

Fen Protection Impacts

3. Impacts of Fen Study on Gravel Mining in the Study Area

In addition to mapping groundwater as seen in Figure 26, DNR scientists also responded to questions posed by the committee regarding sensitive areas where the 10' buffer elevation would be in effect. The following points summarize their recommendations:

1. State School Trust Fund Pit

- Extending the Trust Fund pit south (mining below the water table) will result in further degradation to the north fen, and possibly begin to impact the south fen.

2. County Mine

- Extending the county pit north (mining below the water table) will result in alteration of the hydrology of the south fen. The farther north the county mines, the greater the impact.
- Extending the county pit south or west (mining below the water table) is not likely to affect the hydrology of the south fen, however additional monitoring wells should be established to verify this.

3. Private mine, Section 5, Keene Township

- Mining below the water table in the private pit will result in alteration of the hydrology of the south fen. However, this pit is scheduled to close in fall 2001 and will be reclaimed.

Dry mining above the water table north of the county pit, and south of the Trust Fund pit, and on the private land will not initially affect the hydrology of the fens. However the closer the excavation gets to the water table, the greater the likelihood that some impact will occur.

Given these limitations the committee developed a table and graphic representation of the impact fen protection will have on aggregate availability for each of the core samples evaluated by the Minnesota DNR Division of Resources in 1999. The overall resource evaluation will be explained in more detail in the next section (IV), but it should be noted that a 10' buffer elevation reduces the accessible or mineable aggregate to 11% of the deposit north (#11-27) of the current county mine.

Drill Hole ID	Surface Elevation	Gravel Thickness	Depth of Overburden	Gravel from Elevation	Gravel to Elevation	WT Elev.	10' Fen Buffer Elev.	Gravel above 10' Buffer	
1	1004.660	55	0	1004.66	949.66	994.40	1004.40	0.26	
2	1004.082	54	0	1004.08	950.08	993.40	1003.40	0.68	
3	1005.096	65	0	1005.10	940.10	992.20	1002.20	2.90	
4	1007.849	63	2	1005.85	942.85	993.10	1003.10	2.75	
5	1033.482	57	29	1004.48	947.48				
6	1041.818	0	55	1041.82	1041.82				
7	1048.130	103	2	1046.13	943.13				
8	1016.254	54	47	969.25	915.25				
9	1012.812	0	55	1012.81	1012.81				
10	998.334	9	7	991.33	982.33				
11	1012.009	68	2	1010.01	942.01	990.80	1000.80	9.21	
12	1008.206	61	15	993.21	932.21	989.00	999.00	-5.79	
13	1009.650	83	2	1007.65	924.65	988.60	998.60	9.05	
14	1017.622	77	1	1016.62	939.62	988.30	998.30	18.32	
15	1012.914	72	19	993.91	921.91	988.50	998.50	-4.59	
16	1010.578	45	20	990.58	945.58	984.50	994.50	-3.92	
17	1020.056	64	19	1001.06	937.06	990.90	1000.90	0.16	
18	1017.192	82	2	1015.19	933.19	991.30	1001.30	13.89	
19	1022.435	77	2	1020.43	943.43	993.40	1003.40	17.03	
20	1041.277	93	2	1039.28	946.28				
21	1006.248	16	1	1005.25	989.25	987.00	997.00	8.25	
22	1003.833	11	2	1001.83	990.83	986.00	996.00	5.83	
23	1008.009	42	10	998.01	956.01	986.00	996.00	2.01	
24	1003.364	0	65	1003.36	1003.36				
26	989.548	6	9	980.55	974.55				
27	966.255	0	40	966.26	966.26				
North of Cty Mine		797	feet					83.75	
Percent Available								11	

Table 5: Impact of fen protection on aggregate resource availability. Drill holes #1-4 are in the current county mine footprint and will be mined below the water table (wt).

