Appendix B:
Redline Version of the Proposed Zavoral Mine and Reclamation Plan Final Environmental Impact Statement (EIS)

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Final Environmental Impact Statement for the Proposed Zavoral Mine and Reclamation Plan

City of Scandia
Responsible Governmental Unit

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Abstract: The Tiller Corporation, Inc. (Tiller) proposes to operate a gravel mine on the site of a dormant, unreclaimed gravel mine in the City of Scandia, Minnesota. The 114-acre site (Zavoral Site) is located along St. Croix Trail North (State Trunk Highway [TH] 95), a State Scenic Byway, near its intersection with TH 97. Tiller proposes to mine and reclaim 64 acres of the 114-acre Zavoral Site. Of the 64 acres proposed for mining and reclamation, 55 acres are located on portions of the Site that were previously disturbed by mining. A previously unmined 9-acre area is also included in the proposed mining area. The Site is located along the Lower St. Croix National Scenic Riverway as designated under the Wild and Scenic Rivers Act (Public Law 92-542 as amended; 16 U.S.C. 1271-1287) and Minnesota Statute 103F.351. Portions of the Site are located within the St. Croix River District Zone and scenic easement. However, the area proposed for mining is located outside of these limits. Tiller proposes to conduct reclamation activities on about 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement.

Gravel would be excavated at the Zavoral Site, loaded into trucks, and transported, primarily to the Scandia Mine located between Lofton Avenue and Manning Trail just north of 218th Street in the City of Scandia. The material from the Zavoral Site would be combined with material mined at the Scandia Mine to meet the specified gradations of marketable aggregate produced at the Scandia Mine. Tiller plans to use the material from the Zavoral Site to replace material currently transported to the Scandia Mine from Franconia Township, Minnesota, and the Osceola, Wisconsin, area. Some of the material mined at the Zavoral Site may also be transported directly to construction project sites or other facilities for use and/or processing.

Public Comment: The public comment period on this EIS starts on March 19, 2012. A public meeting is scheduled for the Planning Commission Meeting on April 3, 2012 at 7:00 p.m. at 14727 209th St. North, Scandia, Minnesota. All comments are due to the City of Scandia by 4:00 p.m. on May 18, 2012.

EIS Content: The content of an Environmental Impact Statement (EIS) in Minnesota is established by Minn. R ch. 4410.2300. **Table 1** identifies the content requirements and the location of each content requirement in this EIS. The City of Scandia is the Responsible Governmental Unit (RGU) responsible for the preparation and review of environmental documents for the Zavoral Mining and Reclamation Project.

Table 1: EIS Content Requirements

4410.2300 CONTENT OF EIS: An EIS shall be written in plain and objective language. An RGU shall use a format for an EIS that would encourage good analysis and clear presentation of the proposed action including alternatives to the project. The standard format shall be:	
CONTENT REQUIREMENT	LOCATION IN EIS
A. Cover sheet, the cover sheet shall include	Cover Sheet
(1) the RGU;	
(2) the title of the proposed project that is the subject of the statement and, if appropriate, the titles of related actions, together with each county or other jurisdictions, if applicable, where the project is located;	
(3) the name, address, and telephone number of the person at the RGU who can supply further information;	
4) the name and address of the proposer and the name, address, and telephone number of the proposer's representative who can supply further information;	
(5) a designation of the statement as a draft, final, or supplement;	
(6) a one paragraph abstract of the EIS; and	
(7) if appropriate, the date of the public meeting on the draft EIS and the date following the meeting by which comments on the draft EIS must be received by the RGU.	
B. Summary: the summary shall stress the major findings, areas of controversy, and the issues to be resolved including the choice among alternatives.	Pages ES-1 to ES-44
C. Table of contents: the table shall be used to assist readers to locate material.	Pages vii to xvii
D. List of preparers: this list shall include the names and qualifications of the persons who were primarily responsible for preparing the EIS or significant background papers.	Pages iii to vi
E. Project description: the proposed project shall be described with no more detail than is absolutely necessary to allow the public to identify the purpose of the project, its size, scope, environmental setting, geographic location, and the anticipated phases of development.	Page 1-1 to 1-6
F. Governmental approvals: this section shall list all known governmental permits and approvals required including identification of the governmental unit which is responsible for each permit or approval. Those permits for which all necessary information has been gathered and presented in the EIS shall be identified.	Page 2-1 to 2-4
G. Alternatives: the EIS shall compare the potentially significant impacts of the proposal with those of other reasonable alternatives to the proposed project. The EIS must address one or more alternatives of each of the following types of alternatives or provide a concise explanation of why no alternative of a particular type is included in the EIS: alternative sites, alternative technologies, modified designs or layouts, modified scale or magnitude, and alternatives incorporating reasonable mitigation measures identified through comments received during the comment periods for EIS scoping or for the draft EIS. An alternative may be excluded from analysis in the EIS if it would not meet the underlying need for or purpose of the project, it would likely not have any significant environmental benefit compared to the project as proposed, or another alternative, of any type, that would be analyzed in the EIS would likely have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts. Alternatives included in the scope of the EIS as established under part 4410.2100 that were considered but eliminated based on information developed through the EIS analysis shall be	Pages 3-1 to 3-16

discussed briefly and the reasons for their elimination shall be stated. The alternative of no action shall be addressed.		
H. Environmental, economic, employment, and sociological impacts: for the proposed project and each major alternative there shall be a thorough but succinct discussion of potentially significant `adverse or beneficial effects generated, be they direct, indirect, or cumulative. Data and analyses shall be commensurate with the importance of the impact and the relevance of the information to a reasoned choice among alternatives and to the consideration of the need for mitigation measures; the RGU shall consider the relationship between the cost of data and analyses and the relevance and importance of the information in determining the level of detail of information to be prepared for the EIS. Less important material may be summarized, consolidated, or simply referenced. The EIS shall identify and briefly discuss any major differences of opinion concerning significant impacts of the proposed project on the environment.		Pages 4-1 to 4-118
I. Mitigation measures: this section shall identify those measures that could reasonably eliminate or minimize any adverse environmental, economic, employment, or sociological effects of the proposed project.		Pages 5-1 to 5-6
J. Appendix: if an RGU prepares an appendix to an EIS the appendix shall include, when applicable:		Appendices Section
	(1) material prepared in connection with the EIS, as distinct from material which is not so prepared and which is incorporated by reference;	Appendices Section
	(2) material which substantiates any analysis fundamental to the EIS; and	Appendices Section
	(3) permit information that was developed and gathered concurrently with the preparation of the EIS. The information may be presented on the permitting agency's permit application forms. The appendix may reference information for the permit included in the EIS text or the information may be included within the appendix, as appropriate. If the permit information cannot conveniently be incorporated into the EIS, the EIS may simply indicate the location where the permit information may be reviewed.	Appendices Section

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LIST OF ABBREVIATIONS AND ACRONYMS

AADT	average annual daily traffic
AAQS	ambient air quality standards
ACGIH	American Conference of Industrial Hygienists
AG	Agricultural District (City of Scandia 2020 Comprehensive Plan)
AG-C	Agricultural Core Area (City of Scandia 2030 Comprehensive Plan)
AST	aboveground storage tank
AOP	Annual Operating Permit
ASTM	American Society for Testing and Materials
BMP	best management practice
BRKW	BRKW Appraisals, Inc.
CCES	Critical Connections Ecological Services, Inc.
CESQG	Conditionally Exempt Small Quantity Generator of Hazardous Materials
cfs	cubic feet per second
CMP	Cooperative Management Plan
CMSCWD	Carnelian-Marine-St. Croix Watershed District
CR	County Road
CUP	conditional use permit
CWI	County Well Index
cy	cubic yards
dB	decibel
dBA	decibel, A-weighted
Dresel	Dresel Contracting, Inc.
EAW	environmental assessment worksheet
EDR	Environmental Data Resources, Inc.
EIS	Environmental Impact Statement
EQB	Environmental Quality Board
g/m^2	grams per square meter
GIS	geographic information system
gpd	gallons per day
gpm	gallons per minute
GPS	global positioning system
HCMN	Highway Construction Noise Model
lb/day	pounds per day
lb/hr	pounds per hour
lb/year	pounds per year
LOS	level of service
MAAQS	Minnesota Ambient Air Quality Standards
MDA	Minnesota Department of Agriculture
mgd	million gallons per day
mg/L	milligrams per liter
MGS	Minnesota Geological Survey

mgy	million gallons per year
MIM	Minnesota and Northeast Iowa Morainal
Minn. R. ch.	Minnesota Rules, chapter
Minn. Stat.	Minnesota Statute
MLCCS	Minnesota Land Cover and Classification System
MMUTCD	Minnesota Manual on Uniform Traffic Control Devices
MnDNR	Minnesota Department of Natural Resources
Mn/DOT	Minnesota Department of Transportation
MOT	Material of Trade
MPCA	Minnesota Pollution Control Agency
mph	miles per hour
mppcf	millions of particles per cubic foot of air
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NAC	Noise Area Classification
NAG	North American Green
NHIS	Natural Heritage Information System (MnDNR)
NPDES	National Pollutant Discharge Elimination
NPS	National Park Service
NRCS	Natural Resources Conservation Service
OSCS	Open Space Conservation Subdivision
OSHA	Occupational Health and Safety Administration
ORVW	Outstanding Resource Value Water
PAC	Project Advisory Committee
PCB	polychlorinated biphenyl
PM	particulate matter
$PM_{2.5}$	particulate matter with an aerodynamic diameter less than 2.5 microns
PM_{10}	particulate matter with an aerodynamic diameter less than 10 microns
ppm	parts per million
PTE	potential to emit
REL	Reference Exposure Level
RGU	Governmental unit responsible for the preparation and review of environmental document
RSDD	Revised Scoping Decision Document (January 2010)
RSEA	Regionally Significant Ecological Area
SAM	Standardized Air Modeling
SBP	SBP Associates, Inc.
SDD	Scoping Decision Document (April 2009)
SDS	State Disposal System
SNA	Scientific and Natural Area
SWPPP	Stormwater Pollution Prevention Plan
TA-COS	Take Action - Conserve Our Scandia
TH	Trunk Highway
$\mu g/m^3$	micrograms per cubic meter

µmhos/cm	micromhos per centimeter
USACE	United States Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
WCD	Washington Conservation District
WIMN	What's in My Neighborhood
WMA	Wildlife Management Area

EXECUTIVE SUMMARY

ES 1 PROJECT OVERVIEW

The Tiller Corporation, Inc. (Tiller) proposes to operate a gravel mine on the site of a dormant, unreclaimed gravel mine in the City of Scandia, Washington County, Minnesota. The 114-acre site (Zavoral Site or Site) is located along St. Croix Trail North (State Trunk Highway [TH] 95), a State Scenic Byway, near its intersection with TH 97. Tiller proposes to mine and reclaim 64 acres of the 114-acre Site Of the 64 acres proposed for mining and reclamation, 55 acres are located on portions of the Site that were previously disturbed by mining. A previously unmined 9-acre area is also included in the proposed mining area (**Figures 1 and 2**).

