GROUND WATER POLLUTION POTENTIAL OF MEDINA COUNTY, OHIO

BY

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ABSTRACT

A ground water pollution potential mapping program for Ohio has been developed under the direction of the Division of Water, Ohio Department of Natural Resources, using the DRASTIC mapping process. The DRASTIC system consists of two major elements: the designation of mappable units, termed hydrogeologic settings, and the superposition of a relative rating system for pollution potential.

Hydrogeologic settings form the basis of the system and incorporate the major hydrogeologic factors that affect and control ground water movement and occurrence including depth to water, net recharge, aquifer media, soil media, topography, impact of the vadose zone media and hydraulic conductivity of the aquifer. These factors, which form the acronym DRASTIC, are incorporated into a relative ranking scheme that uses a combination of weights and ratings to produce a numerical value called the ground water pollution potential index. Hydrogeologic settings are combined with the pollution potential indexes to create units that can be graphically displayed on a map.

Medina county lies within the glaciated Allegheny Plateau Section of the Appalachian Plateau Physiographic Province (Fenneman, 1938). The county is covered by a variable thickness of glacial till, lacustrine deposits and outwash. These unconsolidated glacial deposits overlie Mississippian and Pennsylvanian aged sandstones and shales. Ground water yields are dependant on the type of aquifer and vary greatly throughout the county. Pollution potential indexes are relatively low to moderate in areas of till or lacustrine cover over bedrock. Buried valleys containing sand and gravel aquifers, and areas covered by outwash have moderate to high vulnerabilities to contamination.

Ground water pollution potential analysis in Medina County resulted in a map with symbols and colors which illustrate areas of varying ground water contamination vulnerability. Seven hydrogeologic settings were identified in Medina County with computed ground water pollution potential indexes ranging from 50 to 160.

The ground water pollution potential mapping program optimizes the use of existing data to rank areas with respect to relative vulnerability to contamination. The ground water pollution potential map of Medina County has been prepared to assist planners, managers, and local officials in evaluating the potential for contamination from various sources of pollution. This information can be used to help direct resources and land use activities to appropriate areas, or to assist in protection, monitoring and clean-up efforts.

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INTRODUCTION

The need for protection and management of ground water resources in Ohio has been clearly recognized. About 42 per cent of Ohio citizens rely on ground water for their drinking and household uses from both municipal and private wells. Industry and agriculture also utilize significant quantities of ground water for processing and irrigation. In Ohio, approximately 700,000 rural households depend on private wells; approximately 10,000 of these wells exist in Medina County.

The characteristics of the many aquifer systems in the state make ground water highly vulnerable to contamination. Measures to protect ground water from contamination usually cost less and impact ground water users less than clean up of a polluted aquifer does. Based on these concerns for protection of the resource, staff of the Division of Water conducted a review of various mapping strategies useful for identifying vulnerable aquifer areas. They placed particular emphasis on reviewing mapping systems that would assist in state and local protection and management programs. Based on these factors and the quantity and quality of available data on ground water resources, the DRASTIC mapping process (Aller et al., 1987) was selected for application in the program.

Considerable interest in the mapping program followed successful production of a demonstration county map and led to the inclusion of the program as a recommended initiative in the Ohio Ground Water Protection and Management Strategy (Ohio EPA, 1986). Based on this recommendation, the Ohio General Assembly funded the mapping program. A dedicated mapping unit has been established in the Division of Water, Ground Water Resources Section to implement the ground water pollution potential mapping program on a county-wide basis in Ohio.

The purpose of this report and map is to aid in the protection of our ground water resources. Ground water resource protection can be enhanced by understanding and implementing the results of this study which utilizes the DRASTIC system of evaluating an area's potential for ground-water pollution. The mapping program identifies areas that are more or less vulnerable to contamination and displays this information graphically on maps. The system was not designed or intended to replace site-specific investigations, but rather to be used as a planning and management tool. The results of the map and report can be combined with other information to assist in prioritizing local resources and in making land use decisions.

APPLICATIONS OF POLLUTION POTENTIAL MAPS

The pollution potential mapping program offers a wide variety of applications in many counties. The ground water pollution potential map of Medina County has been prepared to assist planners, managers, and state and local officials in evaluating the relative vulnerability of areas to ground-water contamination from various sources of pollution. This information can be used to help direct resources and land use activities to appropriate areas, or to assist in protection, monitoring and clean-up efforts.

An important application of the pollution potential maps for many areas will be to assist in county land use planning and allocating resource expenditures related to solid waste disposal. A county may use the map to help identify areas that are more or less suitable for land disposal activities. Once these areas have been identified, a county can collect more site-specific information and combine this with other local factors to determine site suitability.

Pollution potential maps may also be applied successfully where non-point source contamination is a concern. Non-point source contamination occurs where land use activities over large areas impact water quality. Maps providing information on relative vulnerability can be used to guide the selection and implementation of appropriate best management practices in different areas. Best management practices should be chosen based upon consideration of the chemical and physical processes that occur from the practice, and the effect these processes may have in areas of moderate to high vulnerability to contamination. For example, the use of agricultural best management practices that limit the infiltration of nitrates, or promote denitrification above the water table, would be beneficial to implement in areas of relatively high vulnerability to contamination.

A pollution potential map can also assist in developing ground-water protection strategies. By identifying areas more vulnerable to contamination, officials can direct resources to areas where special attention or protection efforts might be warranted. This information can be utilized effectively at the local level for integration into land use decisions and as an educational tool to promote public awareness of ground water resources. Pollution potential maps may also be used to prioritize ground water monitoring and/or contamination clean-up efforts. Areas that are identified as being vulnerable to contamination may benefit from increased ground water monitoring for pollutants or from additional efforts to clean up an aquifer.

Other beneficial uses of the pollution potential maps will be recognized by individuals in the county who are familiar with specific land use and management problems. Planning commissions and zoning boards can use these maps to help make informed decisions about the development of areas within their jurisdiction. Developments proposed to occur within ground-water sensitive areas may be required to show how ground water will be protected.

Regardless of the application, emphasis must be placed on the fact that the system is not designed to replace a site-specific investigation. The strength of the system lies in its ability to make a "first-cut approximation" by identifying areas that are vulnerable to contamination. Any potential applications of the system should also recognize the assumptions inherent in the system.

SUMMARY OF THE DRASTIC MAPPING PROCESS

The system chosen for implementation of a ground water pollution potential mapping program in Ohio, DRASTIC, was developed by the National Water Well Association for the United States Environmental Protection Agency. A detailed discussion of this system can be found in Aller et al., (1987).

The DRASTIC mapping system allows the pollution potential of any area to be evaluated systematically using existing information. The vulnerability of an area to contamination is a combination of hydrogeologic factors, anthropogenic influences and sources of contamination in any given area. The DRASTIC system focuses only on those hydrogeologic factors which influence ground water pollution potential. The system consists of two major elements: the designation of mappable units, termed hydrogeologic settings, and the superposition of a relative rating system to determine pollution potential.

The application of DRASTIC to an area requires the recognition of a set of assumptions made in the development of the system. DRASTIC evaluates the pollution potential of an area assuming a contaminant with the mobility of water, introduced at the surface, and flushed into the ground water by precipitation. Most important, DRASTIC cannot be applied to areas smaller than one-hundred acres in size, and is not intended or designed to replace site-specific investigations.

Hydrogeologic Settings and Factors

To facilitate the designation of mappable units, the DRASTIC system used the framework of an existing classification system developed by Heath (1984), which divides the United States into fifteen ground water regions based on the factors in a ground water system that affect occurrence and availability.

Within each major hydrogeologic region, smaller units representing specific hydrogeologic settings are identified. Hydrogeologic settings form the basis of the system and represent a composite description of the major geologic and hydrogeologic factors that control ground water movement into, through and out of an area. A hydrogeologic setting represents a mappable unit with common hydrogeologic characteristics, and, as a consequence, common vulnerability to contamination (Aller et al., 1987).

Figure 1 illustrates the format and description of a typical hydrogeologic setting found within Medina County. Inherent within each hydrogeologic setting are the physical characteristics which affect the ground water pollution potential. These characteristics or factors identified during the development of the DRASTIC system include:

D - Depth to Water

R - Net Recharge

A - Aquifer Media

S - Soil Media

T - Topography

I - Impact of the Vadose Zone Media

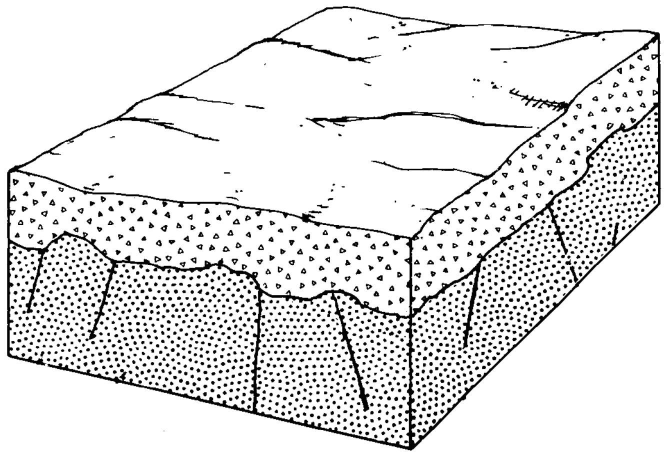
C - Conductivity (Hydraulic) of the Aquifer

These factors incorporate concepts and mechanisms such as attenuation, retardation and time or distance of travel of a contaminant with respect to the physical characteristics of the hydrogeologic setting. Broad consideration of these factors and mechanisms coupled with existing conditions in a setting provide a basis for determination of the area's relative vulnerability to contamination.

Depth to water is considered to be the depth from the ground surface to the water table in unconfined aquifer conditions or the depth to the top of the aquifer under confined aquifer conditions. The depth to water determines the distance a contaminant would have to travel before reaching the aquifer. The greater the distance the contaminant has to travel the greater the opportunity for attenuation to occur or restriction of movement by relatively impermeable layers.

Net recharge is the total amount of water reaching the land surface that infiltrates into the aquifer measured in inches per year. Recharge water is available to transport a contaminant from the surface into the aquifer and also affects the quantity of water available for dilution and dispersion of a contaminant. Factors to be included in the determination of net recharge include contributions due to infiltration of precipitation, in addition to infiltration from rivers, streams and lakes, irrigation and artificial recharge.

Aquifer media represents consolidated or unconsolidated rock material capable of yielding sufficient quantities of water for use. Aquifer media accounts for the various physical characteristics of the rock that provide mechanisms of attenuation, retardation and flow pathways that affect a contaminant reaching and moving through an aquifer.



