A PROGRESSIVE MODEL FOR SEPTIC REGULATION
Christopher W. LeClair

ABSTRACT
Washington County is the easternmost county in the Twin Cities metropolitan area of Minnesota. The unique geology of Washington County and the importance placed on protection of groundwater and surface water by our residents makes progressive regulation of septic systems a necessity.

Washington County’s Septic Program began in 1972. Initially, the County conducted thorough inspections of subsurface sewage treatment systems (SSTS) installations and had an ordinance that is more restrictive than Minnesota’s state regulations. Over the years the program has evolved to also include compliance inspection requirements and tracking, maintenance tracking and reminders, and the use of the latest technology that is available. The County also launched a loan program in 2014 that allows homeowners that have been ordered to replace their septic system the funds to replace their system. The County pays for the system and then the homeowner pays that money back to the County through their property taxes over 3, 5 or 10 years.

Technology is relied upon heavily in the septic system program at Washington County. The use of ArcGIS in the office, and the use of Trimble GeoXT GPS units along with ArcPad for field collection of data are all used on a daily basis for the management of data associated with our program. In 2015, Washington County’s septic system program went 100% electronic by developing a robust internet based permitting and inspection program. Permit applications and payments are accepted online, permit tracking by the applicant and contractors, inspections and inspection reports, pumping reporting, compliance inspection submittals and tracking, and operating permits can all be done online anywhere in the world with any device. This new system makes data management, data mining and the overall process much more efficient to both the homeowner and the county.

PART 1. GEOGRAPHY AND GEOLOGY OF WASHINGTON COUNTY

GEOGRAPHY
Washington County is the easternmost county of the Minneapolis/St. Paul Twin Cities Metropolitan Area and is home to over 243,000 people. Although Washington County is home to a few suburban cities, the County is dominated by a rural and agricultural community, with over 50% of the land use being undeveloped or used for farming and over 80% of the land area not served by municipal sewer.

Washington County’s landscape boasts over 25,000 acres of surface water, including popular fishing and recreation lakes such as Forest Lake, Big Marine Lake and White Bear Lake, and two major rivers, the St. Croix River which divides much of Minnesota and Wisconsin, and the Mississippi River.

GEOLOGY OF WASHINGTON COUNTY
Christopher W. LeClair, REHS, 651-430-4052, Chris.LeClair@co.washington.mn.us
Minnesota’s landscape is dominated by glacial activity during the Quaternary Period (approximately 2 million years ago to present). The Quaternary is divided into two Epochs: the Pleistocene (2 million years ago to 10,000 years ago); and, the Holocene (10,000 years ago to present). During the Pleistocene, also called the “Ice Age”, North America was covered by the Laurentide Ice Sheet. Glaciers during this time period originated from the Keewatin ice sheet northwest of Minnesota and the Labradorian ice sheet in northeastern Canada. (Gary N. Meyer, 1990)

Washington County surficial geology is unique from the rest of Minnesota, in that there are three distinct glacial deposits from multiple glacial periods from 300,000 to 11,000 years ago that make up the county’s surficial geology.

The southeast part of the County has patches of glacial till and outwash of Pre-Illinoian and Illinoian Keewatin deposits from glacial activity 130,000 years ago to over 300,000 years ago. Much of this ancient material has been overridden by loess deposits from more recent glacial events. Deep, well defined ravines and Paleozoic bedrock, such as Prairie du-Chien limestone and Jordan sandstone, close to the surface dominate the landscape in this section of the County.

During the Wisconsin Age, which began 75,000 years ago, Minnesota saw the advance and retreat of multiple glacial lobes-large tongue like ice sheets-the Wadena lobe, the Rainy lobe, the Superior lobe, and the Des Moines lobe. The middle half of Washington County is dominated by topography left behind by the St. Croix moraine, the front edge of the Superior lobe, which originated from the Labradorian ice sheet in northeastern Canada. Distinct red glacial till, outwash and ice-walled lake plains dominate the landscape through much of the county. Glacial material from the Superior lobe material is distinctly red in color, making the identification of redoximorphic features in the soil challenging.