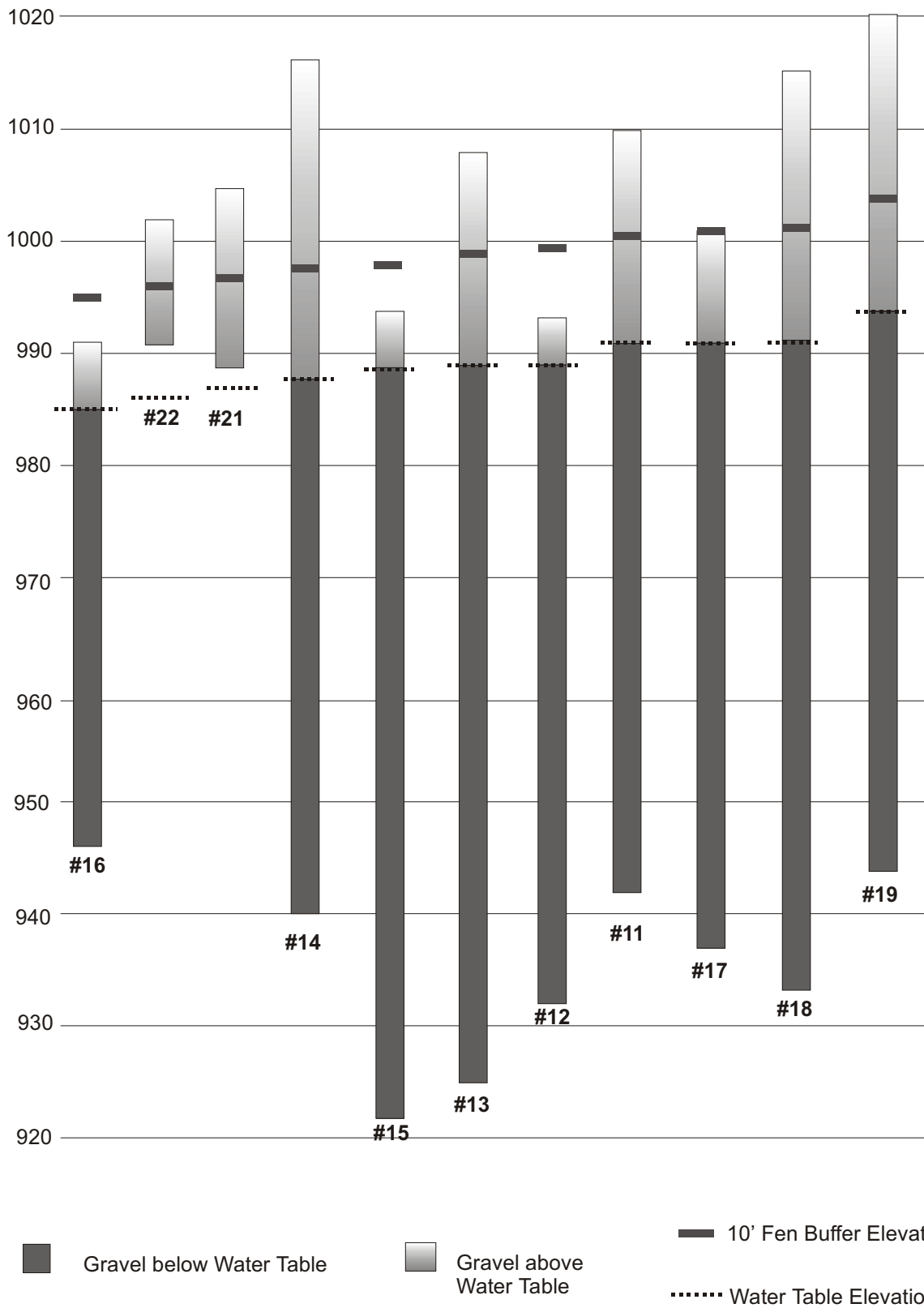


Figure 29: Illustrates the relative quantity of aggregate found in drill holes above and below the water table and fen buffer elevation. Only those drill holes affected by the 10' buffer are shown and are arranged in ascending water table elevation.