7Ad Glacial Till Over Sandstone

This hydrogeologic setting is characterized by moderate to high relief. The topography varies from rolling hills to very prominent ridges, comprised of relatively flat-lying, resistant sandstones. The sandstones are generally fine-grained; their permeability largely reflects their highly-fractured nature and the frequency of bedding planes. Cemented conglomeratic zones are common in the Sharon Sandstone. The Sharon Sandstone creates the steep-sided ridges and ledges. In southern and eastern Medina County the Cuyahoga Formation is dominated by sandstones and sandy shales and is referred to by drillers as the "Big Injun Sandstone". The Berea Sandstone is usually encountered at depths over 100 feet, is confined, and is commonly contaminated by gas and brine. The sandstone is overlain by varying thicknesses of glacial till. The till is basically an unsorted deposit containing sand and gravel lenses. Although ground water occurs in both the glacial deposits and in the intersecting bedrock fractures, the bedrock is the principle aquifer. The glacial till serves as a source of recharge to the underlying bedrock. Although precipitation is abundant in most of the region, recharge is moderate due to the compactness of the overlying till and the high runoff associated with steep slopes. Depth is highly variable depending upon (1) which particular sandstone aquifer is being used, (2) whether the well is located along the crest of a ridge, or along the valley side, and (3) the thickness of the overlying glacial till. Depth to water is usually under 40 feet for the Cuyahoga and Sharon and is typically over 75 feet for the Berea.

Figure 1. Format and description of the hydrogeologic setting - 7Ad Glacial Till Over Sandstone.

Soil media refers to the upper six feet of the unsaturated zone that is characterized by significant biological activity. The type of soil media can influence the amount of recharge that can move through the soil column due to variations in soil permeability. Various soil types also have the ability to attenuate or retard a contaminant as it moves throughout the soil profile. Soil media is based on textural classifications of soils and considers relative thicknesses and attenuation characteristics of each profile within the soil.

Topography refers to the slope of the land expressed as percent slope. The amount of slope in an area affects the likelihood that a contaminant will run off from an area or be ponded and ultimately infiltrate into the subsurface. Topography also affects soil development and often can be used to help determine the direction and gradient of ground water flow under water table conditions.

The impact of the vadose zone media refers to the attenuation and retardation processes that can occur as a contaminant moves through the unsaturated zone above the aquifer. The vadose zone represents that area below the soil horizon and above the aquifer that is unsaturated or discontinuously saturated. Various attenuation, travel time and distance mechanisms related to the types of geologic materials present can affect the movement of contaminants in the vadose zone. Where an aquifer is unconfined, the vadose zone media represents the materials below the soil horizon and above the water table. Under confined aquifer conditions, the vadose zone is simply referred to as a confining layer. The presence of the confining layer in the unsaturated zone significantly impacts the pollution potential of the ground water in an area.

Hydraulic conductivity of an aquifer is a measure of the ability of the aquifer to transmit water, and is also related to ground water velocity and gradient. Hydraulic conductivity is dependent upon the amount and interconnectivity of void spaces and fractures within a consolidated or unconsolidated rock unit. Higher hydraulic conductivity typically corresponds to higher vulnerability to contamination. Hydraulic conductivity considers the capability for a contaminant that reaches an aquifer to be transported throughout that aquifer over time.

Weighting and Rating System

DRASTIC uses a numerical weighting and rating system that is combined with the DRASTIC factors to calculate a ground water pollution potential index or relative measure of vulnerability to contamination. The DRASTIC factors are weighted from 1 to 5 according to their relative importance to each other with regard to contamination potential (Table 1). Each factor is then divided into ranges or media types and assigned a rating from 1 to 10 based on their significance to pollution potential (Tables 2-8). The rating for each factor is selected based on available information and professional judgement. The selected rating for each factor is multiplied by the assigned weight for each factor. These numbers are summed to calculate the DRASTIC or pollution potential index.

Once a DRASTIC index has been calculated, it is possible to identify areas that are more likely to be susceptible to ground water contamination relative to other areas. The higher the DRASTIC index, the greater the vulnerability to contamination. The index generated provides only a relative evaluation tool and is not designed to produce absolute answers or to represent units of vulnerability. Pollution potential indexes of various settings should be compared to each other only with consideration of the factors that were evaluated in determining the vulnerability of the area.

Pesticide DRASTIC

A special version of DRASTIC was developed to be used where the application of pesticides is a concern. The weights assigned to the DRASTIC factors were changed to reflect the processes that affect pesticide movement into the subsurface with particular emphasis on soils. Where other agricultural practices, such as the application of fertilizers, are a concern, general DRASTIC should be used to evaluate relative vulnerability to contamination. The process for calculating the Pesticide DRASTIC index is identical to the process used for calculating the general DRASTIC index. However, general DRASTIC and Pesticide DRASTIC numbers should not be compared because the conceptual basis in factor weighting and evaluation differs significantly. Table 1 lists the weights used for general and pesticide DRASTIC.

TABLE 1. ASSIGNED WEIGHTS FOR DRASTIC FEATURES

Feature	General DRASTIC Weight	Pesticide DRASTIC Weight
Depth to Water	5	5
Net Recharge	4	4
Aquifer Media	3	3
Soil Media	2	5
Topography	1	3
Impact of the Vadose Zone Media	5	4
Hydraulic Conductivity of the Aquifer	3	2

TABLE 2. RANGES AND RATINGS FOR DEPTH TO WATER

DEPTH TO WATER (FEET)	
Range	Rating
0-5	10
5-15	9
15-30	7
30-50	5
50-75	3
75-100	2
100+	1
Weight: 5	Pesticide Weight: 5

TABLE 3. RANGES AND RATINGS FOR NET RECHARGE

NET RECHARGE (INCHES)	
Range	Rating
0-2	1
2-4	3
4-7	6
7-10	8
10+	9
Weight: 4	Pesticide Weight: 4

TABLE 4. RANGES AND RATINGS FOR AQUIFER MEDIA

AQUIFER MEDIA		
Range	Rating	Typical Rating
Massive Shale	1-3	2
Metamorphic/Igneous	2-5	3
Weathered Metamorphic / Igneous	3-5	4
Glacial Till	4-6	5
Bedded Sandstone, Limestone and Shale Sequences	5-9	6
Massive Sandstone	4-9	6
Massive Limestone	4-9	6
Sand and Gravel	4-9	8
Basalt	2-10	9
Karst Limestone	9-10	10
Weight: 3	Pesticide Weight: 3	

TABLE 5. RANGES AND RATINGS FOR SOIL MEDIA

SOIL MEDIA	
Range	Rating
Thin or Absent	10
Gravel	10
Sand	9
Peat	8
Shrinking and / or Aggregated Clay	7
Sandy Loam	6
Loam	5
Silty Loam	4
Clay Loam	3
Muck	2
Nonshrinking and Nonaggregated Clay	1
Weight: 2	Pesticide Weight: 5

TABLE 6. RANGES AND RATINGS FOR TOPOGRAPHY

TOPOGRAPHY (PERCENT SLOPE)	
Range	Rating
0-2	10
2-6	9
6-12	5
12-18	3
18+	1
Weight: 1	Pesticide Weight: 3

TABLE 7. RANGES AND RATINGS FOR IMPACT OF THE VADOSE ZONE MEDIA

IMPACT OF THE VADOSE ZONE MEDIA		
Range	Rating	Typical Rating
Confining Layer	1	1
Silt/Clay	2-6	3
Shale	2-5	3
LImestone	2-7	6
Sandstone	4-8	6
Bedded Limestone, Sandstone, Shale	4-8	6
Sand and Gravel with significant Silt and Clay	4-8	6
Metamorphic/Igneous	2-8	4
Sand and Gravel	6-9	8
Basalt	2-10	9
Karst Limestone	8-10	10
Weight: 5	Pesticide Weight: 4	

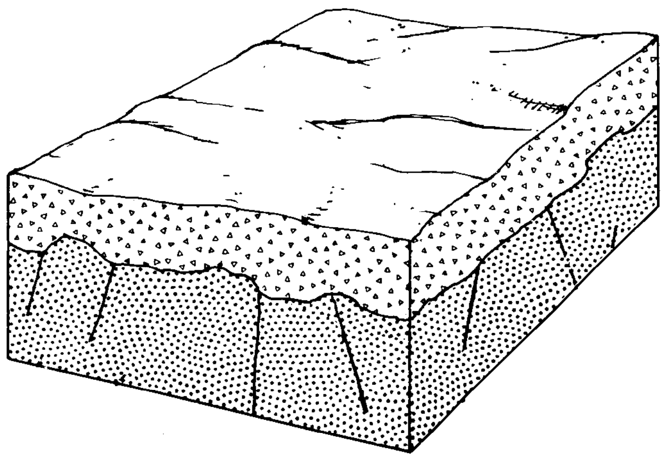
TABLE 8. RANGES AND RATINGS FOR HYDRAULIC CONDUCTIVITY

HYDRAULIC CONDUCTIVITY (GPD/FT^2)	
Range	Rating
1-100	1
100-300	2
300-700	4
700-1000	6
1000-2000	8
2000+	10
Weight: 3	Pesticide Weight: 2

Integration of Hydrogeologic Settings and DRASTIC Factors

Figure 2 illustrates the hydrogeologic setting 7Ad1, identified in mapping Medina County, and the pollution potential index calculated for the setting. Based on selected ratings for this setting, the pollution potential index is calculated to be 98. This numerical value has no intrinsic meaning, but can be readily compared to a value obtained for other settings in the county. DRASTIC indexes for typical hydrogeologic settings and values across the United States range from 65 to 223. The diversity of hydrogeologic conditions in Medina County produces settings with a wide range of vulnerability to ground water contamination. Calculated pollution potential indexes for the seven settings identified in the county range from 50 to 160.

Hydrogeologic settings identified in an area are combined with the pollution potential indexes to create units that can be graphically displayed on maps. Pollution potential mapping in Medina County resulted in a map with symbols and colors that illustrate areas of ground water vulnerability. The map describing the ground water pollution potential of Medina County is included with this report.



SETTING 7Ad1		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	NUMBER
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	Sandstone	3	4	12
Soil Media	Clay Loam	2	3	6
Topography	0-2%	1	10	10
Impact Vadose Zone	Sand & Gravel w/Sl & Cl	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		DRASTIC	INDEX	98

Figure 2. Description of the hydrogeologic setting - 7Ad1 Glacial Till Over Sandstone.

INTERPRETATION AND USE OF A GROUND WATER POLLUTION POTENTIAL MAP

The application of the DRASTIC system to evaluate an area's vulnerability to contamination produces hydrogeologic settings with corresponding pollution potential indexes. The higher the pollution potential index, the greater the susceptibility to contamination. This numeric value determined for one area can be compared to the pollution potential index calculated for another area.

The map accompanying this report displays both the hydrogeologic settings identified in the county and the associated pollution potential indexes calculated in those hydrogeologic settings. The symbols on the map represent the following information:

7Ad1 - defines the hydrogeologic region and setting
98 - defines the relative pollution potential

Here the first number (7) refers to the major hydrogeologic region and the upper and lower case letters (Ad) refer to a specific hydrogeologic setting. The following number (1) references a certain set of DRASTIC parameters that are unique to this setting and are described in the corresponding setting chart. The second number (98) is the calculated pollution potential index for this unique setting. The charts for each setting provide a reference to show how the pollution potential index was derived in an area.

The maps are color-coded using ranges depicted on the map legend. The color codes used are part of a national color-coding scheme developed to assist the user in gaining a general insight into the vulnerability of the ground water in the area. The color codes were chosen to represent the colors of the spectrum, with warm colors (red, orange, and yellow), representing areas of higher vulnerability (higher pollution potential indexes), and cool colors (greens, blues, and violet), representing areas of lower vulnerability to contamination.