After the retreat of the Superior lobe glacier, Minnesota saw the advance of the Des Moines lobe glacier 11,000 to 14,000 years ago. The Des Moines lobe originated from the Keewatin ice center in in northwest Canada. The Grantsburg sublobe advanced northeast through the northwest corner of Washington County and overrode material left behind by the St. Croix Moraine.

The remaining landscape in Washington County is alluvial deposits left behind by both the St. Croix River and the Mississippi River, which are both still present today.
Figure 2. Surficial Geology of Washington County
GROUNDWATER IMPORTANCE

Groundwater is the most important natural resource to Washington County residents, providing high quality drinking water, healthy streams and lakes. Groundwater provides 100% of the drinking water to Washington County residents. (Stephanie Grayzeck-Souter, 2014) Recognizing the importance of protecting and preserving this resource, Washington County is currently the only metro county that utilizes groundwater planning authority granted under Minnesota State Statute 103B.255, initially adopting a groundwater plan in 2003. In 2014 the County Board adopted an updated groundwater plan after a thorough stakeholder process. The Plan provides a countywide framework, issues, policies and strategies to address existing and future groundwater issues – related to both groundwater quality and groundwater quantity. The proper design, installation, maintenance, and operation of septic systems have been identified in the County’s Groundwater Plan as a method and strategy to protect the County’s water resources. The Groundwater Plan also directs the County to develop a county wide assessment that utilizes geologic data, nitrate testing/mapping, housing stock data, and a community approach to determine risk levels of existing systems throughout the County, and identify possible areas of concern for failing septic systems. This data will then be used to set up targeted inventory in areas of concern for failing septic systems. (Stephanie Grayzeck-Souter, 2014)

PART 2. HISTORY OF SEPTIC PROGRAM IN WASHINGTON COUNTY

Washington County’s septic program began on July 6, 1972 with the adoption of Washington County Ordinance #4, the Sanitary Sewer Disposal Ordinance. Since 1972, there have been eight ordinance revisions, 13 County inspectors, Federal 201 dollars used to replace systems, and the eventual assumption of all permitting and inspection duties for all municipalities in the County, save one, the City of Dellwood. The County’s septic program started in the planning department and eventually moved to the County Department Public Health and Environment in 1992, where it has resided since.

Currently, the County has three SSTS professionals. Two of the three inspectors are certified as Advanced Inspectors. On average per year, the County issues 260 septic installation permits, receives compliance inspection reports on 260 existing systems, and tracks the maintenance on over 3,700 septic systems per year.

PART 3. CURRENT REGULATION PRACTICES

Given the unique geology and the importance placed on groundwater protection in Washington County, the regulation of septic system design, installation, maintenance and operation is, and has been, very robust and progressive. Four areas of interest will be discussed in this paper: soil verification prior to permit issuance; compliance inspection review; tracking of maintenance; and, the County’s new low interest loan program.

SOIL VERIFICATION PRIOR TO PERMIT ISSUANCE

The County will issue a permit for a new septic system only after County staff conducts their own soil observation to verify that the proposed system will have adequate vertical separation to provide treatment. Staff review of historical permit records revealed that this practice has been in place at the County since somewhere between 1977 and 1985. This practice evolved over the years to include detailed soil observation logs just like the soil observation logs (Figure 3) required
to be submitted with a design for a permit. GPS coordinates, accurate to sub-meter, are included on the soil observation log. It is currently a requirement in the County’s SSTS ordinance. Section 8.1 of Chapter Four states:

*Inspections to determine compliance with this Chapter shall be performed by the Department or its authorized agent in the following circumstances:*

*(1) Site inspections to verify and evaluate soil and site conditions and to determine the suitability of soils and system design prior to permit issuance.*

Occasionally, County staff will make observations that differ from the soil observations made by the system designer. In these cases, staff will contact the system designer, tell them the soil observation staff made, how it differs. In most cases, the system designer and County staff will then meet on site together and conduct a join soil observation and determine if any changes to the system design are necessary.

