2000 wells is a challenging undertaking. Following inquiries from Hull citizens, the Hull Board of Supervisors in May 2011 created the Water Study Task Force assisted by local experts to determine the quality and quantity of Hull water. The Hull effort is unique among towns in Wisconsin.

This report summarizes groundwater quantity and quality data from multiple sources over 30 years, seldom with coordination of location or frequency. Little regular monitoring has been conducted in the town, so comprehensive water quality information is limited.

Four study areas in the Town of Hull were determined based on geographic and land use considerations. Each area was then assessed for quantity and quality issues. The southeast area was found to have the greatest quality concerns. Many wells in this area are located downgradient from agricultural land, which affects the groundwater quality. Residences in this area are primarily located on lots of less than one acre. Smaller lot sizes and many septic systems close together likely impact the groundwater quality. Half of the samples analyzed from 2000-2010 had nitrate concentrations of 9.4 mg/L or greater, and the highest concentration in this area was 38.5 mg/L, almost four times the drinking water standard of 10 mg/L. This area also had the greatest concentrations of triazine herbicides in the town.

Groundwater concerns and diminished water quality, however, are not limited to the southeast sector. The northeast and central sectors also have wells whose water exceeds the drinking water standard for nitrate. From 2000 to 2010, nitrate concentrations were as high as 17.3 and 13.8 mg/L, respectively, though most samples from these areas had less than 5 mg/L. Many of the smaller lots in the northeast area have tested above the drinking water standard for nitrate. The central area has many lots four acres or larger. A subdivision in the central sector with smaller lots has wells whose water has tested above the drinking water standard for nitrate. While none of the homeowner water samples in the northwest area exceeded the drinking water standard for nitrate from 2000 to 2010,

well water from a public water supply well has tested near or above 10 mg/L several times since 1994. Most residential lots in this area are four acres or larger.

Studies have indicated that uranium may be found in bedrock geology. Uranium in drinking water can be carried through the bloodstream and damage the kidneys. The drinking water standard for uranium is 30 µg/L (ppb). Limited analysis has been conducted in the Town of Hull for uranium; however, available results range from 0.1 to 70 µg/L, indicating a need for further testing.

At this time, quantity of water does not appear to be a concern for any of the areas; however, installation of Well #11 by the City of Stevens Point has raised concern by some residents, particularly in the northeast area. In August 2010, a 72-hour pump test of Well 11 was conducted at a rate of 13 million gallons per day, though the associated treatment facility is only designed to accommodate 5 mgd at this time. This test showed minimal impact on groundwater quantity both at the well itself, and at the five on-site observational wells and three nearby City of Stevens Point monitoring wells.

The Hull Board of Supervisors took up the Water Study Task Force recommendations following review by the Hull Plan Commission. Hull Board recommendations include a public education initiative utilizing public media and direct communication to Hull households and additional testing of Hull's drinking water and what can be done to improve water quality. A monitoring program for Hull's four sectors will be established with particular attention to the southeast sector, where nitrate levels tend to be higher. Discussion will be initiated with Stevens Point to share data since water quantity is important to both the Town of Hull and the City of Stevens Point. Additional focus will be on areas in the Town of Hull near municipal Well #11. Finally, Hull will establish a management plan to collect data on a long-term, consistent basis and report those results to the Hull Town Board and Hull citizens at the town's annual meeting in April.

Town of Hull Water Study Task Force Report on Groundwater Quantity and Quality

Preface

Origin of Study - Background

The Hull Board of Supervisor's adopted village powers in July of 1967. With village powers, the Hull Town Board may act for "the health, safety, welfare and convenience of the public." Like clean air, uncontaminated drinking water is a major public health goal.

In May 2011, the Hull Board of Supervisors created the Water Study Task Force to examine the quality and quantity of groundwater in the Town of Hull. Recent events had sparked Hull interest in water issues. Hull officials were contacted by citizens about the quantity of Hull's water. That contact usually occurred when rainfall diminished, creating the appearance of a drought. Another factor which engaged Hull householder interest in water issues was Stevens Point's installation of Municipal Well #11, which created concerns among Hull residents nearby that their wells would be drawn down by the pumping action of the new city well.

Hull officials have limited knowledge of Hull's overall water situation. Residents of Hull rely on private wells for their household water. While there has been some recorded individual testing of homeowners' wells over the years and a recent study by Stevens Point of water levels during the installation of Well #11, there has never been a systematic, comprehensive and ongoing evaluation of drinking water resources in the town.