The map also includes information on the locations of selected observation wells. Available information on these observation wells is referenced in Appendix A, Description of the Logic in Factor Selection. Large man-made features such as landfills, quarries or strip mines have also been marked on the map for reference.

GENERAL INFORMATION ABOUT MEDINA COUNTY

Medina County occupies an area of approximately 425 square miles in north central Ohio. It is bounded on the east by Summit County, to the north by Cuyahoga and Lorain Counties, to the west by Lorain and Ashland Counties and to the south by Wayne County. Figure 3 shows the location of Medina County.

The 1990 estimated population for Medina County was 122,354 (Ohio Department of Development, 1991). Brunswick, in northeastern Medina County, is the largest city followed by Medina, the county seat, then Wadsworth. The majority of the population is concentrated in the eastern half of the county. Cropland and pasture account for approximately 80% of the land use in Medina County and 10% of the county remains forested (Ohio Capability Analysis Program, (OCAP),1978). Remaining land usage is primarily a mixture of commercial and residential. This segment will probably experience the most rapid growth in the near future, particularly in the eastern portion of the county.

Physiography

Medina County lies within the glaciated Allegheny Plateau Section of the Appalachian Plateau Physiographic Province (Fenneman, 1938). The north western portion of the county is transitional with the Till Plains Section of the Central Lowlands Province. Unfortunately, a distinct boundary between the two sections is lacking in this part of Ohio (Totten, 1988).

The topography of Medina County, particularly the western half, is primarily glacial in origin. The underlying bedrock surface is relatively subdued and flat-lying and reflects the non-resistant nature of the shale bedrock. The present land surface of western and west-central Medina County is comprised of relatively flat to gently rolling ground moraine interspersed by more steeply-sloping end moraines. These moraines are linear ridges which tend to be hummocky in nature and represent thick deposits of till. Locally, these moraines tend to function as drainage divides between smaller stream systems. However, major stream valleys in this area tend to cut through these moraines. These larger valleys are relatively wide and flat-bottomed. In the vicinity of Medina, these moraines tend to coalesce or merge and individual ridges become harder to discern as the overall topography becomes steeper.

In the eastern portion of the county, steep, prominent ridges composed of the resistant Sharon Sandstone dominate the landscape. Total relief is greatest in the northeastern end of the county, and valleys tend to be considerably narrower than in the western or southern regions of the County.

Figure 3. Location of Medina County In Ohio

The Northeast Division of Ohio, which includes all of Medina County, has a fifty year (1931-1980) average annual precipitation of 36.97 inches (U.S. Department of Commerce, 1981). The average annual temperature for the same period was 49.7 degrees Fahrenheit (U.S. Department of Commerce, 1981). The U. S. Weather Bureau station at Chippewa Lake recorded a thirty year (1961-1990) average annual precipitation of 37.06 inches (U.S. Department of Commerce, 1992). Mean temperature for Chippewa Lake over the same thirty year period was 47.9 degrees Fahrenheit. The climate is typical for the Lake Erie region.

Modern Drainage

The southern margin of Medina County's moraine system roughly marks the drainage divide between the Lake Erie Basin and the Ohio River Valley (Totten, 1988). Much of western Medina County is drained by the northerly flowing East Branch Black River. Rocky River and its tributaries, Plum Creek and Mallet Creek, drain much of northeastern Medina County. Along the eastern margin of the county, Granger Ditch and Yellow Creek flow towards the Cuyahoga River. Streams in southeastern Medina County, namely Wolf Creek, River Styx, and Chippewa Creek, flow into the Tuscarawas River. In south central Medina County, Camel Creek and Killbuck Creek drain southwards into the Mohican River.

Pre-glacial Drainage

Pre-glacial drainage history and drainage during the earlier glacial events of Medina County are very complex and poorly understood (Totten, 1988 and Risser, 1987). The latest glacial event, the Wisconsinan, intensively modified and obscured previous drainage patterns. Stout et al. (1943) delineated two northerly flowing pre-glacial (Teays stage) streams draining Medina County: Olmstead Falls Creek in the center of the county and Oberlin Creek to the west. Evidence for most ancient drainage systems in Medina County comes primarily from depth to bedrock data taken from water well logs. Modern drainage patterns are largely the result of late Wisconsinan glacial activity.

Glacial Geology and Hydrogeology

During the Pleistocene Epoch (2 million to 10,000 years ago) at least four major episodes of glaciation, referred to as stages, occurred in north central North America. Each stage probably experienced numerous periods of advance and retreat referred to as sub-stages. Each of these sub-stages almost certainly brought complex changes to Medina County geology. Bedrock and previously deposited glacial material were eroded, drainage was altered, and layers of glacial till were deposited.

Till is an unconsolidated, poorly-sorted, non-stratified (layered) mixture of clay, silt, sand, and gravel directly deposited by ice. Actively moving ice deposits highly compacted (dense) lodgement till, whereas stagnated, non-moving ice deposits compacted ablation or melt-out till. The relatively flat-lying areas referred to as ground moraine usually indicate actively moving ice and lodgement till.

End moraines classically were thought of as representing a zone near the edge of a non-moving ice sheet where debris was moved in as on a conveyor belt and stacked up, creating a thick accumulation of till (Flint, 1971). An alternative hypothesis is that end moraines represent actively moving ice which encounters an obstacle such as a bedrock ridge (Clayton and Moran, 1974). This obstruction temporarily causes the ice to pile-up and a thicker accumulation of debris occurs. Subsequent glacial advances tend to pile up at this location as well; some advances may override the previous deposits and add to the thickness of moraines (Totten, 1969).

Extensive sand and gravel ice-contact deposits, referred to as kames and eskers, commonly occur near the ice margin. These features were created as melt water deposited sand and gravel in cavities, crevasses, or channels within the ice sheet. Melt water leading away from the ice sheet in major bedrock valleys often left extensive sand and gravel deposits commonly refered to as outwash valley trains. In low areas, such as in valleys or between end moraines, drainage may not have been as effective and fine-grained (silty to clay rich) lacustrine (lake) sediments were deposited. Uneven melting of the ice sheet during ablation left behind remnant blocks of ice in many areas. Further melting eventually left depressional areas called kettles, which became sites for bogs and ponds.

Evidence for the two earliest major glacial stages, the Nebraskan and Kansan (collectively referred to as the pre-Illinoian) is lacking or obscured in Medina County and throughout much of Ohio with the possible exception of the Cincinnati area (Norton et al, 1983). Evidence exists for the two later stages, the Illinoian, which occurred at least 120,000 years ago, and the Wisconsinan which occurred between 70,000 and 10,000 ago. The stratigraphic relation of the Pleistocene units in Medina County is given in Table 9.

The oldest till identified in Medina County is the dense, stony, silty to sandy Millbrook Till (White, 1982 and Totten, 1988). The Millbrook was classically regarded as being early Wisconsinan (Altonian sub-stage) in age (White, 1982). However, recent research (Eyles and Westgate, 1987) suggests that this ice sheet was not extensive enough to advance into the southern Great Lakes region during the early or middle (Farmdalian Sub-stage) Wisconsinan. The Millbrook, therefore, may conceivably be Illinoian in age, or perhaps lower members of the Millbrook are Illinoian while the upper members are Woodfordian (Totten, 1988).

Table 9. GENERALIZED PLEISTOCENE (GLACIAL) STRATIGRAPHY of MEDINA COUNTY,OHIO; (Modified from Totten, 1988)

EPOCH	STAGE		SUBSTAGE	UNIT OR INTERVAL
PLEISTOCENE	WISCONSINAN	Late	Woodfordian	Hiram Till Hayesville Till Navarre Till Millbrook Till (1)
		Middle	Farmdalian	stony paleosol ?
		Early	Altonian	Millbrook Till (1)
	SANGAMONIAN			unknown
	ILLINOIAN			Millbrook Till (1)
	pre-ILLINOIAN			not exposed

(1) Age of Millbrook Till is not as of yet determeined.

Overlying the Millbrook is the friable (loose), stony, sandy Navarre Till, which is definitely an early Woodfordian Till. It is the surficial till in extreme southeastern Medina County. The Navarre Till is typically a thin unit, and many of the outwash, kame, and kettle deposits are associated with the advance which deposited this till.

Overlying the Navarre Till are both the Hayesville Till and the Hiram Till. Both units are clay-rich, relatively non-stony, and are poorly compacted (Totten, 1988). These tills comprise the surficial cover over much of the county. The thickness of these units varies. The Hayesville and Hiram Tills tend to be thickest in the end moraines and are thinnest overlying bedrock highs. In many of the end moraines, the core or central interior is composed of Millbrook Till covered by a thick mantle of Hiram Till and Hayesville Till.

The tills in Medina County in general do not constitute an aquifer of regional importance. Locally, lenses of sand or gravel within or between till units comprise a limited local aquifer suitable only for supplying household water needs. Yields are usually under 5 gallons per minute. Fractures or joints in tills may allow water to move vertically, but horizontal movement is generally limited to contacts.

In contrast, the largest yielding aquifers in the county (Schmidt 1978; Simmers, 1985; Kesebir, 1986; Eshler, 1988) are found in the sand and gravel valley train (outwash) deposits and kame complexes. Yields of up to 1000 gallons per minute have been reported; however, more common ranges are between 20 to 25 gallons per minute and 100 to 200 gallons per minute depending upon the locality and depth (Schmidt, 1978).

Pleistocene Drainage and Buried Valleys

The present drainage systems in Medina County roughly correspond to Pleistocene (glacial) drainage-ways. The Bedrock Topography Map of Medina County (Risser, 1976a) and the Glacial Drift Thickness Map of Medina County (Risser, 1976b) as well as Totten's (1988) report, depict the configuration of the Pleistocene drainage systems in great detail. Ancient stream valleys in Medina County were typically eroded wider and deeper than modern valleys resulting from large volumes of meltwater flowing through them. These ancient valleys are now filled by a complex sequence of till, lacustrine clays and silts, and sands and gravels. The majority of the kame fields also overlie these buried (i.e. filled-in) valleys (Risser, 1981).

Glaciation has complex effects on drainages. Northerly flowing streams in Medina County were often blocked and filled in, primarily by till or fine lacustrine sediments. Southerly flowing streams became entrenched deeper and filled with outwash sands, gravels, and silts. These deposits are stratified (layered) and well sorted. Horizontal water movement through these deposits tends to be relatively rapid. The nature of these deposits is dependent upon the volume and velocity of water and the nature of the sediment load. When the rivers were flowing sluggishly, fines (silt and clay) were commonly deposited. Rapidly-flowing rivers with large volumes of water and sediment developed a braided stream pattern with numerous wide, interfingering channels. Coarse sands and gravels were deposited in this environment. Subsequent glacial advances often filled the remainder of the valley with dense till. In general, valleys in the southern part of the county contain a greater proportion of coarse materials and are a better water source than the valleys in northern Medina County.

Large lakes, primarily derived from kettles, occupied many of the ancient valleys. Three prominent examples of such lakes were ancestral Spencer Lake, Garden Isle Lake, and Chippewa Lake (Totten, 1988). As the lake eventually dried up, they became infilled with organic debris, forming huge muck- and peat- filled bogs.