![Soil Verification Log](image)

*Figure 3. Soil Verification Log for Permit Issuance*

**COMPLIANCE INSPECTIONS**

Since September, 2009, the County has required inspections of existing septic systems prior to sale of the property. The County’s approach to non-compliant septic systems is unique in the State of Minnesota. In Minnesota, an existing system is deemed non-compliant if one of two conditions exists. First, a system is non-compliant and *failing to protect groundwater*, more commonly
referred to simply as *failing*, if the soil treatment area does not have a minimum of 36 inches of vertical separation between the soil treatment area and any restriction. Second, a system is non-compliant and declared an *imminent threat to public health and safety (ITPHS)* if the system discharges sewage or sewage effluent to the ground surface, drainage systems, ditches, or storm water drains or directly to surface waters, or a system that causes reoccurring sewage backup into a dwelling or building.

If an inspection of an existing system finds the system to be non-compliant, the County issues orders for the system to be replaced within 90 days or six (6) months depending on if it’s an ITPHS or failing to protect groundwater, respectively. A system that is found to be an imminent threat to public health and safety (ITPHS) has dual orders; the first order gives the property owner ten (10) days to abate the public health nuisance condition that exists (surface discharge of septic tank effluent or sewage backing up into the building) via authority granted in Minnesota Statute 145A; the second order gives the property owner ninety (90) days to repair or replace the system. If an inspection of an existing system is found to be failing, the property owner is issued orders to replace the system within six (6) months. A one-time, six (6) month extension can be granted if the compliance date falls in the winter months, when the ground is frozen and the design and installation of a septic system is not allowed.

The County recognizes that not every system deemed failing by an inspector must be replaced if evidence exists to contradict the inspection that failed the system. The County’s septic ordinance states:

4.3(9) *An existing system that is not a cesspool, drywell, leaching pit or seepage pit, or not considered an imminent threat to public health and safety need not be upgraded, repaired, replaced, or its use discontinued notwithstanding the fact that at the time a compliance inspection, there appears to be less than the required vertical separation between the system bottom and any limiting layer if all of the following can be verified in the historical permit record:*

(A) Complete soil testing, including soil borings and percolation tests were conducted at the time of design and installation;

(B) The soil observations are consistent with the Soil Survey;

(C) The County verified that three feet of vertical separation existed at the time of installation by conducting verification soil observations and notes indicating such verification are present in the permit record;

(D) The system was installed in the proper location where complete soil testing and the County’s verification soil observation were conducted and approved; and,

(E) The system was installed at the maximum depth allowed by the permit.

If the Department receives a Compliance Inspection that indicates that, the system is failing to protect groundwater, is NOT an imminent threat to public health and safety, and was installed under a permit issued by the County, further investigation is warranted.

Since the County has been verifying soil conditions prior to permit issuance for decades, the historical permit record is identified and reviewed. If complete soil testing and verification observations by a County inspector are included in the permit record, the County will issue the property owner a letter stating the system does not have to be replaced.
If verification notes do not exist in the historical permit record, the County will conduct a site visit to conduct at least one soil observation. This soil observation will be compared to the soil observations conducted in the permit and the soil observations conducted during the compliance inspection. If the soil observation made by the County is consistent with the permit record, the property owner will receive a letter stating that the system does not have to be replaced. If the soil observations made the County are consistent with the compliance inspection, the property owner will be issued orders to replace the system within six (6) months.

Since January 1, 2009, the County has maintained a Microsoft Access database of all compliance inspections received. This allows the County to track compliance if orders have been issued, and occasionally analyze the data.

Figure 4. Number of Compliance Inspections of Existing Systems

Figure 4 shows that since January 1, 2009, the County has received 1,879 compliance inspections. Of those, 1,340 (71%) have been compliant, and 539 (29%) were found to be non-compliant as shown in Figure 5. Looking at the non-compliant inspections received in Figure 5, 431 (80%) have been non-compliant and issued orders to be replaced, and 108 (20%) have been non-compliant but allowed to remain in place. There are approximately 16,500 septic systems in Washington County. With over 10% of the septic systems that exist in Washington County having been inspected since 2009, the County can report that roughly 75% of the systems in the County are compliant.
Of the 431 non-compliant systems issued orders to be replaced, 268 have been replaced as shown in Figure 6. This is a 62% compliance rate. Efforts to allow the County to better track compliance are being developed in 2015.
Figure 7. Map of Compliance Inspections of Existing Systems
MAINTENANCE TRACKING

That State of Minnesota requires that maintenance of a septic system occur at a frequency of not less than 3 years. In 2000, the County developed a maintenance tracking database. When maintenance occurs on a septic tank, the licensed maintainer is required by ordinance to complete an SSTS Maintenance Report as shown in Figure 8. This report is then submitted to the County for data entry into the maintenance database.