Public awareness of the value of water resources has grown in Wisconsin and the United States. Public awareness in Wisconsin has been heightened by the efforts of the City of Waukesha to obtain Lake Michigan water because of contaminated municipal wells. Some suburban towns near Green Bay have also struggled to obtain Lake Michigan water because of contaminated municipal wells. The Town of Ledgeview has two water systems: a sanitary public district and private household wells. The sanitary district wells became contaminated with arsenic and radon. They now get water via Manitowoc from Lake Michigan 35 miles away. Closer to home in Central Wisconsin, the City of Abbotsford explored the piping of water from Wausau 30 miles away because of increased demand for water. Eventually, they drilled 12 new wells which, despite federal/state aid, resulted in a water rate increase for each household of 55%. Conversations about water availability occurred earlier in the Western United States, particularly regarding the distribution of Colorado River water to agricultural lands and communities.

Perhaps the most telling indications of the importance of water for Wisconsin and other states bordering the Great Lakes are the restrictions placed by state governments on providing water to communities outside the Great Lakes Basin. The water issue has come home, and as Hull officials, we need to understand and evaluate our water resources. In Wisconsin and in our nation, water is no longer being taken for granted.

Acknowledgement /A Special Thank You

This report would not have been possible without the assistance of Dr. Paul McGinley, Associate Professor at the University of Wisconsin – Stevens Point (UWSP) College of Natural Resources; Ray Schmidt, Water Quality Specialist with the Portage County Planning and Zoning Department; and Bill DeVita, Water Quality Manager at the UWSP Water Testing Lab. Their scientific and technical knowledge and the water data they provided are the underpinnings of this report. Their expertise was crucial to understanding the water situation in the Town of Hull. Amy Nitka, a graduate student at the UWSP College of Natural Resources wrote almost all of this report. If Amy had not put the data into narrative form, this report would not have been possible. Thanks also to Patty Amman, clerical assistant at the Town of Hull, for researching and organizing the information, as well as following up with the various contacts not only in the Stevens Point area but elsewhere in Wisconsin. Finally, a thank you to the Hull citizens comprising the Water Study Task Force for attending the meetings and asking important questions about the quality and quantity of Hull water (see list on the Acknowledgements page of the report). Seven meetings were held by the Task Force. They are all to be commended for their invaluable assistance.

Special Consideration

a. Study Limitation

This investigation was not a scientific, academic study based on control groups, etc. Rather, it was an empirical study based on data collected over time. It gives us a general impression of the water quality and quantity in the Town of Hull.

b. Uniqueness of Study Investigation

As far as Hull officials know from discussions with town officials in other communities and state officials, the Hull effort is the first of its kind to evaluate, understand and plan to preserve its private, household water supply.

c. Legal Responsibility, the Town, the Homeowner

Public municipal wells such as those in Stevens Points are required to meet water quality standards set by the Wisconsin Dept. of Natural Resources. Private household wells, on the other hand, like those in the Town of Hull are unregulated. Each household is responsible for determining the quality of their water using health standards set by the Federal Environmental Protection Agency and/or the state Department of Natural Resources.

d. Selling a House – Clean Water Requirements

When a householder sells a house, there is typically an Offer to Purchase written, usually by a Wisconsin licensed realtor. Realtors use a provision of the Offer to Purchase to require drinking water to be tested for quality. Also, financial institutions require a water test prior to extending a loan, particularly if it is federal or state funded or insured. Finally, buyers often require water testing before purchase, usually paid for by the seller.

Purpose

The purpose of the Water Study Task Force is to review the existing data on water quality and quantity in the Town of Hull and make recommendations to the Hull Board of Supervisors for future action to preserve safe, clean and plentiful drinking water.

Introduction to Water Resources in the Town of Hull

Groundwater is the source of water in the Town of Hull. It is water that fills all the open spaces between the sand grains, gravel or rock below the water table. Residents in the Town of Hull use wells to access this water. Their wells may be driven as shallow sand points, or drilled deeper into the sand or bedrock. [Figure 1](#) shows the construction and plumbing connection of two typical wells: one in a sand and gravel aquifer, and the other in bedrock. If the groundwater elevation is shallow (less than 28 feet), the pump may be located inside a basement, or if the well is a deeper, larger diameter drilled well, the pump may be submersed in the water.

Water enters and leaves groundwater in the Town of Hull as part of the hydrologic cycle. Rain and melting snow percolate vertically through the soil to the water table, the point where water saturates the geologic material ([Figure 2](#)). Once in the groundwater, this water flows generally horizontally towards the Plover River or Haymeadow Creek. These drain to the Wisconsin River. That water is replaced by new water entering in as rain and melting snow. [Figure 3](#) shows a cross-section view of the surface, groundwater and bedrock elevations, in feet above sea level. This figure illustrates some areas where the bedrock is at a higher elevation than the groundwater.