Modern streams flowing in buried valleys are considered to be misfit, i.e. they are significantly smaller than the ancestral river which created the valley. The flow direction of the modern river may be reversed from that of its precursor. The modern stream may be well offset from the center of the buried valley. Some segments of buried valleys may lack overlying modern streams.

Another notable factor is that while buried valley aquifers often contain significant volumes of ground water, careful exploration may be necessary to discover and develop high-yielding formations. Such aquifers cannot simply be regarded as "buried rivers".

Bedrock Geology and Hydrogeology

Bedrock formations underlying Medina County are comprised of Mississippian and Pennsylvanian aged sandstones and shales (Table 10). The bedrock gently dips or slopes to the south or southeast. Individual formations tend to vary considerably both laterally and vertically. The stratigraphic relationship of the units and their characteristics are provided in Table 10.

The oldest and deepest unit utilized as an aquifer in Medina County is the Berea Sandstone (Rau, 1969; Kesebir, 1986; and Eshler, 1988). This unit does not crop out in Medina County; the Berea is at least 100 feet below the surface. The Berea is utilized as an aquifer only in the extreme northern portion of the county immediately adjacent to Lorain County (Barber, 1988) and Cuyahoga County (Winslow et al., 1953 and Barber, 1994).

Table 10. GENERALIZED BEDROCK STRATIGRAPHY of MEDINA COUNTY, OHIO: (Winslow et al., 1953)

SYSTEM	SERIES	GROUP	FORMATION	SIGNIFICANT MEMBERS OR BEDS	DESCRIPTION
PENNSYLVANIAN		POTTSVILLE	Massillon		Sandstone with alternating layers of shale, clay and coal
			Sharon Sandstone	Sharon Conglomerate	medimum- to fine-grained sandstone with cemented conglomeratic zones
MISSISSIPPIAN			Cuyahoga	Rittman Sandstone Meadville Shale Strongsville Shale Sharpsville Sandstone Orangeville Shale	Alternating, thin bedded fine-grained sandstones, sandy shales, siltstones, dark gray fissile shales. Shale dominates in west and north, sandstone dominates in south and east. Informally known as the "Big Injun".
			Berea Sandstone		Massive, crossbedded fine-grained sandstone.
			Bedford Shale	Cussewago Sandstone	Light gray to red, fissile silty shale, with zones of fine-grained sandstone.
DEVONIAN			Ohio Shale	Cleveland Shale Chagrin Shale Huron Shale	Massive, dark , bituminous shale, pyritic concretions common.

Moving southwards into Medina County, the Berea becomes prohibitively deep and is contaminated by brine, oil, or natural gas in many locales (Smith and White, 1953; Rau, 1969; and Kesebir, 1986).

The next oldest unit is the Cuyahoga Formation which is utilized as an aquifer throughout most of the county (Schmidt, 1978). More wells are developed in this unit than in any other formation within the county (Schmidt, 1978). The Cuyahoga is highly variable and is composed of alternating thin shales, sandy shales, siltstones, and sandstone. These sediments were deposited in a deltaic or quiet shoreline environment. Their variation largely reflects changes in water level or sedimentation rate at the time of deposition. West and north of the city of Medina, the Cuyahoga is predominantly shale in nature and is a relatively poor water source. Yields are low, usually less than three gallons per minute. Water is more likely to be found in the upper, weathered portion of the shale, along contacts, or in the vicinity of fractured areas. In portions of Litchfield, Chatham, Spencer, and Homer Townships, brine and natural gas have contaminated the Cuyahoga which is the primary aquifer in this area. This widespread contamination reflects the poor petroleum recovery practices of the 1930's and 1940's, particularly in the vicinity of Chatham (Kaser, 1942 and Schmidt, 1978).

To the south and east of the city of Medina, the Cuyahoga becomes much sandier in nature (Smith and White 1953; Simmers, 1985; and Eshler 1988). Table 10 subdivides the Cuyahoga formations into members. The Sharpsville Sandstone (Simmers, 1985) becomes the predominant member in southeastern Medina County, where it is referred to as the Sharpsville Siltstone (Kesebir, 1986) in Hinckley Township. The Rittman Sandstone is reported as capping the other Cuyahoga units in eastern Medina County (Kesebir, 1986). Drillers locally refer to the sandier portion of the Cuyahoga as the "Big Injun", a practice common throughout much of eastern and central Ohio (Majchszak, 1984). Yields in the sandy portion of the Cuyhahoga average between five and ten gallons per minute with a few wells obtaining twenty gallons per minute, presumably near the intersection of fractured zones. Cuyahoga sandstone and shale have limited exposure in Medina County and usually crop out near the base of deeper stream valleys.

Overlying the Cuyahoga Formation are units of the Pennsylvanian Pottsville Group. The Pottsville rocks are the youngest bedrock units in Medina County. In most of Medina County the basal Pottsville unit, the Sharon Sandstone (locally the Sharon Conglomerate) is the surficial unit and outcrops from Brunswick southeastwards to Wadsworth. This resistant unit, famous for its silica-cemented conglomeratic (pebbly) zones, forms very prominent, steep-sided ridges (Risser, 1987). Near Wadsworth, the Massillon or Connoquensessing Sandstone, (Sedam, 1973) overlies the Sharon and becomes the surficial unit. The Massillon contains thin shales and coals and tends to be fractured. The Sharon yields five to ten gallons per minute in northern Medina County; yields increase to fifteen to twenty gallons per minute southward. The Massillon has a range similar to the Sharon and averages about fifteen gallons per minute. In the extreme southeastern corner of Wadsworth Township, the Pottsville becomes somewhat more shaley and deep wells in the Cuyahoga are utilized.

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APPENDIX A

DESCRIPTION OF THE LOGIC IN FACTOR SELECTION

Depth to Water

This factor was primarily evaluated using information obtained from water well logs on file at the Ohio Department of Natural Resources, Division of Water. Approximately 11,000 water well logs are on file for Medina County. Water well contractors were contacted to help confirm general trends noted from water well logs. The Ground Water Resources Map of Medina County (Schmidt, 1978) and the studies of Simmers (1985), Kesebir (1986), Eshler (1988), and Iqbal (1989) provided useful information on depth to water.

For unconfined aquifers, the depth to water is considered to be the level of the potentiometric surface (i.e. - the static water level in the well), and is not necessarily the depth at which water was first encountered during drilling. Depth to water averaged between 15 and 50 feet for the majority of Medina County, particularly in the areas where the Cuyahoga is shaley. In stream valleys and over buried valleys, depth to water was typically less than 15 feet. Depths over 50 feet were generally limited to crests of major moraines in the central part of the county and the prominent sandstone ridges in eastern Medina County. Depths over fifty feet are associated with the Berea Sandstone, which has been inferred as representing a confined aquifer, in northern-most Medina County.

In regions where confining conditions exist, the depth to water was determined as being the distance from the ground surface to the top of the aquifer (or base of the confining layer). Locally, the Berea Sandstone is overlain by at least 50 feet of shale and an additional 50 feet of till. An unusually great depth to water is found in southeastern Wadsworth Township where the sandy Cuyahoga Formation is overlain by a shaley zone within the Pottsville.

Net Recharge

This factor was evaluated using many criteria, including depth to water, topography, soil type and annual precipitation values. Net recharge is the amount of water (precipitation) that infiltrates and replenishes the aquifer; most precipitation is lost to runoff and evapotranspiration. Precipitation averages approximately 36 inches per year for Medina; however, only about 15% is available for net recharge. Based on data from Lorain County (Barber, 1988) and Cuyahoga County (Barber, 1994) recharge generally ranges from two to four inches. This figure is realistic given the clay-rich nature of the glacial till throughout much of the county (Kesebir, 1986). Where the clay-rich till is thin or absent, the relief is commonly much greater and recharge remains relatively low (Kesebir, 1986).

Higher recharge rates are limited primarily to broad stream valleys, particularly those overlying buried valleys. In these flat-bottomed valleys, runoff is low, soils are permeable, and run-on from surrounding slopes is available. Recharge rates vary from four to seven inches per year. The bog areas which represented the ancient lakes have especially high recharge as the water table is always very high and the sediments are quite permeable in these areas.

Where the depth to water is great, and assuming the vadose zone is comprised of relatively impermeable shales, the recharge becomes low, averaging zero to two inches per year. Recharge is also low for the confined Berea Sandstone aquifer, because the confining layer acts as a major barrier to recharge.

Aquifer Media

In Medina County both consolidated (shale and sandstone) and unconsolidated (sand and gravel and till) aquifers are present. The primary source for determining the aquifer media were the water well logs on file at ODNR, Division of Water. Other important data sources included Schmidt (1978), Sedam (1973), Rau (1969), Eshler (1988), Simmers (1985), Kesebir (1986), White (1982) and Risser (1981; 1987).

In areas where two aquifers are present, the uppermost was evaluated. Generally the uppermost aquifer is the most readily contaminated, assuming that some degree of interconnection with underlying aquifers exsists which would serve as a conduit for contaminant migration. In areas where the uppermost aquifer is bedrock, wells are predominantly developed in this aquifer.

The hydrogeologic setting Glacial Till over Shale (7Ae) was utilized in much of northern and western Medina County. In these regions, the fine, shaley facies of the Cuyahoga predominates. Because of the tight, impermeable nature, low yield, and small storage of this unit, a rating of (2) was assigned. The upper weathered and fractured two to three feet of the shale is the most productive zone; additional depth to the well generally gives only increased storage.

There are numerous sandstone aquifers utilized in the hydrogeologic setting Glacial Till over Sandstone (7Ad). The Berea Sandstone and the sandy phase of the Cuyahoga ("Big Injun") have moderately low yields and are relatively fine-grained; hence they were given a rating of (4). It is worth noting that the Berea aquifers are very deep, confined, and limited to extreme northern Medina County and therefore can be differentiated from the similarly-rated Cuyahoga.

The Sharon Sandstone is coarse grained, contains permeable conglomeratic zones, and was given a rating of (5). The Massillon Sandstone is similar to the Sharon Sandstone, but is less uniform overall. Included with the Massillon are some highly-fractured, very permeable coal beds which contain larger quantities of water. The Massillon also contains some thin, shaley zones which restrict vertical water movement (Booth, 1988). These units, particularly the coal, are exclusive to the Wadsworth area, thus a separate hydrogeologic setting, Glacial Till over Bedded Sedimentary Rocks (7Aa) was utilized. This helped to differentiate the Massillon sandstone from the Sharon conglomerate. Thus a rating of (5) was assigned to the Massillon Sandstone.

While the majority of the domestic wells are developed in bedrock aquifers, sand and gravel deposits constitute significant local aquifers. High-yielding wells, suitable for commercial or municipal usage, are almost exclusively developed in sand and gravel. In the hydrogeologic setting Sand and Gravel Interbedded in Glacial Till (7Af), the sand and gravel deposits are probably limited to thin, discontinuous pockets or lenses. Wells developed in these deposits are limited to domestic use. This setting probably contains a few examples of wells being developed in till itself, presumably in fractured or sandier zones. This setting is limited to upland, non-valley areas that have a moderate cover (less than 50 feet) of till. In morainic areas, bedrock, not sand and gravel typically constitutes the aquifer, hence the Moraine (7C) setting was not utilized in Medina County. A rating of (5) was assigned to these thin sand and gravel lenses interbedded in till.