Tiller prepared a Conditional Use Permit (CUP) Application for the Zavoral Mining and Reclamation Project (or Project; Tiller November 2008). The City's Development Code required that Tiller prepare an Environmental Assessment Worksheet (EAW) for the Project as part of the CUP Application. An EAW was prepared per Minn. R. ch. 4410.4300 (Sunde Engineering 2008). The City of Scandia as the Responsible Governmental Unit (RGU) is responsible for the preparation and review of environmental documents for the Project. On March 3, 2009, Scandia's City Council determined that the Project had the potential for significant impacts and that an Environmental Impact Statement (EIS) was needed to determine the Project's potential for significant environmental impacts.

City, county, and state regulations would govern the proposed mining use on the Site:

- The Site is located within the City of Scandia and partially within the Lower St. Croix National Scenic Riverway (Riverway) as designated under the Wild and Scenic Rivers Act (Public Law 92-542 as amended; 16 U.S.C. 1271-1287; WSRA) and Minnesota Statute (Minn. Stat.) 103F.351 **(Figures 2 and 3)**. Minn. R. ch. 6105.0370 § 9 prohibits sand and gravel operations within the St. Croix River District Zone and scenic easement area. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6.

- The City of Scandia's Development Code and Mining Ordinance require that Tiller obtain a CUP to operate a mine on the Site.

- The protection of resources within these jurisdictions is guided by the City of Scandia Comprehensive Plan, the City's Development Code, and the Cooperative Management Plan (CMP).

- The Washington County Comprehensive Plan also describes a scenic easement that is partially within the Site. However, the proposed mining area is located outside these limits.

Tiller proposes to conduct reclamation activities on about 4 acres of the previously mined area located in the St. Croix River District Zone and within the Riverway boundary on privately owned land on which the National Park Service (NPS) holds a scenic easement (Department of Interior (DOI)/ NPS et al. 2002).

Tiller proposes to develop the gravel mine in phases. Active mining would occur to an average depth of 15 feet (ranging from approximately 10 to 70 feet deep). Tiller does not propose to excavate into groundwater and would maintain the required minimum 3-foot separation from the bottom of the

excavation and the groundwater table. The depth from the maximum depth of the mining excavation to groundwater would range from approximately 25 to 50 feet. Reclamation of the Site would take place in phases that would occur concurrently with mining. Post-reclamation, the depth from ground surface to groundwater would range from approximately 45 to 78 feet.

Gravel would be excavated at the Zavoral Site, loaded into trucks, and transported, primarily to the existing Scandia Mine (or Mine) located between Lofton Avenue and Manning Trail just north of 218th Street in the City of Scandia **(Figure 4**). The Scandia Mine is also operated by Tiller. Material from the Zavoral Site would be used as add-rock to provide material that would meet the specified gradations of marketable aggregate at the Scandia Mine. Some of the material mined at the Zavoral Site may also be transported directly to construction project sites or other facilities for use and/or processing.

Tiller plans to use the material from the Zavoral Site to replace material currently transported to the Scandia Mine from various locations, most recently from Franconia Township, Minnesota, and the Osceola, Wisconsin, area.

ES 2 EIS CONTENT

The content of this EIS is established by the Revised Scoping Decision Document (RSDD; City of Scandia January 2010). This document is available at:

http://www.ci.scandia.mn.us/vertical/Sites/%7B2F1D9A41-1D4D-4195-A3E4-159328E3F399%7D/uploads/%7B95D9B189-3E99-411A-8C12-6173E9A3898B%7D.PDF

The RSDD identified three alternatives to be evaluated in this EIS.

The difference between the two proposed build alternatives in the RSSD is the time period over which mining and reclamation would occur at the Site. The timeframe for Alternative 1 is from 5 to 10 years and for Alternative 3 is from 3.3 to 5 years. Under Alternative 3, mining activity would need to occur either more frequently, for longer durations, or a combination of both to complete the mining within the reduced timeframe.

A Project Advisory Committee (PAC) was established by the Scandia City Council to facilitate the open exchange of information and to obtain input on the EIS analyses and mitigation measures as they were developed (see Section 2.2 of this document). Although not in the RSDD, comparative information has been included in this EIS to address another reduced timeframe subalternative at the request of some PAC members. This Subalternative (3A) consists of completing the mining at the Zavoral Site in 150 working days. Based on 5 working days a week, with time taken out for holidays and bad weather days, mining and reclamation would occur over approximately 1 calendar year under Subalternative 3A.

Alternative 2 is the No-Build Alternative under which the existing land uses on the Zavoral Site would remain and the Scandia Mine would continue to import add-rock from Franconia Township, Minnesota, and the Osceola area in Wisconsin. The No-Build Alternative does not include the reclamation activities of previously mined areas that are included in Alternatives 1 and 3 and Subalternative 3A.

The following items were screened and removed from further review in the EIS as part of the EAW and scoping process that established the scope of this EIS.

- Water Surface Use
- Water Quality (Wastewaters)
- Vehicle-Related Air Emissions
- Archaeological/Historical/Architectural Resources
- Prime/Unique Farmlands
- Impact on Infrastructure and Public Services

The following items were included in the scope of this EIS:

- Land Use
- Economic Impacts
- Cover Types
- Fish, Wildlife, and Ecologically-Sensitive Resources and Threatened and Endangered Species
- Physical Impacts on Water Resources
- Water Use
- Water-Related Land Use Management Districts
- Erosion and Sedimentation
- Surface Water Quality and Quantity
- Geologic Hazards and Soil Conditions
- Traffic
- Stationary Source Air Emissions
- Noise
- Visual Impacts
- Compatibility with Plans and Land Use Regulations
- Cumulative Impacts

The major findings related to these items are summarized below. The alternatives evaluated in this EIS are described in Section 3.0 of this document and summarized in **Table 2. Table 3** summarizes the environmental impacts. Compatibility with plans and land use regulations is addressed under applicable sections of the EIS (land use, noise, visual, water-related management districts, etc.).

Table 2: Alternative Summary Table

Resource Category	Alternative 1 (5 to 10 Years)	Alternative 2 No Build	Alternative 3 (3.3 to 5 Years)	Subalternative 3A (150 Working Days) (Approximately 1 Year)
Mining and Reclamation Operations				
Length of Mining and Reclamation Activities	5 to10 years at Zavoral Site	Zavoral Site not Operated	3 to 5 years at Zavoral Site	150 Working Days (Approximately 1 year)
Anticipated Hours of Operation	Monday through Friday 7 a.m. to 7 p.m. (Assumes 10-hour days)	None at Zavoral Site	Monday through Friday 7 a.m. to 7 p.m. (Assumes 10-hour days)	Monday through Friday 7 a.m. to 7 p.m. (Assumes 12-hour days) Tiller would not be able to comply with current requirement to restrict

Resource Category	Alternative 1 (5 to 10 Years)	Alternative 2 No Build	Alternative 3 (3.3 to 5 Years)	Subalternative 3A (150 Working Days) (Approximately 1 Year)
				use of CR 1 (Lofton Ave.) access at Scandia Mine during non-daylight hours.
Estimated Weeks of Operation	6–12	None at Zavoral Site (6-20[1] from other Class C add-rock sources)	12–18	30
Equipment Use Expected on the Site				
Site Preparation	1 excavator 3-4 off-road trucks 1 front-end loader 1 dozer 1 compactor 1 scraper 1 chipper 1 skidder 1 grader 1 skid steer loader	No Equipment at Zavoral Site	Same as Alternative 1	Same as Alternative 3
Mining Operations	1 excavator &/or 1 front-end loader 15-20 haul trucks 1 dozer 1 grader 1 water truck	No Equipment at Zavoral Site	Same as Alternative 1	Same as Alternative 3, except 15-25 haul trucks would be used.
Reclamation Activities	1 excavator &/or 1 front-end loader 3-4 off-road trucks 1 dozer 1 compactor 1 scraper 1 skid steer loader 1 grader 1 water truck	No Equipment at Zavoral Site	Same as Alternative 1	Same as Alternative 3
Traffic Generation				
Projected loads per day (range) Add-rock + reclamation	167-220 trucks 334-440 trips	(From other Class C add-rock sources) 105–279 trucks[1] 210–558 trips	Same as Alternative 1	368 trucks 736 trips
Total peak (add-rock + reclamation topsoil)	300 trucks 600 trips	280 trucks[2] 560 trips	Same as Alternative 1	368 trucks 736 trips
Reclamation Activities				
Phase 1	2 weeks	None at Zavoral Site	Same as Alternative 1	Same as Alternative 3
Phase 2	8 weeks			
Phase 3	11 weeks			
Phase 4	9 weeks			

[1&2] No reclamation hauling would occur at Zavoral Site under the No-Build Alternative.

Table 3: Impact Summary Table

Resource Category	Alternative 1 (5 to 10 Years)	Alternative 2 No Build	Alternative 3 (5 Years or less)	Subalternative 3A (150 Working Days)
Land Use				
	Site land use altered from mixture of unreclaimed, formerly mined vacant land, forested land, & small areas of agricultural land to mining operation. Mining, hauling, & reclamation activities would take place at Site for 5- to 10-year period. Reclamation plan would result in Site suitable for future uses allowed in the Development Code. Implementation of Tiller's reclamation plan including previously mined 3.1 acres in Riverway District & scenic easement.	Land use would not change to mining operation. No reclamation would occur. No alteration of unreclaimed, formerly mined vacant land, forested land, & small areas of agricultural land. 3.1 acres within Riverway District & scenic easement would remain unreclaimed. Future uses consistent with Scandia Comprehensive Plan & Development Code. Site may require grading, etc. prior to development other than vacant land, open space, & possibly pasture.	Same as Alternative 1 with exception that mining & reclamation activities would take place at Site for 3.3- to 5-year period.	Same as Alternative 3 with exception that mining & reclamation activities would take place at Site for approximately 1 year.
Environmental Hazards				
	No on-site or off-site sources of environmental contamination were identified in a database search.			

Resource Category	Alternative 1 (5 to 10 Years)	Alternative 2 No Build	Alternative 3 (5 Years or less)	Subalternative 3A (150 Working Days)
Economics				
	No significant changes in local jobs, demand for public or emergency services, or tourism are anticipated. Public cost would be expenses of monitoring Project. Site taxed at higher commercial rate (~$1,762/year) during mining. Effect on residential property values (up to 2 or 5% reduction within ¼ mile), diminishes as reclamation occurs to zero. City gravel tax income approximately $7,000 - 14,000/year (~ $72,670 over life of Project). Public & emergency services – expense of monitoring.	No changes in local jobs, demand for public or emergency services, or tourism. No changes in Site property tax, no affect on nearby property values, no gravel tax revenue, no monitoring cost.	Same as Alternative 1 except shorter period of taxing at higher commercial rate, shorter period of negative effect on residential property values, & city gravel tax income would be $14,535 -$21,802/yr (~ $72,670 over the life of Project).	Same as Alternative 3 except shorter period of taxing at higher commercial rate, shorter period of negative effect on residential property values, & city gravel tax income would be ~ $72,670 accrued over ~ 1 year.