![SSTS Maintenance Report](image)

Figure 8. Maintenance Report
This database allows the County to track maintenance. It also allows the County to send reminder cards as shown in Figure 9 to homeowners who are due for their 3 year maintenance of their septic system. Every six months, the County sends out approximately 2,000 reminder postcards.

![A Friendly Reminder to Pump Your Septic Tanks](image)

According to our records, your septic tank(s) may need to be pumped this year. Septic tanks are required to be pumped at least once every three years. Call a licensed Maintainer to set up a pumping appointment. After your system is pumped, the licensed Maintainer will provide a copy of the pumping report to the County along with the required $16.00 pumping report fee.

If your septic tank(s) was pumped in 2013, 2014 or 2015 and you received this notice in error, please call your Maintainer for a copy of the pumping report. Please contact the Department and fax (651-430-6730) us a copy of the report for our records.

If you need a list of licensed Maintainers in the County, please visit the Minnesota Pollution Control Agency’s SSTS Licensed Business database at http://www.pca.state.mn.us/programs/ists/search_SSTS.cfm?tab=business, or if you have any questions, please call our office at 651-430-6655.

Figure 9. Maintenance Reminder Postcard

Analyzing the data from the County’s Maintenance Database shows that 80% of the septic systems in Washington County have been properly maintained within the last 3 years. The remaining 20% varies in how much time has gone by since that last routine maintenance, as shown in Figure 10. The County does not have any maintenance data on only 3% of the systems in the County.
Figure 10. Compliance with 3 Year Maintenance Requirement

In 2015, the County revised its septic ordinance to require licensed maintainers to obtain a permit prior to performing maintenance. This provision will be implemented in 2016 along with the County’s new online septic permitting software.

SEPTIC LOAN AND GRANT PROGRAM

The Washington County Board of Commissioners challenged the Department in 2013 to develop financial assistance options for residents who have been ordered to replace their septic system. As a result, the county launched Washington County Low Interest Loan Program, which is described below.

Modeling the program after Carver County, a neighboring county in the Twin Cities, Washington County now assists property owners by offering low interest loans to replace non-compliant subsurface sewage treatment systems (SSTS) or “septic systems.” The loan program uses funds from the Minnesota Department of Agriculture (MDA)’s Agricultural Best Management Practice (AgBMP) Loan Program, which was enacted by the Minnesota State Legislature and is operated by the MDA. The purpose of the program is to enhance ground and surface water by providing loans to property owners for certain practices, including replacement of septic systems. Through this program, the County has become a “local lender” for the AgBMP Program, and partnered with the Washington County Housing and Redevelopment Authority (HRA) for administration of the program.

If a property owner is interested in participating in this program, an application must be submitted to the HRA. The HRA will determine if the applicant meets the financial qualifications and has the ability to repay the loan. If the applicant is qualified, the County will determine if the project meets the system criteria. The County will make the final decision regarding the details of the loan.
Applications are accepted on a rolling deadline and processed on a first-come, first-serve basis. Loans are made only so long as funding from the MDA program is available.

Loans to qualifying property owners must not to exceed $100,000, and are awarded with a five (5), eight (8) or ten (10) year payback period that is recovered as a special assessment on the property taxes. The interest rate varies based on the payback period, but per MDA requirements it will not exceed 3%.

Loan funds are available to any Washington County resident, landowner or business, defined as a “rural landowner” who owns/operates a septic system, lives outside of the statutorily defined Metropolitan Urban Service Area (MUSA), and has no option to connect to a city sewer system. Property taxes (including assessments and liens) and mortgage payments must be current.

For a septic system to qualify for this loan program, the system must be an imminent threat to public health and safety, discharge directly to surface water via tile line, pipe or direct runoff, is failing to protect groundwater, or the system age is greater than 15 years.