The high-yielding sand and gravel aquifers were limited to the Buried Valley (7D) hydrogeologic setting. These sands and gravels generally are much more extensive, continuous and thicker than the lenses found in till. These deposits tend to be relatively coarse and well-sorted and usually represent outwash or ice-contact (kame) deposits. They are almost always separated from similar surficial sand and gravel deposits to some degree by less permeable zones of glacial till or lacustrine silts and clays. Ratings ranged from (5-7) for sand and gravel aquifers in the Buried Valley (7D) setting. The (5) rating was utilized in the marginal ("flank") areas of the buried valleys, near the head of some buried valley systems, and in major sand and gravel infilled tributaries. The (6) rating was used for the majority of sands and gravels in the central (axis) region of the buried valleys. The (7) rating was used in limited regions with exceptionally high yields such as the Garden Isle and Chippewa Creek regions (Iqbal, 1989).

The (5) rating for sand and gravel was also used in the hydrogeologic setting Alluvium over Glacial Till (7Ec). In this setting, the sand and gravel lenses are overlain by glacial till and thin alluvium. This setting is limited to tributary valleys within buried valley systems.

Surficial outwash and Kame deposits are common in the vicinity of buried valleys in many locations such as the Seville area, Chippewa Creek, River Styx, and Granger Lake. These surficial deposits are generally not used as an aquifer. Well logs in these areas show wells penetrating till or clay and utilizing underlying sand and gravel aquifers. These aquifers are more relatable to the Buried valley systems than to the overlying outwash deposits hence the Buried Valley (7D) setting was used instead of the Outwash (7B) category.

Soil Media

This factor was primarily evaluated by using the Soil Survey for Medina County (Hayhurst et al., 1977). Information on every indicated soil type was evaluated and appropriate ratings were selected. Computer-generated maps derived from digitized data were supplied by the ODNR, Division of Soils and Water, Ohio Capability Analysis Program (OCAP). These maps were helpful in mapping soil parameters. The surficial materials maps of Groenewald (1974) and Risser (1981) were a useful secondary sources of soils information as were the theses of Simmers (1985), Kesebir (1986), and Eshler (1988).

The soils in Medina County have been greatly influenced by glaciation (Hayhurst et al., 1977; Totten, 1988). The soils developed on glacial drift reflect the variability of their parent materials. The steep sandstone ridges in the far eastern portion of the county represent the only soils derived from bedrock. Alluvial soils are derived from stream deposits associated with the floodplains of modern stream valleys. Table 11 lists the soil types encountered in Medina County and gives information on each soil's parent material or setting and the associated DRASTIC rating.

Clay loam soils dominate the upland areas of Medina County with the exception of the southeastern corner of the county. The Bennington-Cardington and Ellsworth-Mahoning clay loam soils reflect the clay rich Hayesville and Hiram Tills, respectively. The Rittman-Wadsworth soils remain clay rich, but also have a higher sand content. These soils are derived from Hayesville Till which contains a greater than usual percentage of sand. This sand was probably incorporated into the Hayesville Till as the ice overran and eroded the steep Sharon Sandstone ridges (Szabo and Angle, 1983; Totten, 1988). The sandiness allows for the formation of a fragipan layer within the Rittman-Wadsworth soils. A fragipan is a dense, impermeable zone found within certain till-derived soils. The overall effect is that while the texture of the soil is equivalent to a silt loam or a loam, the net permeability is reduced to the range of a clay loam (Aller et al., 1987); hence a rating of (3) was assigned to these soils.

Table 11. MEDINA COUNTY SOILS

Soil Name	Parent Material or Setting	DRASTIC Rating	Soil Media
Bennington	Till	3	clay loam
Bennington-Tiro	Till	3	clay loam
Berks	Shale	4	silty loam
Bogart (BtA)	Outwash, Kames	5	loam
Bogart (BtB)	Outwash, Kames	6	sandy loam
Candice	Lakebed	1	clay
Caneadea	Lakebed	1	clay
Canfield	Till	4*	silty loam
Cardington	Till	3	clay loam
Carlisle	Bog, Swamp	8	peat
Chagrin	Alluvium	4	silty loam
Chili (CnA, CnB)	Outwash, Kames	5	loam
Chili (CnC)	Outwash, Kames	6	sandy loam
Chili (CoC2, CoE2, CoF2)	Outwash, Kames	9	sand
Condit	Till	3	clay loam
Elsworth	Till	3	clay loam
Fitchville	Alluvium, Lakebed	4	silty loam
Geeburg	Lakebed	7	shrink/swell clay
Glenford	Lakebed	4	silty loam
Haskins	Till	3	clay loam
Holly	Alluvium	5	loam
Jimtown	Outwash	5	loam
Linwood	Bogs	4	silty loam
Lobdell	Alluvium	4	silty loam
Lorain	Lakebed	3	clayloam
Loudonville	Till Over Sandstone	4	silty loam
Luray	Lakebed	4	silty loam
Mahoning	Till	3	clay loam
Miner	Till	1	clay
Olmsted	Alluvium, Outwash	4	silty loam
Orrville	Alluvium	4	silty loam
Oshtemo	Outwash	6	sandy loam
Ravenna	Till	4*	silty loam
Rawson	Alluvium Over Till /Lakebed	3	clay loam
Rittman	Till	3*	clay loam
Schaffenaker	Sandstone Ledges	9	sand
Sebring (Sg)	Lakebed	4	silty loam
Sebring (St)	Till	3	clay loam
Wadsworth	Till	3*	clay loam
Wellkill	Alluvium, Lakebeds	3	clay loam
Wooster	Till	4*	silty loam

The Ravenna-Wooster Canfield soils in southeastern Medina County have a loamy to sandy loam texture and are presumably derived from either the Navarre or Millbrook Tills. The Ravenna-Wooster Canfield soils, as mapped by Hayhurst et. al., (1977) overlap the area mapped as the Hayesville Till by Risser (1987) and Totten (1988). The Hayesville Till, if present, is probably very thin and discontinuous (patchy) in this area, therefore the soils reflect the underlying loamier tills. The Ravenna-Wooster Canfield soils contain well-developed fragipans, hence they have been rated as a silt loam (4) although their texture ranges from a loam to a sandy loam.

Soil types in stream valleys can be complex. Modern alluvium is rated as a silt loam and is found in smaller valleys and wherever the modern floodplain overlies the larger (buried) valleys. Areas of outwash and Kames are variably rated as loams, sandy loams, or as sand.

Depressional areas and bogs also are variable. These areas typically have high water tables and are poorly drained. These areas typically have been rated as peat (8) due to the high organic content versus muck (2) which contains more inorganic fines. There are minor, circular depressional areas in both uplands and valleys which have been infilled by silty sandy clays and have been rated as (1). Expandable clays which have a high shrink/swell potential are confined to the Geeburg soil. Occurrences of this soil are limited to isolated lacustrine terraces along valley sides in northeastern Medina County.

Topography

Topography was analyzed by determining the percentage of slope obtained from USGS 7 1/2 minute quadrangle maps and from the Soil Survey of Medina County (Hayhurst et al., 1977). Computer-generated maps of topography defined as percent slope were prepared using digitized data on file at the ODNR, Division of Soil and Water Conservation, Ohio Capability Analysis Program (OCAP). Steeper slopes in Medina County are associated with sandstone ridges, margins of stream valleys, and end moraines.

Impact of the Vadose Zone Media

This factor was determined using information obtained from water well logs on file at ODNR, Division of Water, from Totten (1988), Risser (1981; 1987), White (1982), Smith and White (1953), Simmers (1985), Kesebir (1986), and Eshler (1988). The impact of the vadose zone material primarily reflects the nature and thickness of material between the bottom of the soil zone and the static water level (potentiometric surface). Emphasis is placed on the zone (unit) which will be the most effective in retarding or restricting downward movement of water. Fine-grained clays, silts, till and shale are the most effective materials in northern Ohio for impeding the flow of water.

In Medina County, till is almost always the primary unit in the vadose. While the nature of the till changes and is variable, the upper clay rich (Hiram and Hayesville) tills are relatively uniform and constitute a moderately effective barrier. In the southeastern part of the county, the Hiram Till and Hayesville Till become thin to absent. The underlying

Navarre Till and Millbrook Till generally contain more sand and gravel lenses and have more extensively developed fractures and have been given a rating of (5). Where sand and gravel is utilized as the aquifer, particularly in the buried valleys hydrogeologic setting, ratings of (5) to (6) are given due to the presence of more continuous sand and gravel bodies within the vadose zone.

Depth to the water table is also a measure of the effectiveness of the vadose zone because the upper portions of most tills are weathered and fractured, resulting in higher permeability. Where the depth to water was over 50 feet, a rating of (3) was assigned to the tills. Conversely, where the water table was less than five feet, a higher rating was assigned (usually 5).

Near Garden Island and Chippewa Lake, the vadose zone was composed of peat, muck, and miscellaneous fines. Because no rating was directly available, the muck and peat were redefined as silt and clay and given the highest rating (6) for that category. A rating of (1) was utilized for the confining layer overlying the confined aquifer (i.e. the Berea Sandstone) of northern Medina County.

Hydraulic Conductivity

Hydraulic Conductivity was estimated from the reports of Rau (1969); Sedam (1973); and Schmidt (1978). Textbook tables (Freeze and Cherry, 1979 and Fetter, 1980) were useful in obtaining estimated values and ranges for a variety of sediments. The theses of Simmers (1985), Kesebir (1986), and Eshler (1988) provided considerable data regarding hydraulic conductivity for the eastern portion of the county. Mean values for both the Cuyahoga (shale and sandstone) and the Sharon were relatively low, ranging between 1 to 100 gallons per day per square foot (1). An exception was a mean value for the Sharon (Pottsville) of 140 gallons per day per foot square in southern Sharon Township (Eshler, 1988). These data were based on a minimal number of wells and may reflect local fracturing, hence the estimate was considered anomalously high. Data on the Massillon Sandstone were scarce; however, an estimate ranging from 1 to 100 gallons per day seems reasonable for this unit (Sedam, 1973 and Schmidt, 1978). The highly permeable coal seams within the Massillon are counteracted by the thin shaley zones to a large degree.

Reported values for the sand and gravel aquifers varied considerably. For the sand and gravel deposits interbedded in till and for those in the marginal portions and tributaries of buried valleys, a range of 1 to 100 gallons per day per foot (1) was selected. Values for the buried valley sands and gravels were extremely variable and mean values range from 220 gallons per day per square foot in Hinckley Township (Kesebir, 1986) to 1470 gallons per day per square foot in Sharon Township (Eshler, 1988). The high values in Sharon Township reflect some commercial/industrial well fields that are developed at greater depths than the overlying sand and gravel units commonly utilized for domestic wells in this area (Schmidt, 1978). Therefore, values over 1000 gallons per day per square foot are not necessarily representative of the aquifer being rated by the DRASTIC system. The majority of the sand and gravel aquifers fit into the 100-300 gallons per day per square foot range or the 300-700 gallons per day per square foot range, and were given ratings of (2) and (4) respectively.