Resource Category	Alternative 1 (5 to 10 Years)		Alternative 2 No Build		Alternative 3 (5 Years or less)	Subalternative 3A (150 Working Days)
Cover Types 64-Acre Mining & Reclamation Area						
	Before	After	Before	After	Same as Alternative 1	Same as Alternative 3
Types 1–8 wetlands	0	0	0	0		
White Pine Hardwood Forest	6.72	3.42	6.72	6.72		
Maple Basswood Forest	0.21	0	0.21	0.21		
Cropland	3.40	0	3.40	3.40		
Southern Mesic Cliff	0	0	0	0		
Altered Nonnative Forest	1.49	0	1.49	1.49		
Altered Nonnative Deciduous Woodland	7.06	0	7.06	7.06		
Dry Prairie	1.80	40.44	1.80	1.80		
Black Ash Swamp	0	0	0	0		
Altered Nonnative Long Grasses	1.55	0	1.55	1.55		
Altered Nonnative Short Grasses	0	0	0	0		
Altered Nonnative Long Grasses with Sparse Trees	13.03	0	13.03	13.03		
Altered Nonnative Short Grasses with Sparse Trees	28.18	0	28.18	28.18		
Lawn/landscaping	0	0	0	0		
Impervious Surfaces	0	1.17	0	0		
Mesic Prairie	0.56	18.97	0.56	0.56		
Altered Nonnative Long Grasses	1.55	0	1.55	1.55		
Total	64.00	64.00	64.00	64.00		
Fish, Wildlife & Ecologically Sensitive Resources & Threatened & Endangered Species						
	No threatened or endangered species known to exist or identified during Site surveys. One healthy Butternut tree was identified & is located outside mining & reclamation areas. Southern mesic cliff & Black ash seeps not negatively affected. Temporary displacement of wildlife.		No loss of woodland & cropland. Gravel resource not used. No reclamation of previously mined areas. No displacement of wildlife.		Same as Alternative 1, except reclamation completed earlier & reduced period of wildlife displacement.	Same as Alternative 3, except reclamation completed earlier & reduced period of wildlife displacement.

Resource Category	Alternative 1 (5 to 10 Years)	Alternative 2 No Build	Alternative 3 (5 Years or less)	Subalternative 3A (150 Working Days)
Physical Impacts on Water Resources				
	Increases internal Site drainage as mining progresses. Reduces off-site peak flows, risk of erosion, & overflow. Improves infiltration resulting in slightly improved base flow to seeps, springs, & creeks	No change from existing conditions.	Same as Alternative 1. Lower probability of major storm event during operation because of reduced timeframe. Increase in internal drainage & infiltration would occur earlier.	Same as Alternative 3. Lower probability of major storm event during operation because of reduced timeframe. Increase in internal drainage & infiltration would occur earlier.
Water Use				
	No significant effects on area wells, Black ash seeps, Southern mesic cliffs, or other surface water bodies. Maximum volume of groundwater that could be pumped over 10 years is 10 million gallons; annual use could be less than Alternative 3 because mining would occur for fewer weeks/year, but not more than 10,000 gallons per day (gpd).	No mining or mining-related water use.	Same as Alternative 1, maximum volume over 5 years is 5 million gallons; annual use could be more than Alternative 1 because mining occurs for more weeks/year, but not more than 10,000 gpd.	Same as Alternative 3, maximum volume over 1 year is 1 million gallons; annual use could be more than Alternatives 1 & 3 because mining occurs for more weeks/year, but not more than gpd.
Water-Related Land Use Management Districts				
	Project would comply with CMSCWD, WCD, and St. Croix River District requirements.	No change from existing conditions.	Same as Alternative 1.	Same as Alternative 3.
Erosion & Sedimentation				
	Immediately after soil stripping, & prior to overburden removal, several short periods (matter of days or less for each occurrence) when potential impacts to downstream water resources could occur. If significant rain fell during these periods, erosion in externally draining perimeter areas of Site could potentially impact downstream resources. Tiller included BMPs to control this. After overburden removal & after vegetative stabilization potential for these impacts becomes very small, & less than under existing conditions.	No change from existing conditions	Same as Alternative 1, except there is a lower probability of major storm event during operation because of reduced timeframe.	Same as Alternative 3, except there is a lower probability of major storm event during operation because of reduced timeframe.

Resource Category	Alternative 1 (5 to 10 Years)	Alternative 2 No Build	Alternative 3 (5 Years or less)	Subalternative 3A (150 Working Days)
Surface Water Quality & Quantity				
	Implementation of BMPs to prevent surface water runoff from becoming contaminated & sediment from being discharged off-site. Surface water quantities discharging off-site significantly reduced from existing conditions after reclamation because most of Site would drain internally.	No change from existing conditions	Same as Alternative 1, over reduced timeframe. Amount of internal drainage would increase earlier.	Same as Alternative 3, over reduced timeframe. Amount of internal drainage would increase earlier.
Geologic Hazards & Soil Conditions				
	Potential for significant erosion event to occur would be reduced by BMPs to control sedimentation & erosion as well as increase in internal drainage. Reclamation activities to establish vegetative cover would further reduce potential for soil erosion.	No change from existing conditions	Same as Alternative 1, but shorter duration.	Same as Alternative 3, but shorter duration.
Solid Waste, Hazardous Waste, & Storage Tanks				
	Portable sanitary facilities located on-site. Solid waste collected & hauled to Tiller's Maple Grove facility. No hazardous wastes generated. If diesel fuel stored at Site - 1,000-gallon mobile tank.	No change from existing conditions.	Same as Alternative 1, but shorter duration.	Same as Alternative 3, but shorter duration.
Traffic				
Mining activity	5 to10 years	20 to 30+ Years[1]	3.3 to 5 years	Approximately 1 year
Projected weeks operating per year	6-12	6-20	12-18	30
Projected loads per day (range)	167-220 trucks 334-440 trips	105-279 trucks 210-558 trips	167-220 trucks 334-440 trips	368 trucks 736 trips
Total peak (add-rock+reclamation topsoil)	300 trucks 600 trips	280 trucks 560 trips	300 trucks 600 trips	368 trucks 736 trips
Haul Route	6. 5 mile haul route on TH 97 & CR 1, a reduction of ~ 7 miles from current haul route.[2]	Maintain current add-rock use & approximately 13.5-mile haul route in Minnesota.	Same as Alternative 1.[2]	Same as Alternative 3.[2]
Anticipated Hours of Operation	Monday through Friday 7 a. m. to 7 p.m. (Assumes 10-hour days) Existing roadway network sufficient to handle daily traffic volumes.	None at Zavoral Site	Monday through Friday 7 a.m. to 7 p.m. (Assumes 10-hour days)	Monday through Friday 7 a.m. to 7 a.m. (Assumes 12-hour days) Tiller would not be able to comply with current requirement to restrict the

Resource Category	Alternative 1 (5 to 10 Years)	Alternative 2 No Build	Alternative 3 (5 Years or less)	Subalternative 3A (150 Working Days)
	Mn/DOT requires northbound right-turn lane.			use of CR 1 (Lofton Ave.) access at Scandia Mine during non-daylight hours under this Alternative.
Level of Service	LOS analysis showed that during morning rush hour the LOS remained at Level C or better for all turning movements for all three build alternatives. During evening rush hour the LOS remained unchanged at Level C or better for all turning movements with the following exceptions. For approximately 1 to 2 hours during evening rush hour or other periods of similar traffic patterns: • LOS for turning movement from eastbound TH 97 left onto northbound TH 95 would decrease from Level C to Level D for all build alternatives. • LOS for eastbound approach on TH 97 crossing TH 95 to the Zavoral Site would be Level D for all build alternatives. LOS analysis showed that the TH 95/TH 97 intersection has sufficient gaps for traffic, even during morning and evening "rush hour" and similar conditions.	Maintains current LOS.	Same as Alternative 1.	Same as Alternative 3.
Stationary Source Air Emissions & Dust				
Ambient Air Quality & Nuisance Dust	Uncontrolled emissions from operations at maximum mining rate would likely exceed National Ambient Air Quality Standards (NAAQS) for PM_{10} & $PM_{2.5}$. Uncontrolled emissions would likely exceed nuisance dust levels. Mitigated emissions (implementation of Tiller's Fugitive Dust Control Plan)	No change. Site not source of new fugitive emissions.	Same as Alternate 1	Emission rates would be higher on daily & annual basis than Alternates 1 or 3. However, mitigated emissions ~~likely~~ would not exceed the NAAQS for PM_{10} & $PM_{2.5}$ or nuisance dust levels.

Resource Category	Alternative 1 (5 to 10 Years)	Alternative 2 No Build	Alternative 3 (5 Years or less)	Subalternative 3A (150 Working Days)
	from operations at maximum mining rate would not exceed the NAAQS for PM_{10} & $PM_{2.5}$ or nuisance dust levels.			
Deposition	Uncontrolled emissions from operations at maximum mining rate may have adverse impact on vegetation or fauna around Site. Mitigated emissions from operations at maximum mining rate not likely to adversely impact the St. Croix River, Zavoral Creek, Middle Creek, South Creek, vegetation, or fauna around Site.	No change. Site not source of new fugitive emissions.	Same as Alternate 1	~~Emission rates~~ Deposition rates would be approximately 30% higher on a daily & annual basis than Alternates 1 or 3. However, mitigated emissions not likely to adversely impact the St. Croix River, Zavoral Creek, Middle Creek, South Creek, vegetation, or fauna around Site.
Silica Effects	Ambient concentrations of silica ~~under~~ based on mitigated emissions would be below existing California health based standards established for the general public.	No change. Site not source of new fugitive emissions.	Same as Alternate 1	Emission rates would be higher on daily & annual basis than Alternates 1 or 3. However, ambient concentrations of silica ~~under~~ based on mitigated emissions would be below existing California health based standards
Noise				
	Noise levels adjacent to Site & in St. Croix Riverway would be below the applicable Minnesota Daytime standards. Increase in noise levels would be perceptible at a number of residences near Site during operations at the maximum mining rate. Mining noise would likely be audible on St. Croix Riverway depending on weather conditions & other activities occurring on river. Noise levels along TH 97 would exceed Minnesota daytime standards at some residences. However, this would not be a change from current conditions.	No change from existing conditions	Same as Alternate 1, but for more days each year.	Noise levels expected to be somewhat higher than Alternatives 1 & 3 due to the additional trucks on-site necessary to achieve the higher mining rate. Noise present for estimated 12 hours per typical working day rather than 10 hours under Alternatives 1 & 3.
Visual				
	Short-term Site preparation would be visible. Project not visible to boaters & other recreationists on St. Croix	No change from existing conditions	Same as Alternative 1, except the Site would be reclaimed earlier because shorter period of operation.	Same as Alternative 3, except the Site would be reclaimed earlier because shorter period of operation.

Resource Category	Alternative 1 (5 to 10 Years)	Alternative 2 No Build	Alternative 3 (5 Years or less)	Subalternative 3A (150 Working Days)
	River or from Wisconsin. Site can be seen from some limited viewpoints, but does not attract attention, because most activities are screened.			

[1] Hauling from current add-rock sources.

[2] Hauling from current Class C add-rock sources would resume after Zavoral Site resources have been exhausted.