The addition of water from precipitation, also known as recharge, and the loss of water by draining to streams result in a groundwater flow system in the town where the groundwater is always moving. In the Town of Hull, groundwater moves approximately one to three feet per day. The direction of this flow can be estimated from a contour map of the groundwater elevations. [Figure 4](#) shows the elevation of the water table in the town as lines of equal water table elevation or water table contours. This map was created from measurements made during well installation and at monitoring wells. The groundwater flow direction is perpendicular to the contour lines. This map shows that groundwater flow is towards the streams.

Water Quantity in the Town of Hull

The groundwater level changes in response to the amount of precipitation that enters and the amount of groundwater that is removed by either pumping or surface water drainage. As a result, the groundwater level is expected to vary somewhat over time. For example, if there was less water entering from rain or snow, then the water level would decrease. Similarly, if more water enters during a wet year, the groundwater level would be expected to increase. Regular measurements of the groundwater at several wells show the variation in water table surface. [Figure 4](#) shows location of several of the monitoring wells, and [Figure 5](#) illustrates the changes in depth to water in these wells over time. The depth to water increases in drier periods and decreases in wetter periods. Measurements at these wells are only available since the late 1980s, and they do not include the very dry late 1950s and late 1960s.

The amount of water that enters the Town in groundwater can be estimated. On average, the Town receives approximately 32 inches of precipitation per year. Of that, 10 inches will recharge groundwater and the remaining runs off to surface water bodies, evaporates, or is used by plants. Given that the Township has a land area of 20 square miles (not including wetlands), annual groundwater recharge is approximately 3.5 billion gallons.

Figure 4. Water table map for the Town of Hull, indicating four monitoring wells maintained by the City of Stevens Point

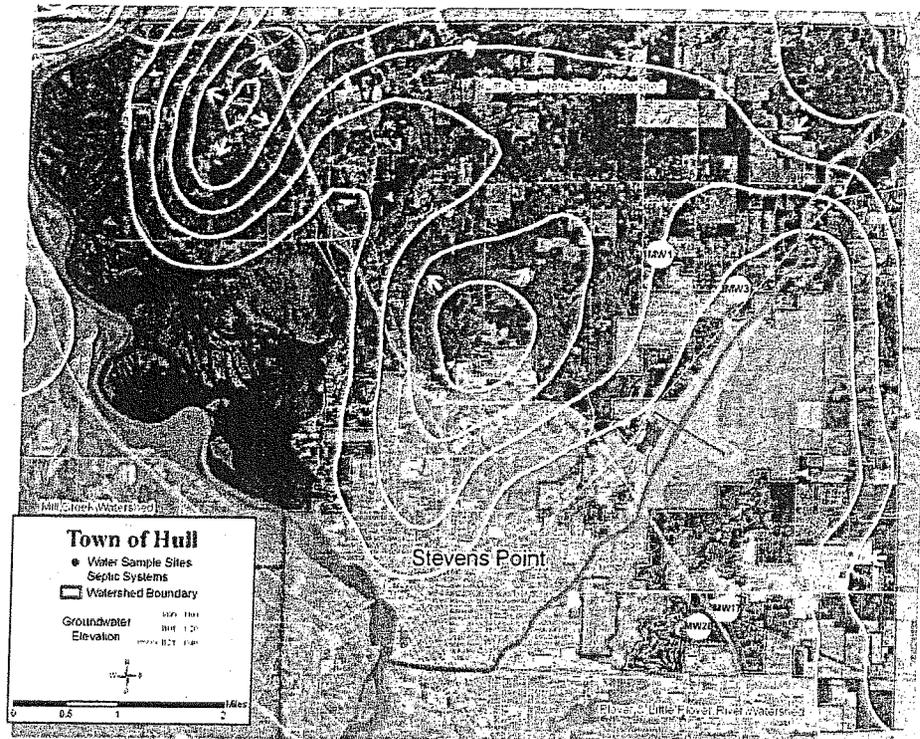
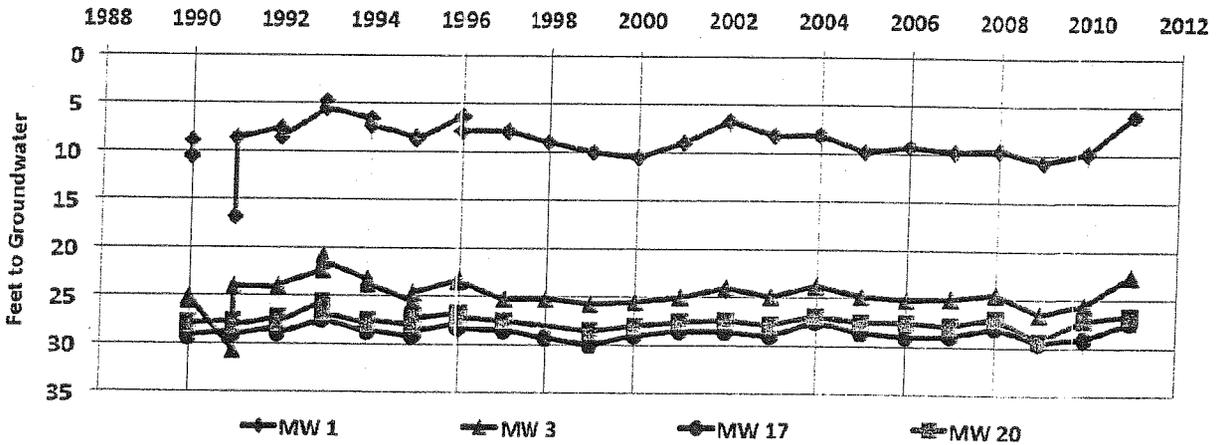