APPENDIX B

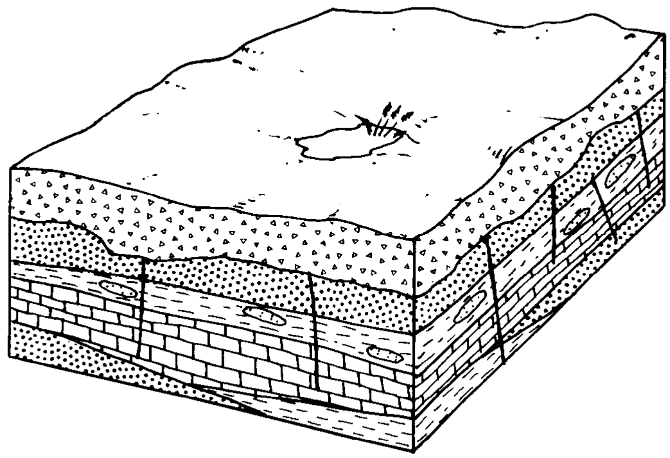
DESCRIPTION OF HYDROGEOLOGIC SETTINGS AND CHARTS

Table 12. HYDROGEOLOGIC SETTINGS MAPPED IN MEDINA COUNTY, OHIO:

Hydrogeologic Settings	Range of GWPP Indexes	Number of Index Calculations
7Aa - Glacial Till Over Sedimentary Rock	93-107	3
7Ad - Glacial Till Over Sandstone	50-124	68
7Ae - Glacial Till Over Shale	53-119	24
7Af - Sand & Gravel Interbedded in Glacial Till	62-113	18
7D - Buried Valley	95-160	77
7Ec - Alluvium Over Sedimentary Rock	104-112	5
7Ed - Alluvium Over Glacial Till	103-118	3

The following information provides a description of each hydrogeologic setting identified in the county, a block diagram illustrating the characteristics of the setting, and a listing of the charts for each unique combination of pollution potential indexes calculated for each setting. The charts provide information on how the ground water pollution potential index was derived and are a quick and easy reference for the accompanying ground water pollution potential map. A complete discussion of the rating and evaluation of each factor in the hydrogeologic settings is provided in Appendix A, Description of the Logic in Factor Selection.

In the pollution potential mapping of Medina County, seven hydrogeologic settings within the Glaciated Central Region were identified. The list of these settings, the range of pollution potential index calculations, and the number of pollution potential index calculations for each hydrogeologic setting are provided in Table 12. Computed pollution potential index values for Medina County range from 50 to 160.



7Aa Glacial Till Over Bedded Sedimentary Rocks

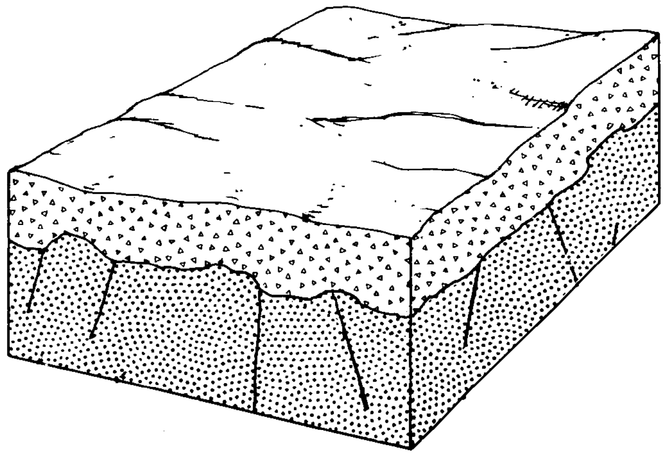
This hydrogeologic setting is characterized by high relief with prominent, steep-sided ridges, and by relatively flat-lying, fractured sedimentary rocks. The rocks are predominantly sandstones with thin, inter-layered coals and shales which are covered by varying thicknesses of glacial till. The thin coal seams are usually highly fractured and are quite permeable. Thin clay and shale zones tend to impede vertical water movement and create "perched " water tables. The till is basically an unsorted deposit which contains localized deposits of sand and gravel. Although precipitation is abundant in the region, recharge is generally moderate due to the relatively high depth to water (low water table) and the corresponding thick vadose zone composed of compacted tills. Depth to water is variable, but generally ranges between 25 to 50 feet.

GWPP index values for the hydrogeologic setting of glacial till over bedded sedimentary rocks range from 93-107 with the total number of GWPP index calculations equaling 3.

Setting: 7Aa1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	bedded sedimentary	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	97

Setting: 7Aa2		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	2-6	1	5	5
Impact of Vadose Zone	bedded sedimentary	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	93

Setting: 7Aa3		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	bedded sedimentary	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP		107



7Ad Glacial Till over Sandstone

This hydrogeologic setting is characterized by moderate to high relief. The topography varies from rolling hills to very prominent ridges, comprised of relatively flat-lying, resistant sandstones. The sandstones are generally fine-grained; their permeability largely reflects their highly-fractured nature and the frequency of bedding planes. Cemented conglomeratic zones are common in the Sharon Sandstone. The Sharon Sandstone creates the steep-sided ridges and ledges. In southern and eastern Medina County the Cuyahoga Formation is dominated by sandstones and sandy shales and is referred to by drillers as the "Big Injun Sandstone". The Berea Sandstone is usually encountered at depths over 100 feet, confined, and commonly contaminated by gas and brine. The sandstone is overlain by varying thicknesses of glacial till. The till is basically an unsorted deposit containing sand and gravel lenses. Although ground water occurs in both the glacial deposits and in the intersecting bedrock fractures, the bedrock is the principle aquifer. The glacial till serves as a source of recharge to the underlying bedrock. Although precipitation is abundant in most of the region, recharge is moderate due to the compactness of the overlying till and the high runoff associated with steep slopes. Depth is highly variable depending upon (1) which particular sandstones aquifer is being used, (2) whether the well is located along the crest of a ridge or along the valley side, and (3) the thickness of the overlying glacial till. Depth to water is usually under 40 feet for the Cuyahoga and Sharon and is typically over 75 feet for the Berea.

GWPP index values for the hydrogeologic setting of glacial till over sandstone range from 50-124 with the total number of GWPP index calculations equaling 68.

Setting: 7Ad1		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	98

Setting: 7Ad2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	confined	5	1	5
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	50

Setting: 7Ad3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	88

Setting: 7Ad4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	108

Setting: 7Ad5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	90

Setting: 7Ad6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	100+	5	1	5
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	1	5
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	53

Setting: 7Ad7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	98

Setting: 7Ad8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	100

Setting: 7Ad9		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	90

Setting: 7Ad10		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	75

Setting: 7Ad11		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	97

Setting: 7Ad12		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	93

Setting: 7Ad13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	86

Setting: 7Ad14		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	91

Setting: 7Ad15		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	96

Setting: 7Ad16		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	105

Setting: 7Ad17		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	83

Setting: 7Ad18		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	12-18	1	3	3
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	91

Setting: 7Ad19		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	12-18	1	3	3
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	93

Setting: 7Ad20		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	87

Setting: 7Ad21		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	93

Setting: 7Ad22		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	92

Setting: 7Ad23		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	89

Setting: 7Ad24		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	63

Setting: 7Ad25		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	sandy loam	2	6	12
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	103

Setting: 7Ad26		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	101

Setting: 7Ad27		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	100

Setting: 7Ad28		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	loam	2	5	10
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	101

Setting: 7Ad29		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	99

Setting: 7Ad30		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	107

Setting: 7Ad31		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	97

Setting: 7Ad32		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	loam	2	5	10
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	99

Setting: 7Ad33		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	sandy loam	2	6	12
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	106

Setting: 7Ad34		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	67

Setting: 7Ad35		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	sand	2	9	18
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	112

Setting: 7Ad36		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	loam	2	4	8
Topography	18+	1	1	1
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	84

Setting: 7Ad37		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	18+	1	1	1
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	94

Setting: 7Ad38		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	clay loam	2	3	6
Topography	12-18	1	3	3
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	94

Setting: 7Ad39		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	shrink / swell clay	2	7	14
Topography	12-18	1	3	3
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	102

Setting: 7Ad40		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	71

Setting: 7Ad41		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	93

Setting: 7Ad42		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	103

Setting: 7Ad43		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	12-18	1	3	3
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	91

Setting: 7Ad44		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	12-18	1	3	3
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	101

Setting: 7Ad45		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	100

Setting: 7Ad46		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	104

Setting: 7Ad47		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	94

Setting: 7Ad48		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sandstone	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	67

Setting: 7Ad49		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	ss, sh	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	57

Setting: 7Ad50		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	ss, sh	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	61

Setting: 7Ad51		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	100+	5	1	5
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	ss, sh	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	56

Setting: 7Ad52		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	66

Setting: 7Ad53		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	100+	5	1	5
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	ss, sh	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	52

Setting: 7Ad54		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	98

Setting: 7Ad55		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	95

Setting: 7Ad56		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	5	15
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	117

Setting: 7Ad57		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	114

Setting: 7Ad58		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	sand	2	9	18
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	110

Setting: 7Ad59		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	95

Setting: 7Ad60		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	85

Setting: 7Ad61		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	109

Setting: 7Ad62		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	sand	2	9	18
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	124

Setting: 7Ad63		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	105

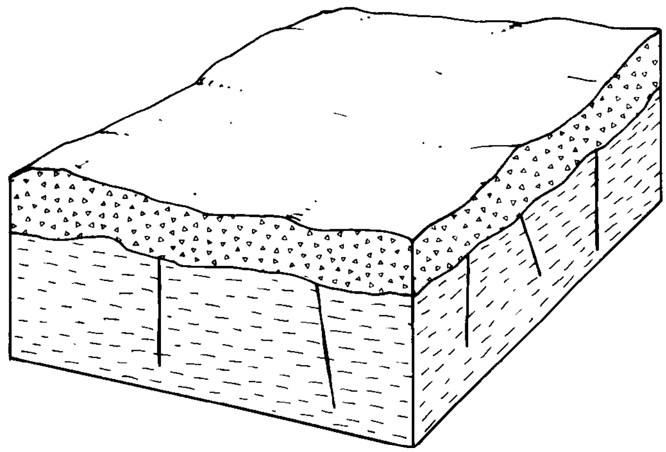
Setting: 7Ad64		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	0-2	4	1	4
Aquifer Media	sandstone	3	4	12
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	64

Setting: 7Ad65		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	90

Setting: 7Ad66		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	loam	2	5	10
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	96

Setting: 7Ad67		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	clay	2	1	2
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	83

Setting: 7Ad68		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	sandy loam	2	6	12
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	93



7Ae Glacial Till Over Shale

This setting is characterized by low relief and relatively flat-lying to gently rolling topography. In western and northern Medina County, the Cuyahoga Formation is predominantly a thin-bedded, flat-lying shale. The compact, fractured shales contain minor lenses of sandstone and sandy shale. The upper, weathered portion of the shale is the most productive; additional depth is usually drilled for storage. The till is an unsorted deposit which contains minor sand, gravel, and silt lenses. Thickness of the till varies. Greater thicknesses are associated with end moraines, thinner accumulations are present within ground moraine areas. Although ground water occurs in both the glacial deposits and in the intersecting bedrock fractures, the bedrock is the principle aquifer. The glacial till serves as a source of recharge to the underlying bedrock. Although precipitation is abundant in most of the region, recharge is moderate due to the compactness of the glacial till and the clay loam nature of soils derived from the till. Depth to the water table is usually under 30 feet, except in the vicinity of end moraines where the depth usually averages 50 feet.