ES 2.1 Current and Future Land Use

Zavoral Site and Vicinity

Over the last 70 years, land use within the Zavoral Site has transitioned from predominantly cropland in the late 1930s to its current condition as vacant open space largely disturbed by past mining activities. In the late 1960s, sand and gravel mining became a significant use at the Site. By the mid to late 1970s, mining had displaced much of the former cropland. Active mining continued into the 1980s.

The Zavoral Site is within the jurisdiction of the City of Scandia and partially within the Riverway as designated under the WSRA (Public Law 92-542 as amended; 16 U.S.C. 1271-1287) and Minn. Stat. 103F.351. Current land uses in the area near the Site include agricultural production, single-family residences, and parks and open space.

The Zavoral Site and the Scandia Mine are both located within the Agriculture (AG) District under the City's 2020 Comprehensive Plan. This was the adopted plan at the time of the Tiller application for the Project (2008). The Development Code that was in place at the time of the Tiller CUP application for the Project included mining as an allowed use within the AG Zoning District, with a CUP.

On March 17, 2009, the Scandia City Council adopted the City's 2030 Comprehensive Plan. The potential locations of new mining operations were discussed as the new Comprehensive Plan and Zoning Ordinance were developed, and one of the goals of the plan was to limit the locations where new mining operations would be allowed in the City of Scandia. The Zavoral Site is within the area now designated as AG-C in the 2030 Comprehensive Plan. The 2030 Plan included policies that mining not be an allowed use in the AG C District. Since adoption of the plan, the City's Development Code has been updated to implement the plan's recommendations. The Council adopted the new Development Code in November 2010. Mining is not an allowed use in the AG-C Zoning District in the new Code.

These changes in the Comprehensive Plan and Development Code have led to a controversial issue associated with the Project as described in Sections ES 4 and 2.3.1 of this document.

Nearby public natural and recreational resources include the Falls Creek Scientific and Natural Area (SNA), Farmington Bottoms SNA, Lower St. Croix National Scenic Riverway, St. Croix Scenic Byway (TH 5), Rutstrum Wildlife Management Area, William O'Brien State Park, and Wind in the Pines Park (Figure 3).

No significant impacts to nearby public natural and recreational resources have been identified. Potential impacts to these resources are addressed under the applicable sections of this EIS.

Alternative 1 – 5- to 10-Year Operation

If the Project were approved, the existing land use on the Site would be replaced by a mining operation. Mining, hauling, and reclamation activities would take place for a 5- to 10-year period. Upon the completion of mining, the Site would be reclaimed. Based on Tiller's reclamation and forestry management plans, the Site would be revegetated with native prairie and coniferous woodland that would provide stable soil conditions for future land uses (CCES May 2011).

Tiller does not own the Zavoral Site and therefore would not have control over post-mining and reclamation land use at the Site. Future post-mining land uses on the Site would need to comply with the City of Scandia Development Code at the time development is proposed. The current code allows for a variety of agricultural uses, public parks and recreation facilities, and single-family residential use. Based on the current City of Scandia Development Code, an estimated maximum of 20 residential lots could be developed on the entire 114-acre Zavoral Site.

Alternative 2 – No-Build Alternative

The area would remain as vacant open space rather than be mined and reclaimed as part of the Project. The land use would not be altered. The gravel resource would not be used. Establishment of native prairie and coniferous forest would not occur and the portion of the Site within the Riverway would not be reclaimed. Vegetation succession would continue to occur. Residential development at the Site could occur as described under Alternative 1, but site preparation, such as grading and revegetation, would be required. The Site could also remain as open space.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

The impacts would be the same as with Alternative 1 but would occur in a reduced timeframe. Mining, hauling, and reclamation activities would take place at the Site for a 3.3- to 5-year period. As a result, the area would be available for post-mining and reclamation use earlier than under Alternative 1. Mining-related activity would be required either more frequently or for longer durations, or a combination of both, in order to bring the Project to completion within the reduced timeframe.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

The impacts would be the same as with Alternative 3 but would occur in a compressed timeframe. Mining, hauling, and reclamation activities would take place at the Site for approximately 1 year. As a result, the area would be available for post-mining and reclamation use earlier. Mining-related activity would be required more frequently or for longer durations, or a combination of both, in order to bring the Project to completion within the 150 working-day timeframe.

ES 2.2 Environmental Hazards

A database search was conducted for potential on-site and off-site sources of environmental contamination relative to the Zavoral Site. Environmental Data Resources, Inc. provided specified state

and federal regulatory list information for potential sites of environmental concern located at or in the vicinity of the Zavoral Site.

The database search did not identify any known contamination associated with the Zavoral Site or nearby properties that would be likely to impact the Zavoral Site.

ES 2.3 Economic Impacts

Local Jobs

The Project may or may not result in local hiring. However, the ongoing need for employees and the reduction in costs to haul add-rock to the Scandia Mine could allow Tiller to extend the period of employment for existing employees.

Tourism

Tourism in the area is largely related to the St. Croix River and river corridor, nearby public natural and recreation areas, and cultural heritage resources such as the Gammelgården Museum (approximately 2 miles from the Site) and the Hay Lake School and Erickson Log House Museum (approximately 3 miles from the Site).

The area along the St. Croix River is scenic and provides a range of recreational and scenic driving opportunities. William O'Brien State Park is located approximately 2.5 miles south of the Zavoral Site on State Scenic Byway TH 95. Recreation traffic is a component in increasing average daily traffic on TH 97 and State Scenic Byway TH 95 during the spring to fall timeframe. The trunk highways have sufficient reserve capacity to handle the change in traffic volume for seasonal traffic. Periods of congestion may be experienced during peak weekend travel times or on a holiday weekend, with or without the Project.

Removing the current hauling traffic from the river crossing at TH 243 and the portion of State Scenic Byway TH 95 north of the Zavoral Site until material from the Zavoral Site is exhausted, should be beneficial to vehicles using these roadways to get to the state park or enjoy other recreational opportunities in the area.

No water quality or quantity impacts that would affect the experience of people using the river were identified.

Analyses conducted for this EIS determined that although mining noise could be audible to people using the St. Croix River, it would fall below applicable standards. Air quality analysis predicted that the mitigated impacts (after implementation of the Tiller Fugitive Dust Control Plan) from Project plus the addition of appropriate background concentrations would not result in exceedances of applicable standards or adversely affect the water quality in the St. Croix River.

The Project would not be visible from the Riverway or from the Wisconsin bluffs on the east side of the river. In general, long-term effects of mining and reclamation activities would be not be visible or would be partially visible from sensitive viewpoints. This is because the interior Site terrain would be further excavated to a lower elevation than adjacent properties, which would limit visibility into the Site. In

addition, views of the Site are blocked by tree stands in both leaf-on and leaf-off conditions as viewed from the bike path, TH 97, State Scenic Byway TH 95, and nearby residences.

Public and Emergency Services

The City of Scandia and Washington County would be capable of providing public and emergency services for the Project under their existing organization. The City would require additional staff and consultant resources to monitor the Project for compliance with permit requirements and any mitigation measures that the City would implement.

Property Taxes for the Zavoral Site

Most of the Zavoral Site is classified as Non-Homestead Rural Vacant Land for property tax purposes, with an estimated market value of approximately $8,000 per acre. If and when the Site is mined, the classification of the property (the area to be mined including buffer areas) would change to Commercial. The land value is not likely to change, but the property tax classification rate would change.

The increase in taxes payable to the City of Scandia due to reclassification of the property after commencement of mining would be approximately $1,762 per year. Property taxes are levied by setting a total citywide levy, which is then spread against all the taxable property. An increase in taxes payable for the Zavoral Site would have the effect of lowering the tax burden of other properties within the taxing jurisdiction. The impact on individual properties would be so small as to not be noticeable.

This analysis does not include impacts on the other local property taxing jurisdictions (county, school district, watershed district, or others) nor does it include an estimate of the increased collection of the state property tax that is payable for property classified as commercial. A change in classification from vacant land to commercial would also affect calculations for the Metropolitan Area Fiscal Disparities Levy. It is impossible to determine how this might affect the pool overall or the City of Scandia in particular, and any impact would be extremely small.

Nearby Property Values

AECOM consultant team member, BRKW Appraisals, Inc. (BRKW), a real estate valuation services firm, conducted an analysis of the impact that the Project could have on nearby property values. The Site has not been operated as a gravel mine for over 20 years. As a result, the proposed mining operation would be expected to have the same effect as the introduction of a new gravel mining operation into an area. The BRKW analysis concluded that the impact would be limited to a radius of 1/4 mile from the Site. Within that area, the analysis estimated a potential property value reduction up to 2% to 5% for specific properties. No value loss was ascribed to the Fusco property, which is a vacant site that is being zoned for commercial use and would not be affected.

In determining the value loss, the Assessor's 2011 Estimate of Market Value was used. Consideration was also given to the impact of the potential value losses to the real estate taxes from the individual properties. This tax income would not actually be lost unless a sale occurred or a new assessed value was established. Any property tax "loss" from these individual properties would be redistributed over other properties in Scandia.

The projected negative impact would remain as long as the facility is in operation. The impact would diminish as reclamation occurred, to a level of zero with completion of the successful reclamation.

This analysis presents possible impacts to property values for use in an EIS process only. The County Assessor would not prospectively lower property values or related tax rates for groups of properties based on changes that may or may not occur in the future. The values would not be modified unless sales took place or documented appraisal information for individual properties was submitted for County consideration in the valuation process.

Aggregate Material Removal Production Tax

Minn. Stat. § 298.75 provides for the payment of a production tax on aggregate material removal in certain areas of the state, including Washington County and adjoining Chisago County. With two active sand and gravel mines in the City, Scandia's revenue from the tax was $17,033.85 in 2009 and $13,035.21 in 2010. The forecasted revenue without the Zavoral Project is about $10,000 for both 2011 and 2012. The City of Scandia credits this revenue to its Public Works Department Budget in the General Fund, which pays for all road maintenance expenditures.

Tiller proposes to extract up to 1.2 million tons of aggregate from the Zavoral Site. At 15 cents per ton ($180,000) and after deducting 5% for administration, this would generate $171,000 in taxes to be distributed, $72,675 (42.5%) of which would be payable to Washington County, $72,675 (42.5%) of which would be payable to the City of Scandia, and $25,650 to Washington County's reserve fund for restoration of abandoned pits.

Tiller has indicated that the add-rock material excavated from the Site would replace add-rock currently excavated and hauled from other sites in Chisago County and/or Wisconsin. To the extent that the add-rock replaces material now excavated in Chisago County, the gravel tax paid to Chisago County would be reduced by the amount that would be paid to Washington County for material excavated from the Zavoral Site. This would be new revenue to Washington County and to the City of Scandia.

If add-rock material is currently imported by Tiller from Wisconsin to the Scandia Mine, Tiller should already be paying the aggregate tax to Washington County. Replacing this with material excavated in Scandia, at the Zavoral Site, would not generate new tax revenue.

Alternative 1 – 5- to 10-Year Operation

No significant changes in local jobs, demand for public or emergency services, or tourism are anticipated. Public service change would consist of the expense of monitoring the Project.