Figure 5 - The depth to water of four wells from 1990 to 2011
 MW 1 and MW 3 are in the northeast sector of Hull; MW 17 and MW 20 are in the southeast.



The amount of water used in the Town of Hull is not measured directly, but it can be estimated. The average person uses 55 gallons of water per day (WI DNR, 2006). The average household in the Town of Hull has 3.1 people, so the average use is 170.5 gallons of water per household per day. The 2010 census, lists the population as 5,346. At 55 gallons per person per day that equals 294,030 gallons of water per day or 107 million gallons of water each year. Currently, septic system drainfields return most of the household water to the aquifer. However, if water is removed from the ground and not returned, the level of the water table could be lowered.

Quantity was a concern for the town with the installment of Well #11. On August 16, 2010, a 72-hour test pump of the well began. The well was pumped at a rate of 10,000 gallons per minute or 13 million gallons per day (mgd). While this well was designed to pump at this maximum rate, the associated treatment facility is only designed to accommodate 5 mgd at this time. Water levels were monitored at Well #11 as well as five on-site observation wells and three City of Stevens Point monitoring wells. **Figure 6** shows the **estimated** drawdown when pumped at 5 mgd. **Figure 7** shows the **actual** drawdown from the 13 mgd test pump. The radius of the inner ring is 340 feet, the middle ring is 830 feet, and the outer ring is 1,400 feet from Well 11. If this test is an accurate reflection, water quantity should not become an issue in this specific area of Hull due to Well #11.

Figure 6. *The estimated drawdown effect prior to any actual pumping of Well #11 when pumping at 5 mgd – this is only an estimate, not an actual pump test.*