Northern Clay County Aggregate Needs

4. General Assessment of Aggregate Resource

Based on the results of the rotosonic drill study, high quality aggregate is available within the existing footprint of the Clay County gravel pit and north of it towards the School Trust Fund pit. Additional drilling would be needed to better estimate the quality and quantity of the aggregate resource in the northwest corner of Bicentennial Prairie SNA. With the exception of the School Trust Fund mine, most of the material found on state land is shallow, poorly sorted, and of lesser quality than that found on county land. For this reason and because of the environmental permitting requirements that will arise if the county chooses to continue surface mining north (see Alternative 3 of the mining scenarios), or below the fen buffer elevation, the stewardship committee assessed the county's mining options in greater detail (Section E, pp. 36-43).

D. Northern Clay County Aggregate Needs

According to the Aggregate Resource Evaluation (MN DNR, 2000), the primary aggregate deposit indicated by rotosonic drilling is found on county land within the current gravel pit and north. This deposit meets MnDOT specifications for concrete, but portions of it are buried under significant overburden, especially south of the current footprint. This poses an economic barrier to extraction under current market conditions; however, it may become cost effective to mine this material in the future as other surface supplies in the region are depleted. This high quality aggregate will likely maintain or increase its value over time. The report estimates 5.9 million cubic yards of gravel remains within the current footprint of the county gravel pit. Approximately 2.5 million yards of additional material may lie west and south of the current mined footprint. Not all of this can be mined since equipment cannot remove material at a 90 degree angle. The committee estimates an accessible volume of approximately 6.5 million yards within the current mine footprint, west and south. This could supply the county's road needs for a minimum of 65 years or longer depending on the amount of finer material (fines) that would be mixed with aggregate mined below the water table to meet Class 5 specifications. Class 5 aggregate (road gravel) is a mixture of gravel and fine particles an inch in diameter or less, with no more than 10% being very fine silt or clay. Processing the aggregate below the water table will require additional crushing and mixing to meet the Class 5 specification. The aggregate below the water table in the county pit will lack fine particles like clay that are needed to bind a road-quality mix together. For this reason the county will need to mix overburden and spoil found onsite if they are suitable or import fines to create a Class 5 mix for road gravel.

Each year the Clay County pit supplies approximately 60,000 cubic yards of road gravel (Class 5) for 200 miles of road maintenance under county control and 40,000 cubic yards for 400 miles of township road maintained by thirteen of the northern townships. The amount used by the county accounts for 40% of the county's annual aggregate purchase of 150,000 c.y. The townships that buy Class 5 from the county mine are identified in Figure 30. The county has mined gravel from the current site since the late 1940's. The current footprint of the mine is approximately 60 acres. Only gravel above the water table has been mined to date. When all of this material is removed, the method of extraction will change and costs will increase. Table 6 lists the townships that purchased Class 5 from the county in 2000 and estimates an average cost per yard. The county's cost per yard is given along with the estimated haul distance and cost. As can be observed in the table, hauling costs sometimes comprise the majority of the cost to a township and the county. Six out of the 13 pay more in hauling fees than for the gravel itself. Distance is a critical factor in the cost of aggregate and will be a concern for the county if fines need to be imported to the current mine for mixing Class 5 aggregate with material mined below the water table. If the townships purchased Class 5 from a private source, the cost will increase approximately 30% overall, but substantially for some of them, especially Kragnes and Morken townships. These costs must be considered when assessing future operations of the Clay County gravel pit.