GWPP index values for the hydrogeologic setting of glacial till over shale range from 53-119 with the total number of GWPP index calculations equaling 24.

Setting: 7Ae1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	92

Setting: 7Ae2		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	91

Setting: 7Ae3		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	101

Setting: 7Ae4		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	102

Setting: 7Ae5		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	81

Setting: 7Ae6		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	104

Setting: 7Ae7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	82

Setting: 7Ae8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay	2	1	2
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	88

Setting: 7Ae9		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	87

Setting: 7Ae10		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	97

Setting: 7Ae11		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	4-7	4	6	24
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	119

Setting: 7Ae12		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	18+	1	1	1
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	83

Setting: 7Ae13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	103

Setting: 7Ae14		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	0-2	4	1	4
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	53

Setting: 7Ae15		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	77

Setting: 7Ae16		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	71

Setting: 7Ae17		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	83

Setting: 7Ae18		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	79

Setting: 7Ae19		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	98

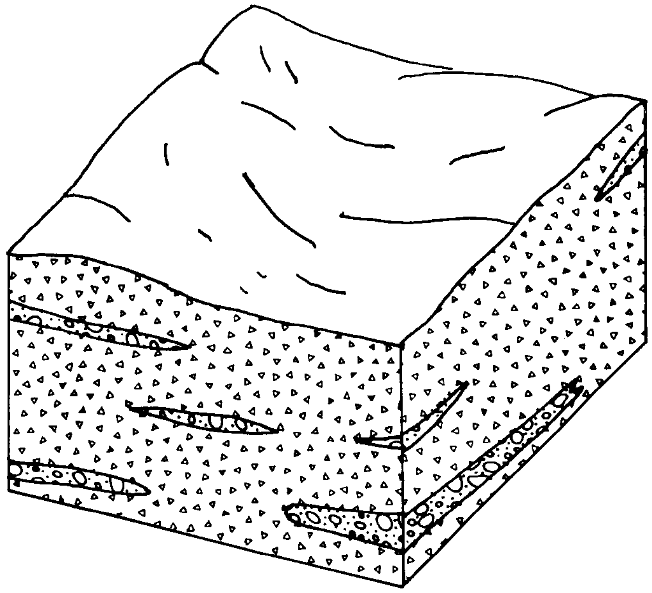
Setting: 7Ae20		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	sandy loam	2	6	12
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	87

Setting: 7Ae21		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	sandy loam	2	6	12
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	107

Setting: 7Ae22		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay	2	1	2
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	98

Setting: 7Ae23		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	93

Setting: 7Ae24		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	clay	2	1	2
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	97



7Af Sand and Gravel Interbedded in Glacial Till

This hydrogeologic setting is characterized by low relief within the till plains (ground moraine) and moderate relief with rolling, hummocky topography in areas of end moraines. The till is primarily unsorted silt and clay with minor amounts of sand and gravel. Soils are typically clay loams. Ground water occurs in both the till and sand and gravel deposits; however, the sand and gravel serves as the principle aquifer. The sand and gravel may exist as relatively thin and discontinuous lens-shaped bodies, or as thick lenses or sheets that cover a large area. These units are sometimes confined to common horizons within the till. Areas containing appreciable amounts of sand and gravel within the till generally are located adjacent to buried valleys or bedrock highs; they are not typically associated with end moraines. Recharge is from percolation through the till and is highly dependent upon fracturing and the amount of sand and gravel above the zone of saturation. Depth to the water table is highly variable, but usually ranges between 30 to 50 feet.

GWPP index values for the hydrogeologic setting of sand and gravel interbedded in glacial till range from 62-113 with the total number of GWPP index calculations equaling 18.

Setting: 7Af1		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	111

Setting: 7Af2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	110

Setting: 7Af3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	100

Setting: 7Af4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	113

Setting: 7Af5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	90

Setting: 7Af6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	50-75	5	3	15
Net Recharge	0-2	4	1	4
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	67

Setting: 7Af7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	75-100	5	2	10
Net Recharge	0-2	4	1	4
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	3	15
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	62

Setting: 7Af8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	105

Setting: 7Af9		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	6	18
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	108

Setting: 7Af10		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	6	18
Soil Media	silty loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	110

Setting: 7Af11		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	loam	2	5	10
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	94

Setting: 7Af12		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	86

Setting: 7Af13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	96

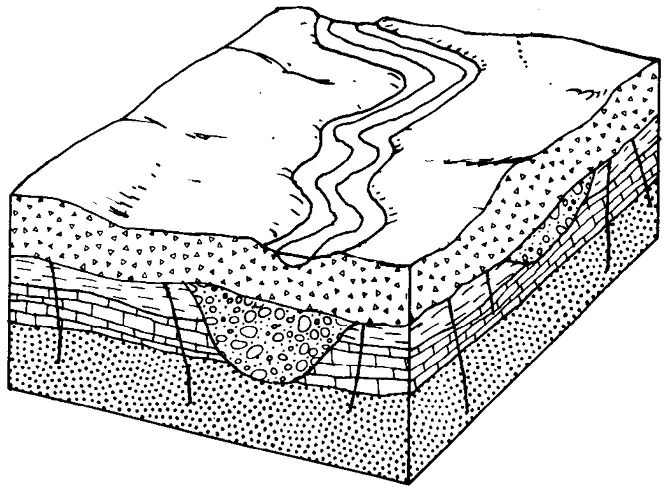
Setting: 7Af14		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	91

Setting: 7Af15		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	5	15
Soil Media	sand	2	9	18
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	103

Setting: 7Af16		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	6	18
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	102

Setting: 7Af17		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	109

Setting: 7Af18		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	113



<u>7D Buried Valley</u>

This hydrogeologic setting is characterized by sand and gravel that has been deposited in a former topographic low (usually a pre-glacial or inter-glacial river valley) by glacial meltwaters. These outwash (valley train) deposits are capable of yielding large quantities of ground water. Commonly, the more continuous, thicker sands and gravels are located within the main "trunk" valleys; sands and gravels along valley margins and in tributary valleys may not be as productive. These deposits typically underlie present-day rivers; however, the degree of hydraulic connection between streams and the underlying aquifers is highly variable. Surficial sand and gravel outwash and ice-contact (kame) deposits associated with the Late Wisconsinan glaciations overlie major portions of the buried valleys, especially in southern Medina County. Recent alluvium, peat and muck infilled bogs, and glacial till comprise the surficial cover overlying buried valleys elsewhere in Medina County. Usually, less permeable glacial till and lacustrine clays and silts separate the surficial deposits from the underlying sand and gravel aquifers. These sand and gravel aquifers tend to be several times more permeable than the surrounding bedrock. Recharge within the buried valley setting is generally higher than in the surrounding till and bedrock uplands. Depth to water can be variable, but is usually within 30 feet of the surface and is often less then 15 feet, especially in the areas near bogs and modern streams.

GWPP index values for the hydrogeologic setting of buried valley range from 95-160 with the total number of GWPP index calculations equaling 77.

Setting: 7D1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	135

Setting: 7D2		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	2	6
		GWPP	INDEX	116

Setting: 7D3		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	128

Setting: 7D4		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	111

Setting: 7D5		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	115

Setting: 7D6		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	125

Setting: 7D7		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	121

Setting: 7D8		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	149

Setting: 7D9		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	136

Setting: 7D10		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	7	21
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	7	35
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	165

Setting: 7D11		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	7	21
Soil Media	silt loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	139

Setting: 7D12		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	120

Setting: 7D13		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	peat	2	8	16
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	149

Setting:7D14		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	7	21
Soil Media	silt loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	139

Setting: 7D15		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	0-100	3	1	3
		GWPP	INDEX	127

Setting: 7D16		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	7	21
Soil Media	sand	2	9	18
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	143

Setting: 7D17		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	7	21
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	144

Setting: 7D18		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	7	21
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	148

Setting: 7D19		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	145

Setting: 7D20		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	loam	2	5	10
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	127

Setting: 7D21		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	126

Setting: 7D22		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	7	21
Soil Media	silty loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	151

Setting: 7D23		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	155

Setting: 7D24		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	7	21
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	162

Setting: 7D25		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	5	15
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	120

Setting: 7D26		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	8	32
Aquifer Media	sand & gravel	3	7	21
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	7	35
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	163

Setting: 7D27		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	122

Setting: 7D28		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	124

Setting: 7D29		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	134

Setting: 7D30		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	126

Setting: 7D31				**GENERAL**
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	128

Setting: 7D32				**GENERAL**
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	103

Setting: 7D33				**GENERAL**
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	sandy loam	2	6	12
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	112

Setting: 7D34				**GENERAL**
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay	2	1	2
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	130

Setting: 7D35				**GENERAL**
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	143

Setting: 7D36		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	sand	2	9	18
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	146

Setting: 7D37		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	7	21
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	7	35
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	167

Setting: 7D38		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	6-12	1	5	5
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	124

Setting: 7D39		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	156

Setting: 7D40		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	141

Setting: 7D41		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	112

Setting: 7D42		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	121

Setting: 7D43		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	113

Setting: 7D44		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	109

Setting: 7D45		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	peat	2	8	16
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	117

Setting: 7D46		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	sand	2	9	18
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	125

Setting: 7D47		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	sand	2	9	18
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	124

Setting: 7D48		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	137

Setting: 7D49		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	5	15
Soil Media	sandy loam	2	6	12
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	121

Setting: 7D50		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	108

Setting: 7D51		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	silt / clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	153

Setting: 7D52		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	102

Setting: 7D53		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	139

Setting: 7D54		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	0-100	3	1	3
		GWPP	INDEX	130

Setting: 7D55		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	5	15
Soil Media	peat	2	8	16
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	0-100	3	1	3
		GWPP	INDEX	146

Setting: 7D56		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	132

Setting: 7D57		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	160

Setting: 7D58		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	peat	2	8	16
Topography	0-2	1	10	10
Impact of Vadose Zone	silt / clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	162

Setting: 7D59		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	silt / clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	154

Setting: 7D60		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	128

Setting: 7D61		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	134

Setting: 7D62		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	106

Setting: 7D63		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	133

Setting: 7D64		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	5	15
Soil Media	sandy loam	2	6	12
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	111

Setting: 7D65		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	134

Setting: 7D66		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	loam	2	5	10
Topography	2-6	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	138

Setting: 7D67		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	peat	2	8	16
Topography	0-2	1	10	10
Impact of Vadose Zone	silt / clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	168

Setting: 7D68		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	silt / clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	158

Setting: 7D69		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	clay loam	2	3	6
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	129

Setting: 7D70		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	131

Setting: 7D71		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	sandy loam	2	6	12
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	135

Setting: 7D72		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	6	18
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	133