After mining is complete, the land classification for the Zavoral Site would likely revert from Commercial to Vacant Land (unless the land is developed for some other use). The longer the mining operation continues, the longer the property would pay property taxes at the higher commercial rate.

The projected negative effect on nearby property values would remain as long as the facility is in operation. The impact would diminish as reclamation takes place, to a level of zero with completion of the reclamation plan. Thus any effect on property values would occur for a longer period of time under Alternative 1.

The aggregate tax revenue for the City of Scandia would be approximately $72,670, accrued at a rate of $7,267 a year over 10 years to a rate of $14,535 over 5 years.

Alternative 2 – No-Build Alternative

No significant changes in local jobs, demand for public or emergency services, or tourism are anticipated.

No changes in Zavoral Site property tax would occur. Nearby property values would not be affected.

No aggregate tax revenue would be collected for the Zavoral Site.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

No significant changes in local jobs or the demand for public or emergency services are anticipated. Public service change would consist of the expense of monitoring the Project.

Less tax benefit would be realized than under Alternative 1 due to the Site reverting back to the lower-taxed classification more quickly.

The projected negative effect on nearby property values would occur for a reduced period of time under Alternative 3.

The aggregate tax revenue for the City of Scandia would be approximately $72,670 accrued at a rate of $14,535 over 5 years to a rate of $21,802 a year over 3 years. Alternative 3 or Subalternative 3A would be preferred based on a present-value analysis of the stream of payments from the aggregate tax.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

No significant changes in local jobs, demand for public or emergency services, or tourism are anticipated. Public service change would consist of the expense of monitoring the Project.

Less tax benefit would be realized due to the Site reverting back to the lower-taxed classification more quickly.

The projected negative effect on nearby property values would occur for an approximately 1-year period.

The aggregate tax revenue for the City of Scandia would be approximately $72,670 accrued over approximately 1 year. Alternative 3 or Subalternative 3A would be preferred based on a present-value analysis of the stream of payments from the aggregate tax.

ES 2.4 Biological Resources

A variety of upland and wetland plant communities, Southern mesic cliffs, and former gravel mining areas were documented during the June/July 2009 field surveys conducted by the Critical Connections Ecological Services, Inc. (CCES December 2009). Southern mesic cliffs are open lichen-and moss-dominated plant communities on dry-mesic to mesic, shaded, northwest- to east-facing cliffs in rugged terrain in southeastern Minnesota. Vascular plants are largely restricted to crevices and ledges (MnDNR, website accessed December 2011).

Areas from the bluff line down (east) to the St. Croix River are relatively undisturbed White-pine hardwood and Maple-Basswood forests that run contiguously from the north and south property boundary and extend off-site in both directions. The forested area below the bluff is included within a~~n~~ MnDNR designated Regionally Significant Ecological Area (RSEA). The classification of RSEA denotes the presence of a high-quality plant community with the potential to have suitable habitat for rare species located within it. On the Zavoral Site, the RSEA is composed primarily of the White-pine hardwood forest along the steep east-facing bluff, Maple-Basswood forest within the southernmost ravine system, and Black ash swamp seepage subtype wetlands located along the eastern boundary of the Site within ravine systems adjacent to the railroad tracks.

A query of the MnDNR Natural Heritage Information System (NHIS) identified 70 historic records of rare plants, animals, fishes, reptiles, mussels, and native plant community occurrences within a 1-mile radius of the Site. Of these 70 historic records, the MnDNR Natural Heritage Program staff determined that the following state-listed species would have the potential to occur on the Site and, if present, would have the potential to be affected by Project activities:

- Kitten-tails (*Besseya bullii*; Minnesota Threatened)
- Bog blue grass (*Poa paludigena*; Minnesota Threatened)
- American ginseng (*Panax quinquifolius*; Minnesota Special Concern)
- Red-shouldered hawk (*Buteo lineatus*; Minnesota Special Concern)
- Blanding's turtle (*Emydoidea blandingii*; Minnesota Threatened)
- Several threatened and endangered species of mussels occur within the St. Croix River. Two of these endangered mussel species, winged mapleleaf (*Quadrula fragosa*) and snuffbox (*Epioblasma triquetra*), are known to occur within 2,000 feet of the Project. However, these species do not occur on-Site.

In a July 21, 2008, letter, the MnDNR NHIS staff recommended that a rare species and significant natural features survey be conducted on the Site to determine the presence or absence of these state-listed species. As a result, a biological assessment was completed for the entire 114-acre property by an MnDNR-approved surveyor employed by CCES. No surveys were conducted for threatened and endangered mussel species within the St. Croix River because Project activities are not expected to directly or indirectly affect these species. At the request of the MnDNR PAC member, AECOM requested an updated NHIS review from the MnDNR on November 30, 2011. AECOM requested an expedited (rapid turnaround) on this review. The MnDNR responded that they could not provide the expedited process. ~~A response is still pending.~~ On February 9, 2012 the MnDNR Natural Heritage Program staff provided an updated Natural Heritage database report (no new records) and stated that the EIS should include a discussion on the issues raised in the July 21, 2008 Natural Heritage letter and a discussion regarding the Butternut trees.

None of the state-listed species identified in the MnDNR's July 21, 2008, letter or from the NHIS query were detected. However, three raptors were observed and recorded during the call-response surveys for

Red-shouldered hawks within the Site during the May 2010 surveys, including two Red-tailed hawks (*Buteo jamaicensis*) and one Bald eagle (*Haliaeetus leucocephalus*, Minnesota Special Concern).

Also, a previously undocumented population of Butternut trees (*Juglans cinerea*; Minnesota Special Concern) was detected and documented as part of the CCES survey. The single Butternut tree that appears to be disease free is located outside of the mining and reclamation area at the base of the bluff above the railroad tracks in the central part of the Site.

The status of the Butternut tree is currently proposed to change from special concern to endangered within the next year. If tree clearing occurs after this reclassification takes place, a taking permit from the MnDNR would be required (MnDNR May 2012).

Although no Blanding's turtles were identified at the Site, the MnDNR has requested that Blanding's turtle mitigation measures be applied to the Project.

Alternative 1 – 5- to 10-Year Operation

Of the 64 acres to be mined, approximately 55 acres consist of altered nonnative cover types. In the approximately 9-acre area not disturbed by earlier mining, the Project would result in the loss of:

- 5.2 acres of White-pine hardwood forest
- 0.2 acres of Maple-Basswood forest
- 3.4 acres of cropland

The Tiller biological assessment for the Site described the Maple-Basswood forest as showing evidence of moderate impacts from invasive earthworms, such as reduced leaf litter and reduced leaf mold, reduced herbaceous species cover in the ground layer, soil compaction, and soil erosion. The 5.4 acres of White-pine hardwood forest and Maple-Basswood forest that would be lost due to the Project would be reclaimed to a combination of native prairie and White-pine hardwood forest.

The remaining 40.8 acres of the 114-acre Site consisting of White-pine hardwood forest, Maple-Basswood forest, Black ash swamp seepage subtype wetlands, Southern mesic cliff, and cropland are located outside the proposed mining limits and would not be directly affected by mining activities. Although the Southern mesic cliffs and the Black ash swamp seepage subtype wetlands are located outside the mining and reclamation limits, several PAC committee members voiced concern over whether the use of the Zavoral Site Well could result in groundwater impacts that would negatively impact the these areas.

The Southern mesic cliffs and the Black ash swamp seepage subtype wetlands obtain their base flow from groundwater discharged from the shallow aquifers below the Site that consist of the Glacial Drift and the Prairie Du Chien-Jordon Aquifers. The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers. The shallow aquifers at the Site were not influenced by pumping in the deeper aquifer and the projected use of water from the Zavoral Site Well for dust control purposes would not be expected to impact these regionally significant features.

Mining would increase the amount of internal surface drainage at the Site, resulting in increased base flow. The increase in the base flow is not expected to be significant, but would provide an incremental increase in the groundwater flow into the seeps and creeks. The decrease in surface runoff should decrease sediment loading to the creeks, which should benefit the creeks.

Although the proposed mining would involve the loss of some wildlife habitat, approximately 86% (55 acres) of the impact would occur in previously mined areas that remain unreclaimed on the Site and currently provide low-quality wildlife habitat, primarily for common, disturbance-adapted edge species. These species would be temporarily displaced during mining activities, but many of the species would be expected to return to the area once mining and reclamation activities are complete. Since no nesting or roosting areas were identified, the raptors that were observed at the Site would not be expected to be negatively affected due to the large size of the areas that they use.

Alternative 2 – No-Build Alternative

No mining or reclamation activities would take place and there would be no effect to fish, wildlife, or ecologically sensitive resources within the Site. The loss of woodland and cropland not previously affected by mining and temporary displacement of wildlife would not occur. The gravel resource would not be used. No reclamation activities would take place on the Site and vegetation succession would be expected to continue.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

Impacts to fish, wildlife, or ecologically sensitive resources within the Site resulting from Alternative 3 would be the same as for Alternative 1. The loss of forestland and cropland would occur. The compressed timeframe proposed under Alternative 3 would have the advantage of reducing the length of time that wildlife is displaced from the Site due to mining activities and would allow for reclamation of habitat to begin sooner.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

Impacts to fish, wildlife, or ecologically sensitive resources within the Site resulting from Subalternative 3A would be the same as for Alternative 3. The more compressed timeframe proposed under Subalternative 3A would have the advantage of reducing the length of time that wildlife is displaced from the Site due to mining activities and would allow for reclamation of habitat to begin sooner.

ES 2.5 Water Resources

Effect on Area Surface Water Resources

The Site drains to three creeks referred to as Zavoral, Middle, and South Creeks in this EIS. Several areas with steep slopes attributed to past mining activities and that drain internally are located within the Site.

A stormwater pollution prevention plan (SWPPP) would be implemented for the Project in compliance with the National Pollutant Discharge Elimination System/State Disposal System and Carnelian-Marine-St. Croix Watershed District (CMSCWD) permits. Tiller has prepared a draft SWPPP for the Project that

identifies the use of best management practices (BMPs) to manage erosion and stormwater runoff. Erosion and sedimentation control methods were identified for the individual phases, including post-reclamation. As mining progresses, the interior elevation of the Site would be reduced, which would increase the flow of surface water to the interior of the Site. As described in Tiller's draft SWPPP, the 64-acre area that would be mined and reclaimed includes approximately 53 acres that currently drain internally due to past mining operations.

The potential for erosion and sediment transport exists after the start of operation when soils are exposed for overburden removal or other activity. The potential source of erosion and sediment movement is the 4.6 acres located on the perimeter of the Site that would discharge off-site during operation. Watershed areas discharging off-site during operation would include 1.3 acres discharging to Zavoral Creek, 1.0 acre discharging to the Middle Creek, and 2.3 acres discharging to the South Creek. To prevent untreated off-site flow a number of BMPs would be applied.

After reclamation, the majority of stormwater runoff would be directed toward the six depressions to be located in the interior of the Site. The exception is the northwesternmost 1.3 acres of the Site that would discharge off-site post-project. This area would be reclaimed during Phase 2. According to Tiller's draft SWPPP, BMPs would remain in place until vegetation and soil stability became well established.