Funds are only available for septic system repair or replacement that will result in a water quality improvement. This excludes construction of a septic system for a new parcel and the expansion or upgrade of a compliant septic system due to the construction of additional living quarters or expanded use.

In 2014, eleven (11) loans totaling $162,047.60 were awarded to property owners to replace non-compliant septic systems. Using the Septic System Improvement Estimator developed by the University of Minnesota Onsite Sewage Treatment Program, the County estimates that 2,646 pounds of BOD$_5$, 1,462 pounds of TSS, $5.93 \times 10^{14}$ CFU of fecal coliform bacteria, 86 pounds of phosphorus and 219 pounds of nitrogen, have been prevented from entering the watershed as a result of these 11 property owners using this available loan program. So far in 2015, the county approved 8 loans.

In addition to the low interest loan program, the county provided several “SSTS fix up grant” to residents who meet low income requirements. These grants were made possible via State funding from the Clean Water Fund. The county awarded a total of 10 fix up grants since 2013.

PART 3, USE OF AVAILABLE TECHNOLOGY IN SEPTIC PROGRAM

The County has a history of using available technology to improve the decision making tools available while working through septic system permitting and inspections. ESRI’s ArcGIS is the County’s most utilized tool in the septic program. Staff uses ArcGIS daily to look up historical permit records. These records are hyperlinked using a shapefile, allowing staff to look physical features of a parcel, and sometimes even make regulatory decisions. The County’s three databases used in the septic program for maintenance records, compliance inspection records and active permits, are mapped every morning using a model in ArcGIS programmed by staff in the septic program. Figure 11 provides an example of how the County uses ArcGIS and maps its databases. The figure shows the City of Afton and all of the compliance inspections conducted in that municipality since January 1, 2009.
Figure 11. Example of Map Generated with Septic Data and ArcGIS
Since 2005, County septic staff has carried Trimble GeoXT’s in the field during inspection and soil observations to collect coordinates of pertinent data related to the installation of a septic system, as shown in Figure 12. These handheld GIS units use ESRI’s ArcPad to collect data accurate to within a meter. The types of data collected using the Trimbles include: designer soil observation locations, county staff verification soil observation location, well location, location of septic tanks and soil treatment areas. This data is checked out and checked back into a geodatabase on the County’s GIS server.

![Figure 12. GPS Points Collected during Permitting and Installation](image_url)
Today, the County is moving away from the use of the Trimble GeoXT’s and developing methods to use iPads in the field to collect coordinates. The same data will be collected.

In 2015, the County has been developing an online permitting, inspection, and data management system along with RT Vision out of Little Falls, Minnesota. This will allow County staff to conduct all necessary functions in the field using laptops, smartphones, and tablets. Permitting, inspections, soil observation data, and looking up historical permit records will be at the inspector’s fingertips. It will allow the County to better track non-compliant systems and increase compliance rates. In addition, the software will also allow SSTS contractors to apply for permits online, track the status of permits applied for, request inspections, and even allow the data entry of septic tank maintenance data right in the field. The licensed maintainer will purchase “keys” online via a laptop or smartphone/tablet and use those purchased keys while sitting in their truck after maintenance is performed. This online tool will be implemented in 2016 and will revolutionize how County staff, residents, and septic contractors conduct business in Washington County.

CONCLUSION

Washington County residents expect safe drinking water and clean lakes and streams for swimming and fishing. Effective regulation of septic systems through the proper design, installation, inspection, operation and maintenance of septic systems is one method to meet that expectation. A careful review of the soil and geology of each permit application assures that the proposed system will provide treatment of the effluent before it reaches drinking water aquifers. The careful and thoughtful consideration of existing systems that are potentially not providing treatment, while at the same time considering previous soil observations that were used to design that system allows the County to make reasonable and educated decisions so as to not place an unnecessary hardship on the property owner with unneeded upgrades and repairs. Tracking routine maintenance ensures that system longevity will be maximized. Providing financial options for residents eases the monetary burden of replacing a septic system. Finally, providing and using the latest technology available to assist the County in making decisions. All of these progressive activities in the County’s septic program ensure that Washington County residents’ expectations are met.

REFERENCES