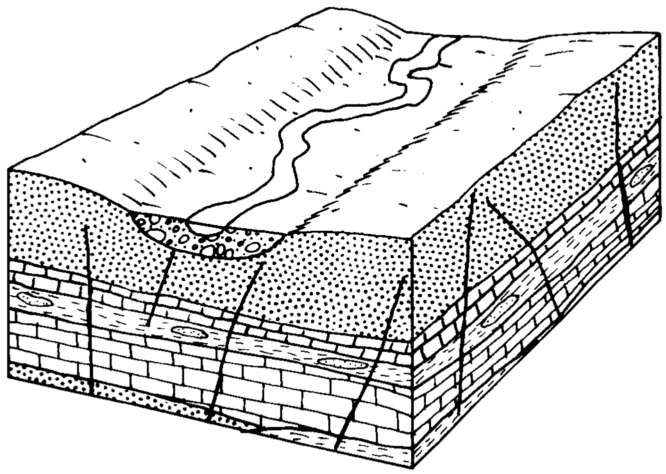
Setting: 7D73		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	30-50	5	5	25
Net Recharge	2-4	4	3	12
Aquifer Media	sand & gravel	3	6	18
Soil Media	silty loam	2	4	8
Topography	2-6	1	9	9
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	108

Setting: 7D74		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	7	21
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	160

Setting: 7D75		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	6	18
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	100-300	3	2	6
		GWPP	INDEX	149

Setting: 7D76		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	7	21
Soil Media	silt loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	158

Setting: 7D77		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	7-10	4	8	32
Aquifer Media	sand & gravel	3	7	21
Soil Media	sand	2	9	18
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	6	30
Hydraulic Conductivity	300-700	3	4	12
		GWPP	INDEX	168



7Ec Alluvium Over Sedimentary Rock

This hydrogeologic setting is characterized by minor narrow, low relief tributary valleys, particularly in northern Medina County. The silty alluvium associated with the floodplain of these minor streams is commonly more permeable than the surrounding till uplands. The alluvium overlies the fractured shales and sandstone which serve as the principal aquifer. Recharge may be slightly higher than in the surrounding uplands, but is generally much less than in the major valley systems due to the lack of sand and gravel deposits. Depth to the water table is usually less than in surrounding upland areas and is typically less than 15 feet in depth.

GWPP index values for the hydrogeologic setting of alluvium over sedimentary rock range from 104-112 with the total number of GWPP index calculations equaling 5.

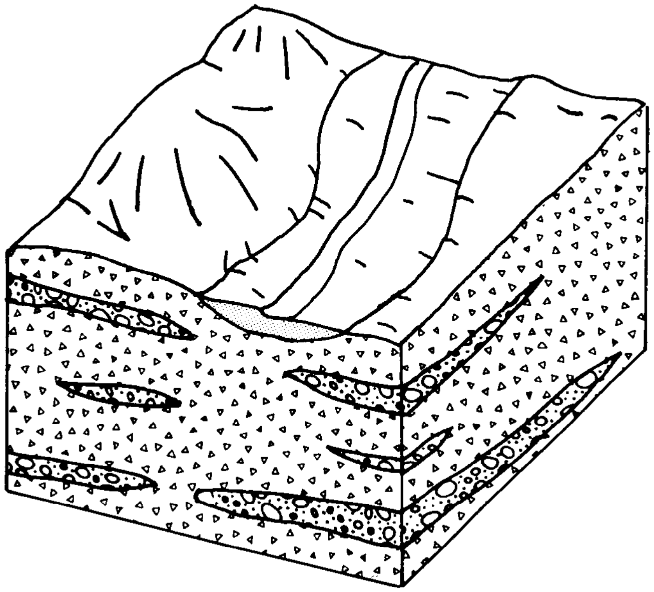
Setting: 7Ec1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	104

Setting: 7Ec2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	110

Setting: 7Ec3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	sandstone	3	4	12
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	112

Setting: 7Ec4		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	loam	2	5	10
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	106

Setting: 7Ec5		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	0-5	5	10	50
Net Recharge	2-4	4	3	12
Aquifer Media	shale	3	2	6
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	109



7Ed Alluvium Over Glacial Till

This setting is characterized by relatively narrow, low-relief, minor tributary valleys. The primarily silty alluvium associated with the floodplains of modern streams overlies glacial till. The aquifer is comprised of sand and gravel lenses interbedded with or underlying till. These sand and gravel beds may be associated with the minor tributaries of buried valley systems, or with interfluvial areas between buried valley systems. The alluvial deposits are typically thin and do not constitute an aquifer. They are generally not in direct contact with the sand and gravel aquifer. The surficial, silty alluvium is generally more permeable than the surrounding uplands. The alluvial deposits serve as a source of recharge to the sand and gravel layers underlying the till. Depth to water is usually less than the surrounding upland areas and typically is less than 15 feet in depth.

GWPP index values for the hydrogeologic setting of alluvium over glacial till range from 103-118 with the total number of GWPP index calculations equaling 3.

Setting: 7Ed1		**GENERAL**		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	113

Setting: 7Ed2		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	15-30	5	7	35
Net Recharge	2-4	4	3	12
Aquifer Media	stg	3	5	15
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	4	20
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	103

Setting: 7Ed3		GENERAL		
FEATURE	RANGE	WEIGHT	RATING	INDEX
Depth to Water	5-15	5	9	45
Net Recharge	4-7	4	6	24
Aquifer Media	sand & gravel	3	5	15
Soil Media	silty loam	2	4	8
Topography	0-2	1	10	10
Impact of Vadose Zone	sand & gravel w/silt & clay	5	5	25
Hydraulic Conductivity	1-100	3	1	3
		GWPP	INDEX	130

Ground-Water Pollution Potential of MEDINA COUNTY

by
Michael P. Angle

Description of Map Symbols

- Hydrogeologic Region / Hydrogeologic Setting: 7Ad 6
- Relative Pollution Potential: 98
- Observation Well Site**
- Gravel Pit / Quarry
- County Line
- Township Line
- Incorporated City Limit

Scale: 1 0 1 2 Miles; 1 0 1 2 Kilometers

CONTOUR INTERVAL 5 OR 10 FEET

Pollution Potential Index Range

Higher

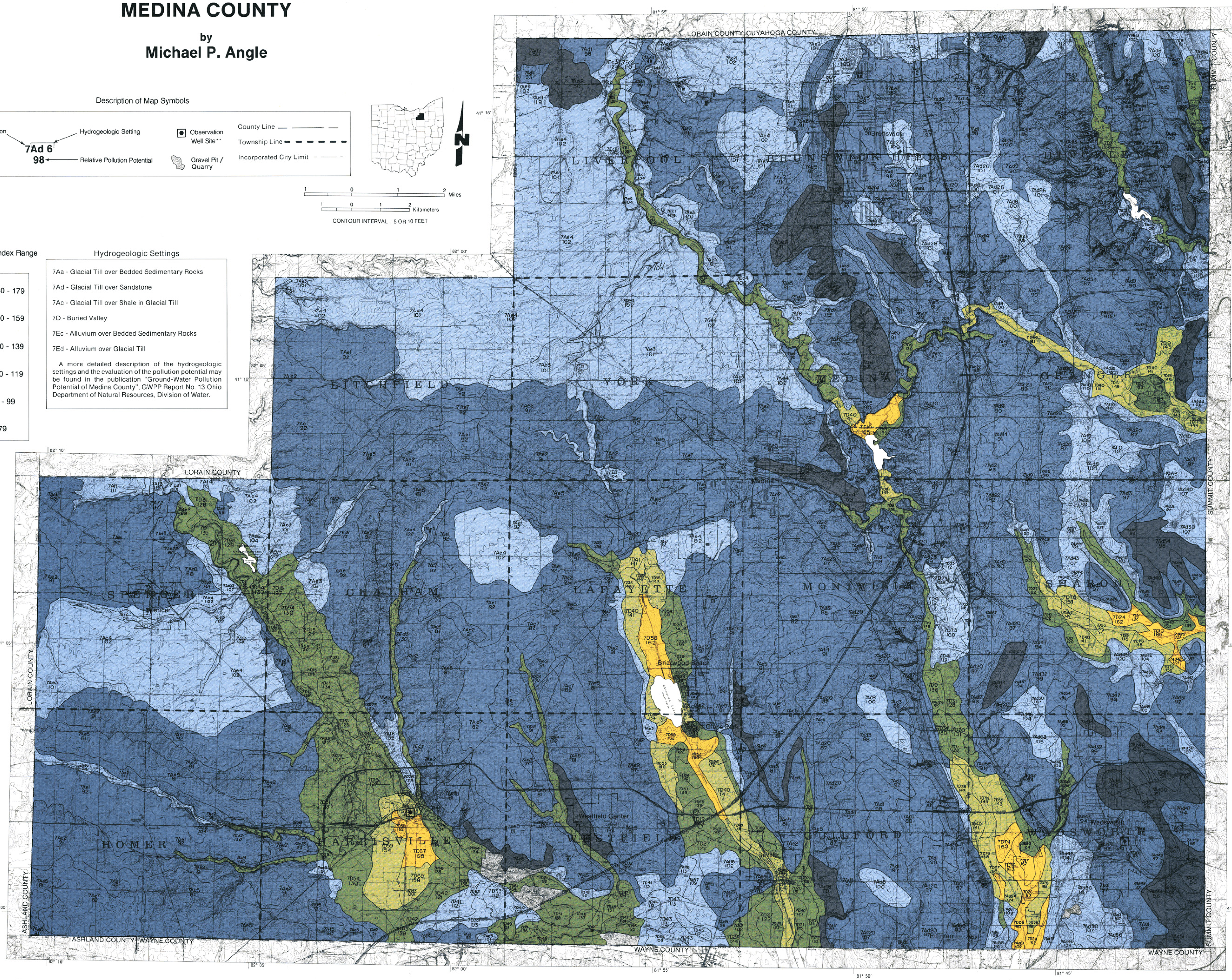
- 160 - 179
- 140 - 159
- 120 - 139
- 100 - 119
- 80 - 99
- <79

Lower

Hydrogeologic Settings

- 7Aa - Glacial Till over Bedded Sedimentary Rocks
- 7Ad - Glacial Till over Sandstone
- 7Ac - Glacial Till over Shale in Glacial Till
- 7D - Buried Valley
- 7Ec - Alluvium over Bedded Sedimentary Rocks
- 7Ed - Alluvium over Glacial Till

A more detailed description of the hydrogeologic settings and the evaluation of the pollution potential may be found in the publication "Ground-Water Pollution Potential of Medina County", GWPP Report No. 13 Ohio Department of Natural Resources, Division of Water.



The ground-water pollution potential of this county has been mapped using the methodology described in U.S. EPA Publication EPA/600-2-87/035, "DRASTIC: A Standardized System for Evaluating Ground Water Pollution Potential Using Hydrogeologic Settings (Aller et al., 1987)".

** Observation well sites indicate the location of wells used to collect ground-water level information. These wells are part of the State observation well network. Hydrographs of the water levels recorded in these and other State observation wells can be obtained through ODNR-Division of Water.

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Cartographer

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ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

Richard F. Celeste
Governor
Joseph J. Sommer
Director

ERRATA SHEET

MEDINA COUNTY
Ground Water Pollution Potential No. 13

Label error on map 7Ad90 (eastern edge of Granger Twp.) should be 7Ad9

Changes in Tables

Aquifer media-
Change stg to sand & gravel
Change sand gravel to sand & gravel

Vadose zone media-
Change ss,sh to interbedded ss & sh
Change bedded sedimentary to interbedded ss & sh