Potential effects of the Project on water resources were investigated by analyzing Site runoff rates during operation and after reclamation, and then comparing these rates to existing conditions.

During operation, a berm would be installed on the south end of the Site as close to the mining limits as possible. This would be the boundary between the internally drained and off-site discharge areas. The flow off-site from each watershed for 2-year, 10-year, and 100-year storm events are greatly reduced from existing conditions to post-reclamation, which would benefit the tributary streams by reducing risks of erosion and sedimentation. The existing peak flow rate during a 100-year event of 2.2 cubic feet per second (cfs) discharging to Zavoral Creek would be reduced to 0.6 cfs. The other existing off-site discharge points to the Middle and South Creeks would be eliminated post-reclamation.

After reclamation, the total watershed area with off-site discharges would be reduced from the existing 11.6 acres to 1.3 acres. Approximately 1.3 acres at the north end of the Site would discharge to Zavoral Creek. After reclamation, the total capacity of the Site to store and infiltrate runoff would be approximately 60.1 acre-feet, compared to the 25.6 acre-feet of rain falling in the internally drained area during a 100-year 24-hour storm. The reduction of surface water flow and increase in infiltration would benefit cold water species in Zavoral Creek, such as trout.

Potential for Significant Erosion Event or Overflow

Potential geologic hazards are related to the elevation relief between the Zavoral Site and the St. Croix River, and the erodible nature of the soil. The surface soils consist of highly erodible granular materials. These soils are generally stable unless water is introduced. Surface water drainage is the primary source of water that could lead to erosion and soil transport.

There is some evidence that a major transportation of soil from the Site to the St. Croix River occurred in the past, primarily based on discussions with area residents and the existence of a delta deposit near the mouth of Zavoral Creek that appears to be the result of a significant erosion event. The cause of this

delta deposit is not known. It could be the result of a natural erosion event (major rain event) or the result of human activities.

The potential for overflow from internally drained areas during a large storm event was analyzed for the proposed grading of the Site for final reclamation conditions. For the final proposed Site contours, only one potential overflow point exists for the Site and this would discharge to the South Creek.

Additional analyses were completed to determine a relative probability of the storm or snow melt event that would need to occur to create overflow from the Site post-project. A conservative analysis was completed by ignoring infiltration, evapotranspiration, and interception that would occur during any rain event. It would take two back-to-back 100-year 24-hour storm events (5.9 inches per storm, 11.8 inches total) before Site overflow would occur. If the losses due to infiltration and interception were included in the analysis, no off-site discharge would result from back-to-back 100-year 24-hour storms. The potential of overflow post-reclamation is seen to be very small, less than the potential under existing conditions. Prior to reclamation, the potential for overflow would be less than under existing conditions as the Site becomes more internally drained as mining occurs and as part of ongoing stormwater management.

Alternative 1 – 5- to 10-Year Operation

Immediately after soil stripping, and prior to overburden removal, there would be several relatively short periods (a matter of days or less for each occurrence) when potential impacts to downstream water resources could occur. If significant rainfall events occurred during this period, erosion in externally draining perimeter areas of the Site could potentially affect downstream resources, including the three small tributaries receiving Site drainage and the St. Croix River. Stormwater and erosion control BMPs would be employed to minimize the potential for this.

After vegetative stabilization, and after overburden removal, the potential for these impacts becomes very small, and less than under existing conditions.

Potential impacts are proportional to potential impacts on flow rates. The Project, regardless of differences in phasing, would reduce peak flows off-site, reduce the risk of erosion, and greatly reduce the risk of overflow. The Project would improve infiltration, resulting in slightly improved base flow conditions for the seeps, springs, and creeks, enhancing the ability of area creeks to support aquatic life, including cold water species such as trout.

Alternative 2 – No-Build Alternative

There would be no change in potential impacts to water resources of downstream tributaries and the St. Croix River for the No-Build Alternative. No reduction in peak water flow or increase in infiltration would occur.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

The only difference between Alternatives 1 and 3 is the difference in time it would take for peak flow reductions and increases in infiltration to occur. Alternative 3 has a shorter overall schedule, and estimated peak flow reductions would occur sooner as a result.

Alternative 3 may reduce the risk for impacts to water resources because of the shorter timeframe of Site operation compared to the probability of occurrence of a major storm event. For instance, the probability of a storm event exceeding the 100-year event happening in 5 years is 5%, whereas for a 10-year Project duration (Alternative 1 maximum duration), the probability of this occurrence for a storm of this size is10%. However, Alternative 3 would increase the intensity of mining activity during Project operation, increasing the potential sources of erosion during the operation period.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

The potential environmental impacts to water resources are similar to Alternative 3 but would occur over a period of approximately 1 year, further reducing the potential for a major storm event to occur during operation, but increasing the potential sources of erosion during operation. BMPs would be applied to control erosion.

ES 2.6 Water Use

Barton Construction formerly operated the Site's multi-aquifer bedrock well (Minnesota Unique Number 00210498). Available well records show that the Zavoral Site Well is cased to a depth of 245 feet and is completed as an open hole in two aquifer systems—the Franconia-Ironton-Galesville Aquifer and the Mt. Simon Aquifer—to a total depth of 648 feet. AECOM determined that Barton's water appropriation permit had expired as part of the coordination conducted with the MnDNR.

The 1989 Minnesota Ground Water Act strictly limits new water use permits in the Mt. Simon-Hinckley Aquifer in a metropolitan county (Minn. Stat. § 103G.271 4a). The intent of the law is to protect use of the Mt. Simon-Hinckley Aquifer for drinking water purposes in metropolitan counties and prohibit use of this resource for lower priority and nonessential purposes, such as lawn watering. A potential renewal of the water appropriation permit for the multi-aquifer Zavoral Site Well would be carefully evaluated by the MnDNR.

Tiller's analyses of the Project noted that reinitiating the use of the Zavoral Site Well at the levels the well is capable of producing would require significant investment to address MnDNR water appropriation permit requirements

The total annual groundwater use from the Zavoral Site Well is limited to less than 1 million gallons; anything above this level would require a water appropriation permit. At the maximum allowable daily water use of 10,000 gallons per day (gpd), pumping could occur for a maximum of 100 days per year.

Tiller would limit the use of water from the Zavoral Site Well to what is required for dust control at the Site. Tiller's water use projection for dust control purposes is to pump less than 10,000 gpd at a rate of up to 1,200 gallons per minute (gpm). The total annual groundwater use would be less than 1 million gallons per year (mgy). This would keep the amount of groundwater use to a level below the threshold that requires a water appropriation permit from the MnDNR.

Pumping groundwater at the maximum rate of 1,200 gpm, would result in pumping for approximately 8 minutes per day to reach the maximum allowable daily water volume of 10,000 gallons. If the pumping rate were reduced to 500 gpm, the maximum allowable daily water volume would be obtained within 20 minutes of pumping.

The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers on the shallow Drift and Prairie Du Chien-Jordon Aquifers. Based on the aquifer test, it appears that area supply wells located to the west, southwest, and northwest of the Site that are screened in the shallow Drift or Prairie Du Chien-Jordan Aquifers would not be affected by pumping the Zavoral Site Well at the rates and volumes proposed for dust control purposes and allowable under law without obtaining a water appropriation permit. It should be noted that if a new well were installed at the Site and water were pumped from the shallow aquifers, the potential for impacts to area supply wells and surface water features would be more likely because pumping would be from the aquifer serving these resources.

Supply wells screened in the Franconia Aquifer could potentially be affected by pumping the Zavoral Site Well. The Zavoral Cabin Well is the closest well to the Zavoral Site Well that is screened in the Franconia Aquifer. The aquifer test indicated a drawdown of 0.25 feet (3 inches) caused by pumping the Zavoral Site Well during the first 15-minute period, which is the time required to reach the maximum projected daily volume of 10,000 gallons Tiller proposes to use. This represents 1/800th of the total water column present in that well. A decline of water level of 3 inches or less is considered insignificant given the capacity of the aquifer and the limited duration over which the decline would occur. The decline would begin to rebound once the pumping is stopped.

After 4 hours and 20 minutes of pumping, the drawdown in the Zavoral Cabin Well was 3.5 feet, which represents less than 1/50th of the total water column in that well. Other supply wells located farther from the Zavoral Site Well would experience even less drawdown. No aquifer test-related drawdowns were observed in the other two monitored wells, Trails End Well and Magnuson Well. It should be noted, the total volume of water pumped during the aquifer test was 172,600 gallons, or more than 17 times the maximum amount of water the Tiller would use daily during its seasonal operations at the Site and was sufficient to address potential impacts.

The potential for effects on area surface water features is described in Section ES 2.6.

Alternative 1 – Mining 5- to 10-Year Operation

No significant impacts to area supply wells, groundwater resources, or surface water features are projected to occur based on water use for dust control purposes. The total volume of groundwater that could be pumped over the maximum period of operation would be 10 million gallons (1 mgy for 10 years). As a result, the total volume of pumping over the life of the Project may be greater than Alternative 3; however, due to the mining occurring for fewer weeks per year, the annual volume of water use could be less than for Alternative 3 (with none of the alternatives being allowed to use more than 10,000 gpd). Water management, operational measures, and weather conditions would influence the quantity of water used for dust control both on a daily and annual basis.

Alternative 2 – No-Build Alternative

No mining at the Site would occur, so no mining-related water use would result. Tiller has indicated that the property owner has no plans to abandon the well regardless of whether the mining would occur.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

No significant impacts to area supply wells, groundwater resources, or surface water features are projected to occur based on water use for dust control purposes. The total volume of groundwater that can be pumped over the maximum period of operation would be 5 million gallons (1 mgy for 5 years). As a result, the total volume of pumping over the life of the Project may be less than Alternative 1; however, due to the mining occurring for more weeks per year, the annual volume of water use could be more than for Alternative 1 (with none of the alternatives being allowed to use more than 10,000 gpd). Water management, operational measures, and weather conditions would influence the quantity of water used for dust control both on a daily and annual basis.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

No significant impacts to area supply wells, groundwater resources, or surface water features are projected to occur based on water use for dust control purposes. The total volume of groundwater that could be pumped over the estimated 1 year of operation would be 1 million gallons; however, due to mining occurring for more weeks during this year, the annual volume of water use could be more than the other alternatives but could not exceed 10,000 gpd.

ES 2.7 Water-Related Land Use Management Districts

Water-related land use management districts for the Site are the CMSCWD, the Washington Conservation District (WCD), and the St. Croix River District.

Tiller would be required to obtain a Permit for Stormwater Management from the CSCWD prior to operation that requires a stormwater plan to be submitted to the CSCWD for review and approval. To meet CMSCWD permit requirements, the Project would not be allowed to increase peak flow discharge rates to off-site areas, would not be allowed to increase the runoff volume discharge off-site, and would be required to implement appropriate BMPs. The Project would need to meet all of these requirements through on-site infiltration and would not be allowed to increase the level for duration of bounce in downstream waterbodies.

Based on the fact that no jurisdictional wetlands were identified within the mining and reclamation area (NRC 2010), it is not anticipated that any permits would be required under the programs managed by the WCD.