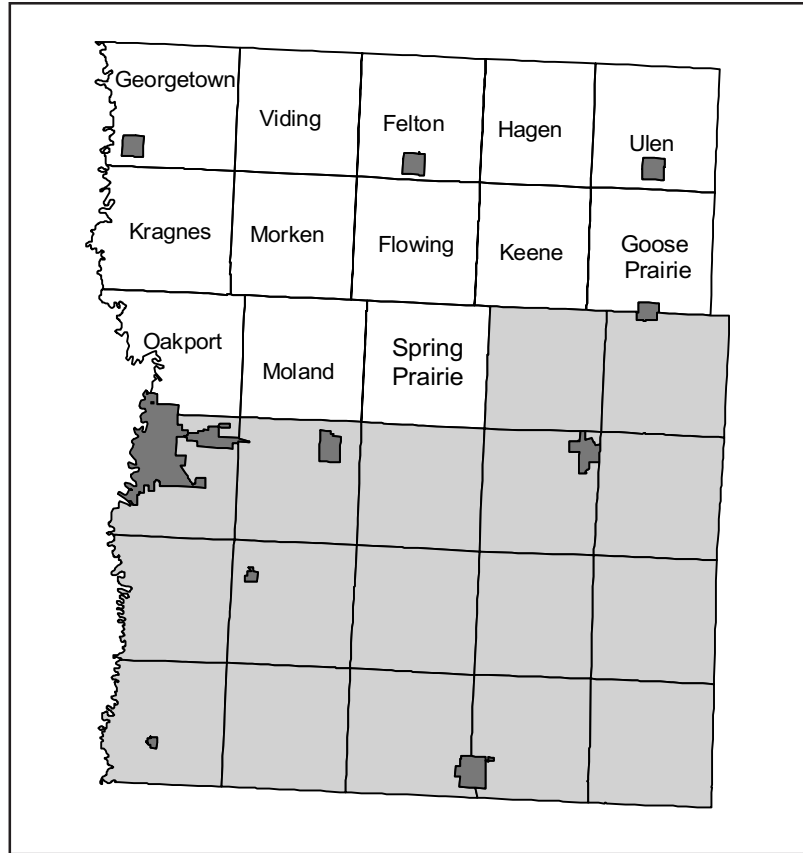


Figure 30: Townships that purchased Class 5 from the county pit in 2000.

Road Gravel from County Pit - Current						Gravel from Private Pit - Estimated			
Township	Mat'l cost /cu. yd.	Miles	Haul Cost	Township	County	Mat'l cost /cu. yd.	Miles	Haul Cost	Cost/yd.
				Total Cost per Yard					
Georgetown	\$2.25	17	\$2.98	\$5.23	\$4.93	\$3.50	24	\$4.20	\$7.70
Viding	\$2.25	13	\$2.28	\$4.53	\$4.23	\$3.50	19	\$3.33	\$6.83
Felton	\$2.25	7	\$1.70	\$3.95	\$3.65	\$3.50	13	\$2.28	\$5.78
Hagen	\$2.25	7	\$1.70	\$3.95	\$3.65	\$3.50	8	\$1.40	\$4.90
Ulen	\$2.25	12	\$2.10	\$4.35	\$4.05	\$3.50	8	\$1.40	\$4.90
Kragnes	\$2.25	13	\$2.28	\$4.53	\$4.23	\$3.50	28	\$4.90	\$8.40
Morken	\$2.25	10	\$1.75	\$4.00	\$3.70	\$3.50	23	\$4.03	\$7.53
Flowing	\$2.25	5	\$1.70	\$3.95	\$3.65	\$3.50	14	\$2.45	\$5.95
Keene	\$2.25	8	\$1.40	\$3.65	\$3.35	\$3.50	6	\$2.10	\$5.60
Goose Prairie	\$2.25	13	\$2.28	\$4.53	\$4.23	\$3.50	6	\$2.10	\$5.60
Oakport	\$2.25	21	\$3.68	\$5.93	\$5.63	\$3.50	25	\$4.38	\$7.88
Moland	\$2.25	15	\$2.63	\$4.88	\$4.58	\$3.50	20	\$3.50	\$7.00
Spring Prairie	\$2.25	12	\$2.10	\$4.35	\$4.05	\$3.50	18	\$3.15	\$6.65
Average Cost per yard				\$4.45	\$4.15	Average cost per yard			\$6.52

Table 6: Comparison of Class 5 costs purchased from county mine versus private. Note that the townships pay a \$0.30 royalty per yard to the county. Haul costs are \$1.70 per yard for 1-7 miles and \$0.175 per yard mile for distances greater than 7 miles.