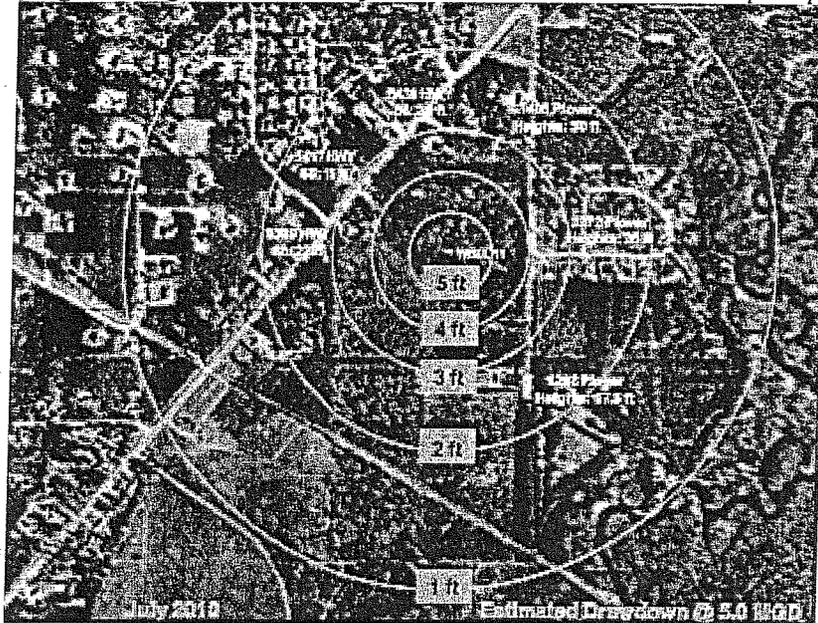
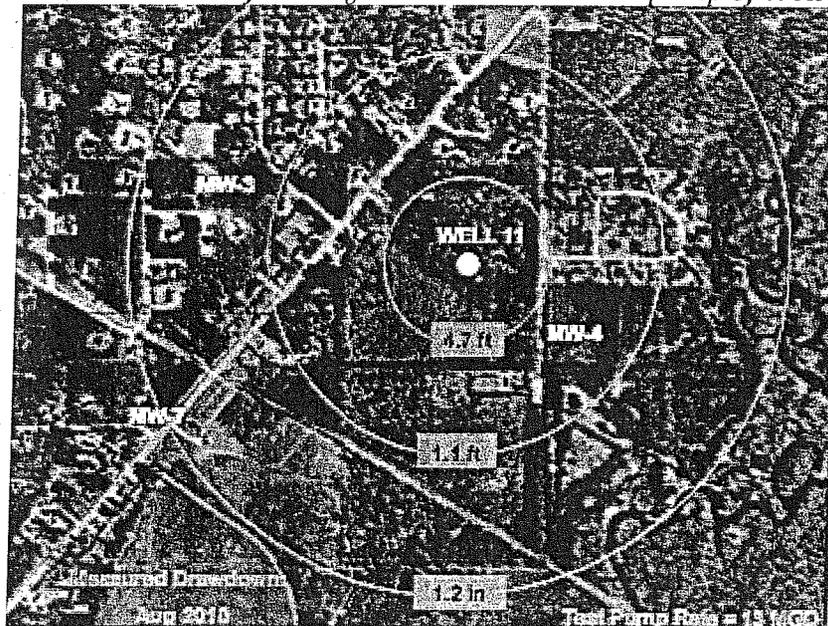


Figure 7. *The actual results of the August 2010 72-hour test pump of Well #11 at 13 mgd*



Findings / Summary / Conclusions

1. From the data in this report, there is no evidence that Hull has a water quantity shortage. Though the water level may fluctuate over time, it has remained remarkably consistent.
2. From the data it was found that, in general, the drinking water quality in Hull is safe. However, in the Southeast sector of Hull, nitrate levels in some household wells are higher than the recommended levels for health standards. That area should be periodically monitored and evaluated over an extended period.
3. Groundwater is always moving, and the direction of groundwater flow influences the type of contamination found in a well and may be a source of nitrate contamination.
4. Septic systems return most of the water to the aquifer.
5. Understanding water quality requires an understanding of both what is in the water and the health effects of any contaminants. Water appearance may not necessarily reflect water quality.
6. Primary drinking water standards are health based. Secondary drinking water standards are established as guidelines for esthetics.
7. Public water systems are required to meet the primary drinking water standards.
8. Private wells do not have mandatory standards. Drinking water standards serve as guidelines for private household wells.
9. Treatment of groundwater is specific to the type of contaminant.

Recommendations

- A. Use an intergovernmental approach in the future to determine water quality and quantity. Utilize as much as possible county and city monitoring wells to determine from regular testing the water quality and quantity in Hull and contiguous areas.
- B. Contact selected residents in Hull's southeast sector, soliciting interest in testing their private well every 15 months or a set timeframe. Hull may form a small citizen advisory group regarding this sector. The testing cost would be subsidized partly by Hull in exchange for the test results being available to Hull. Confidentiality and use of data will be explained to participants before implementation.
- C. In the other three sectors (northwest, central and northeast), solicit volunteers for longer term testing of private wells, perhaps every two or three years, with results to be shared with Hull officials. Confidentiality will be clarified.
- D. Share information through Hull's newsletter, website, etc. with Hull residents about the possibility of nitrate and other contaminants in certain areas of Hull. Also share information on the health effects of contaminants, including safety levels and recommended corrective measures.
- E. Recommend authoritative sources or experts that residents can go to for advice on dealing with specific water contamination issues.
- F. Advise residents of the potential dangers of lawn chemicals/pesticides and their effect on drinking water quality.
- G. Explore the possible limiting of future subdivision lots to a minimum of two (or more?) acres per family to improve septic system dispersion.
- H. Correct the level of uranium in the drinking water at the Hull Municipal Building.
- I. Create a central location in Hull government for data obtained through monitoring efforts, and assign that responsibility to a Hull staff member.
- J. Develop communications with individual householders surrounding Stevens Point Municipal Well #11 to share information and invite feedback on the status of their private household wells.
- K. Develop a system to measure the quantity of water in Hull.
- L. Explore the development of a Wellhead Protection Ordinance for the Town of Hull.