Tiller proposes to conduct reclamation activities on approximately 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the St. Croix Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6. This work should be monitored for compliance with regulatory requirements.

The potential for impacts to area surface water bodies is described in other sections of this summary. The Project is consistent with water-related land use management district regulations.

ES 2.8 Solid Waste, Hazardous Waste, and Storage Tanks

Sanitary and Solid Waste

Tiller does not propose to install permanent sanitary waste facilities. Instead, portable sanitary waste facilities would be used and managed by a licensed contractor. It is anticipated that very little solid waste would be produced at the Site and that a waste container within the on-site trailer would be sufficient for waste collection. This would be collected by a Tiller employee on a daily basis during periods when work is occurring at the Site and disposed of at Tiller's Maple Grove facility where waste is picked up by a licensed solid waste hauler for disposal at a licensed waste facility. In the event that increased waste disposal was needed, a dumpster managed by a licensed waste hauler could be brought to the Site.

Hazardous Waste

No hazardous wastes are expected to be generated at the Zavoral Site. Hazardous materials at the Site would be limited to Materials of Trade (MOTs) carried in a service truck, which would come to the Site to perform routine maintenance on operating equipment. The service truck would take all used fluids and filters from the Site where they would be properly disposed of at the operator's main shop. The service truck would carry a spill containment kit.

Other materials that are not considered hazardous but are expected to be on-site during operations include engine oil, grease, hydraulic fluid, and anti-freeze. The materials would be stored in the on-site trailer in compliance with state, county, and city requirements and regulations.

Storage Tanks

The only material that may be stored in on-site tanks during operation would be diesel fuel. However, Tiller expects that diesel fuel would primarily be brought on-site by a bulk delivery truck that would directly fuel the operating equipment. In the event that fuel storage would be necessary, storage would be in a single 1,000-gallon mobile tank in compliance with state, county, and city requirements and regulations. This tank would be located within the active mining or reclamation phase.

Alternative 1 – 5- to 10-Year Operation

The generation of solid waste, use of MOTs, and delivery and/or storage of diesel fuel would occur during the 5 to 10 years of operation. If a diesel storage tank is not used at the Site, these activities would occur only when mining and/or reclamation activities take place. If diesel is stored at the Site, the tank could remain there for up to 10 years.

Alternative 2 – No-Build Alternative

The No-Build Alternative would have no impact on solid waste, hazardous waste, or storage tanks because no mining or reclamation activities would take place within the Site.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

If diesel fuel is not stored in a tank at the Site, the generation of solid waste, use of MOTs, and delivery of diesel fuel would occur during the 3.3 to 5 years of operation, but either more frequently or for longer

durations or a combination of both. If diesel is stored at the Site, the tank could remain there for up to 5 years.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

If diesel fuel is not stored in a tank at the Site, the generation of solid waste, use of MOTs, and delivery of diesel fuel would occur during the approximately 1 year of operation, but either more frequently or for longer durations or a combination of both. If diesel is stored at the Site, the tank could remain there for approximately 1 year.

ES 2.9 Traffic

Raw aggregate material mined at the Zavoral Site would primarily be transported to the Scandia Mine. In some cases, it would be transported directly to construction project sites at currently unidentified locations. The Scandia Mine currently uses or processes add-rock material that is transported to the Scandia Mine from various locations. Included are Class A, B, and C aggregate material that fall into two basic categories:

- Material hauling that would not change regardless of whether the Zavoral Site is permitted
- Material hauling that would change if the Zavoral Site is permitted

These categories are described in detail below.

Material hauling that would not change regardless of whether the Zavoral Site is permitted

Class A Aggregate: Class A aggregate hauled to the Scandia Mine consists of basalt from the Dresser, Wisconsin, area and granite from the St. Cloud, Minnesota, area. Historically, this has typically consisted of up to 30 round trips on a typical day for up to 3 days a week (90 round trips a week). The route from Wisconsin is east on TH 243, to south on State Scenic Byway TH 95, to west on TH 97, to north on County Road (CR) 1 (Lofton Avenue), to the Lofton entrance of the Scandia Mine. The route from St. Cloud is the regional system (TH 61 and Interstate 35E), then east on TH 97 to north on CR 15A (Manning Trail). These routes are reversed for return trips.

Class B Aggregate: The number of trucks hauling limestone is up to 30 round trips on a typical day for up to 3 days a week (90 round trips a week). There are two haul routes. One route is from the Bayport, Minnesota, area; trucks hauling limestone travel north on CR 15 and CR 15A (Manning Trail) to the Scandia Mine. The other route is from the west from the Burnsville, Minnesota, area; trucks hauling limestone travel the regional system (TH 61 and Interstate 35E), then east on TH 97 to north on CR 15A (Manning Trail). These routes are reversed for the return trips.

Material hauling that would change if the Zavoral Site is permitted

Class C Aggregate: Tiller currently imports Class C aggregate from Franconia Township, Minnesota, and the Osceola, Wisconsin, area. The existing Class C aggregate haul routes are concentrated on both State Scenic Byway TH 95 (north), CR 1 (from the south), and TH 97. Tiller has made the commitment that the Zavoral Site would be the only source of Class C aggregate for the Scandia Mine if the Zavoral Site were permitted until the material from the Zavoral Site was exhausted. This is because the

Zavoral Site is closer to the Scandia Mine than the Franconia or Osceola sources and, as a result, is less costly to haul.

The Class C aggregate haul routes currently used are:

- Franconia Township, Minnesota – from the intersection of Sugar Bush Trail N. and State Scenic Byway TH 95 in Franconia Township, to south on State Scenic Byway TH 95, to west on TH 97, to north on CR 1 (Lofton Avenue), to the Lofton entrance of the Scandia Mine, with return trips reversing this route.

- Osceola, Wisconsin, area – trucks typically cross the river at TH 243 from Polk County, which is the closest river crossing to south on State Scenic Byway TH 95, to west on TH 97, to north on CR 1 (Lofton Avenue), to the Lofton entrance of the Scandia Mine, with return trips reversing this route.

These hauling activities have generated a maximum of 265 loads (530 trips) a day with an average of 190 loads (380 trips) a day. The current haul route is approximately 13.5 miles long in Minnesota.

Proposed Haul Route

The proposed haul route from the Zavoral Site to the Scandia Mine is approximately 6.5 miles long. Material would be hauled directly from the Zavoral Site to the Scandia Mine on TH 97 (**Figure 4**). The impacts of alternatives on traffic operations and safety were evaluated on the following roadways:

- TH 97 from Manning Trail to State Scenic Byway TH 95

- State Scenic Byway TH 95 from 220th Street to 209th Street

- Manning Trail and Lofton Avenue from TH 97 to the Scandia Mine entrance

- Intersections within the study limits

- Scandia Elementary School Entrance

Under Alternatives 1 and 3 and Subalternative 3A, truck traffic currently traveling to and from the Scandia Mine along TH 97, State Scenic Byway TH 95, and TH 243 would be replaced by the direct routes between the Zavoral Site and Scandia Mine. While the Zavoral Site is in operation, Tiller would not haul Class C add-rock to the Scandia Mine from Franconia or Osceola. As a result, in Minnesota, TH 243 and State Scenic Byway TH 95 north of TH 97 would no longer carry this traffic, a distance of approximately 7 miles.

In addition to mining, reclamation would be occurring at the Site resulting in a maximum of 300 trucks (600 trips) a day with an average of 167-200 trucks (334-440 trips) a day. Employee and maintenance transportation at the Zavoral Site would be minimal.

Safety Evaluation

The safety of the roadway system was evaluated by obtaining and reviewing the most current 3 years of crash reports, geometrics and operations, and site reviews.

The study area roadway system includes trunk highways, county roads, and local roads that provide access to all vehicles for local and regional travel. Based on the traffic analysis completed for this EIS, the Trunk Highway system has sufficient capacity for the traffic volumes in the area and meets Minnesota Department of Transportation (Mn/DOT) requirements for sight distance (including the TH 95 and TH 97 intersection). Under Scenarios 1, 3 and Subalternaitve 3A, the level of service (LOS) analysis showed that the intersection has sufficient gaps for traffic, even during the morning and evening "rush hour" and similar conditions. The county and local roads also meet the county design criteria for rural traffic. The details of the crash analysis are described below. No significant crash problems were identified in the study area during the 3-year period (~~2008–2010~~2009-2011). Mn/DOT provided updated crash data for the Scandia area for roadway segments and intersections.

The segment crashes are relatively small in number and include run-off road and deer collision crashes. Segment crashes are defined as crashes that occur on a section of roadway between intersections (but not including the intersection). These are typical for rural areas. There appear to be no major contributing factors in terms of roadway geometry and operations. Mn/DOT has reviewed the sight distance at the TH 97 and State Scenic Byway TH 95 intersection and found no deficiencies. TH 97 was rehabilitated in 2007 and the sight distances met Mn/DOT standard requirements at the 55 mph speed limit. State Scenic Byway TH 95 was rehabilitated in 2009 and the sight distances met Mn/DOT standard requirements at the 55 mph speed limit. A crash analysis was completed for four road segments using data from 2009 through 2011 provided by MnDOT. The road segments were:

- TH 97 Manning to Lofton
- TH 97 Lofton to Olinda
- TH 97 Olinda to TH 95
- TH 95 220th to Oakhill

The analysis showed that crash rates for all of the road segments on TH 97 and TH 95 were well below the statewide average for similar roads.

A crash analysis was completed for four intersections using data from 2009 through 2011 provided by MnDOT. The intersections were:

- TH 97 and Lofton
- TH 97 and Oakhill
- TH 97 and Olinda
- TH 97 and TH 95

The analysis showed that crash rates for all of the intersections were well below the statewide average for similar roads.

A high number of crashes (8) occurred in 2008 at the TH 97 and Lofton intersection. Additional review of the above crash data for the TH 97 and Lofton intersection showed the following:

1) There were 16 crashes in a 6 year period, 2006 – 2011.

Table 3A: Crash Numbers at TH 97 and Lofton

Year	Number of Crashes
2006	0
2007	3
2008	8
2009	1
2010	3
2011	1

2) No pattern was observed in the 16 crashes that indicated a problem with the road or intersection design.

3) No gravel trucks or semi-trucks were involved in any of the crashes at TH 97 and Lofton.

Based on data from 2006 to 2011, the high crash rate in 2008 appears to be an anomaly not directly associated with existing traffic patterns.

~~The intersection crash data collected for the typical 3-year period when evaluating such data is generally low at most intersections. The TH 97 and Lofton intersection had the highest number of crashes during the 3-year period (12 crashes), including five right angle crashes. The TH 97 and Lofton intersection was part of Mn/DOT's resurfacing project. The crashes were likely caused by drivers erroneously turning in front of vehicles on TH 97. Concern about speeding on TH 97 is an enforcement issue that requires the attention of the State Patrol. A review of the data does not show involvement of semi-trucks in the area crashes. The data captures actual crashes and does not record near-miss or other close call data.~~

One fatal crash occurred just north of the TH 97 and State Scenic Byway TH 95 intersection in 2006 that involved a pedestrian. This data was not provided in the initial crash reports obtained from Mn/DOT because the incident occurred outside of the typical 3-year crash data collection window. A concerned resident provided information at a PAC meeting regarding a pedestrian struck by a semi-truck. The State Patrol investigated the crash and found that it was caused by the pedestrian walking in front of the truck and the driver was unable to stop in time.

A single-vehicle crash involving an overturning gravel truck occurred in 2012 at the intersection of TH 95 and TH 97. This crash fell outside of the 2006-2011 data used in the above analysis.

Area residents may choose to avoid the intersection by traveling on other local roads and may currently be using other routes to avoid truck traffic on State Scenic Byway TH 95 and TH 97. The area street network has the physical capacity to handle additional traffic.

Scandia Elementary School

Scandia Elementary School is located on the south side of TH 97 near Oakhill Road. School representatives were contacted by the City and they provided information on school bus operations, parent drop-off/pickup, and bike/walk patterns. The school does not cite any major concerns with traffic and safety on TH 97. The traffic operation, capacity, and safety were evaluated by AECOM for the school driveways (at TH 97 and Oakhill Road). The LOS analysis showed the morning peak was Level A and the afternoon peak was Level B. This indicates that sufficient gaps are present in traffic to allow buses and cars to access TH 97.~~No problems were identified with capacity or safety based on traffic volumes and turning movements out of the driveway.~~ The road segment near Scandia Elementary and the intersection of TH 97 and Oakhill Road are well below the MnDOT statewide average crash rate for similar roads. TH 97 includes a right-turn lane into the school and a bypass lane westbound around turning vehicles.

Impacts to Bicycle and Pedestrian Facilities

The City of Scandia Trail Plan presents near- and long-term improvement plans for trails in the area and connections to regional trails. The plan includes maintaining and improving the existing trail on TH 95 in the area of the Project, and a proposed pedestrian and bicycle trail on TH 97 west of the Project area. This EIS identifies measures that should be considered in relation to the Project.

Impacts Related to Recreation Area Traffic

The area along the St. Croix River is scenic and provides a range of recreational and scenic driving opportunities. William O'Brien State Park is located approximately 2.5 miles south of the Zavoral Site on State Scenic Byway TH 95. Recreation traffic is a component in increasing average daily traffic on TH 97 and TH 95 during the spring to fall timeframe. Mn/DOT data was recorded on TH 97 (at Automated Traffic Recorder station east of Lofton). The trunk highways have sufficient reserve capacity to handle the change in traffic volume for seasonal traffic. Periods of congestion may be experienced during peak weekend travel times or on a holiday weekend, with or without the Project.

Removing the current Class C hauling traffic from the river crossing at TH 243 and the portion of State Scenic Byway TH 95 north of the Zavoral Site should be beneficial to vehicles using these roadways to get to the state park or to enjoy other recreational opportunities in the area.

Alternative 1 – 5- to 10-Year Operation

The existing roadway network is sufficient to handle the daily traffic volumes in the area. TH 97 and State Scenic Byway TH 95 are state highways designed to accommodate regional traffic. The peak hour truck volumes are also within the capacity of the roadways.

Alternatives 1 and 3 have the same range of loads per day (334–440 projected trips with a maximum of 600 trips). The difference would be the length and duration of mining activity. Alternative 1 spreads the mining out over 5 to 10 years but would only operate hauls for a projected 6 to 12 weeks a year.

Current hauling patterns to the Scandia Mine require trucks to travel longer distances. Tiller has agreed not to haul Class C add-rock to the Scandia Mine from Franconia Township, Minnesota or the Osceola,

Wisconsin, area during the period that the Zavoral Site is active. As a result, in Minnesota, TH 243 (including the bridge to Wisconsin), and State Scenic Byway TH 95 north of TH 97 would no longer carry this traffic, a distance of approximately 7 miles.

Mn/DOT reviewed the proposed driveway location for the Zavoral Site and determined the intersection sight distance to meet their requirements. A northbound right-turn lane would be required to allow vehicles to reduce speed and move out of mainline traffic to turn. An acceleration lane on TH 97 was not recommended by Mn/DOT, as the trucks are not pulling into high speed traffic and the acceleration lane would be a high cost and high property impact.

Alternative 2 – No-Build Alternative

Alternative 2 (No-Build) is expected to maintain the current level of truck traffic on the roadways currently used. Alternative 2 is projected to have 210–558 trips with a maximum of 560 trips. The reduction in maximum trips per day is related to no reclamation of the Zavoral Site, resulting in a possible reduction of up to 40 trips a day for topsoil hauling.

Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation

Alternative 3 condenses the mining to 3.3 to 5 years, and the hauls would be projected to occur for 12 to 18 weeks a year. The add-rock haul impacts per day are limited by the maximum number of loads per day, which could be the same for all alternatives, but may be more likely to occur under Alternative 3 than Alternative 1 given the compressed Project timeframe. Under any scenario, the truck volumes are within the capacity of the study area roadway system.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

As a result of the compression of mining and reclamation to approximately 1 year, the traffic volumes and the typical hours of operation would need to increase in order to mine and transport the material from the Site within the reduced time period.

Estimated daily traffic volumes would increase under this subalternative. The maximum traffic levels estimated for Alternatives 1 and 3 are not likely to occur on a daily basis. However, limiting mining operations to 150 working days would require a consistently higher volume of truck traffic on each working day, and may require longer typical working days than Alternatives 1 and 3.

Based on 1.2 million tons of material and 23-ton haul trucks that would be required to move the amount of material within 150 working days, approximately 348 trucks or 696 trips could be expected per day. This is an increase from Alternatives 1 and 3 in which a maximum of 280 trucks or 560 trips are expected. Reclamation traffic is expected at a maximum of 20 trucks or 40 trips per day. This would result in an estimated peak traffic level of 736 trips per day under Subalternative 3A ~~v~~was compared with 600 trips per day under Alternatives 1 and 3. The LOS analysis showed that with the additional truck traffic sufficient gaps remain at the TH 97 and TH 95 to allow traffic to move through the intersection at an acceptable rate even during morning and evening rush hours.

Based on City regulations, the Project would be allowed to operate Monday through Friday 7:00 a.m. to 7:00 p.m. In the past, hauling operations have occurred from 7:00 a.m. to 7:00 p.m., but the average

workday has been 10 hours. Therefore an expected 10-hour workday was used for analysis in both Alternatives 1 and 3. The 150 working days would result in 12-hour workdays for Subalternative 3A in order to remove the aggregate within the reduced timeframe.

The Scandia Mine operates under a CUP issued by the City. Condition 14 of this permit requires Tiller to restrict truck traffic that imports add-rock to the Mine from using the CR 1 (Lofton Avenue) access during non-daylight hours. Tiller would not be able to comply with this current requirement to restrict the use of CR 1 (Lofton Avenue) access during non-daylight hours under Subalternative 3A.

ES 2.10 Air Emissions and Dust

AECOM completed an impact analysis related to Project air emissions and dust that included calculating maximum and mitigated emission rates, completing a modeling and deposition analysis to water and land, and evaluating potential ambient concentrations of crystalline silica from Site operations silica.

Modeling Analysis

An ambient air quality modeling analysis was used to predict the ambient air concentrations of particulate matter (PM), particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}), and particulate matter with an aerodynamic diameter less than 2.5 microns ($PM_{2.5}$). The PM modeling results were used to predict deposition of dust onto land, into the St. Croix River, and nearby creeks. The PM_{10} and $PM_{2.5}$ results were compared to the primary and secondary National Ambient Air Quality Standards (NAAQS) to determine if the emissions would cause or contribute to an exceedance of the NAAQS.

The Clean Air Act required the U.S. Environmental Protection Agency (USEPA) to set NAAQS for pollutants considered harmful to public health and the environment if present in sufficient concentrations. The NAAQS include two types of air quality standards.

- Primary standards protect the public, including the health of sensitive populations such as asthmatics, children, and the elderly.
- Secondary standards protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

The model predicted that the worst-case uncontrolled impacts from Project sources plus the addition of appropriate background concentrations would result in exceedances of the NAAQS for PM_{10} and $PM_{2.5}$.

The model predicted that the mitigated impacts (after implementation of the Tiller Fugitive Dust Control Plan) from Project sources (road dust and diesel exhaust) plus the addition of appropriate background concentrations would not result in exceedances of the NAAQS for PM, PM_{10} ,or $PM_{2.5}$.

Deposition Analysis

<u>Deposition to Land</u>

Deposition modeling was conducted for PM emissions to assess the impact of particulate deposition from the Project. Under normal conditions, only PM_{10} remains in the atmosphere long enough to be

considered atmospheric particulates. Therefore, use of PM_{10} for deposition analysis is appropriate for impacts to land and plants.

The uncontrolled emissions would have the potential to adversely impact vegetation around the Site. Following the implementation of mitigation techniques as described in the Tiller Fugitive Dust Control Plan, the concentrations of PM_{10} would be below the primary and secondary NAAQS. As noted above, the secondary NAAQS were established to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings. Since the deposition analysis shows the highest predicted concentration on any day, all other days would be predicted to have lower impacts. Therefore, it is unlikely that deposition would have an adverse impact on the surrounding land.

The results of the modeling analysis indicate that the uncontrolled PM emissions from the Site would have the potential to be above nuisance dust levels. The mitigated dust levels would be below these levels.

Deposition to Water

A deposition analysis was completed for potential impacts to the St. Croix River. The primary concern would be a significant increase in the amount of sediment in the river.

The maximum deposition of PM into the St. Croix River from the Project was determined by modeling the amount of PM that would be deposited into the river for a distance of 2,200 meters upstream and downstream from the Site under the maximum emission and deposition conditions. The worst-case uncontrolled 24-hour average deposition rate based on an average from the receptors in the above area would increase sediment loading by up to 3.7%. The mitigated average deposition rate would increase sediment loading by less than 0.2% under low flow conditions and by less than 0.01% under high flow conditions.

It is unlikely that fugitive dust would adversely affect the water quality in the St. Croix River under either uncontrolled or mitigated conditions given:

- A high degree of variability exists in the sediment loading in the St. Croix River.
- Maximum deposition conditions are projected to occur on 1 day per year.

A deposition analysis was completed for potential impacts to Zavoral Creek, Middle Creek, and South Creek. The maximum mitigated daily deposition rate would be:

- 1.7 lbs PM/day over the entire length of Zavoral Creek. This is the equivalent of approximately one handful of dust distributed over approximately 1.3 miles of creek length.
- 0.6 lbs PM/day over the entire length (~0.9 miles) of Middle Creek.
- 1.2 lbs PM/day over the entire length (~0.5 miles) of South Creek.

No data was found on the existing amount of silt in the three creeks. Therefore, an analysis of the percent increase in silt loading is not included.

Silica Analysis

~~The Occupational Safety and Health Administration has established a maximum exposure limit (MEL) of 300 micrograms per cubic meter (µg/m3) to silica expressed as an 8-hour time weighted average (TWA) for workers. The American Conference of Industrial Hygienists (ACGIH) has recommended a Threshold Limit Value - Time-Weighted Average Limit (TLV -TWA) of between 50 µg/m3 and 100 µg/m3 for the respirable fraction of the dust depending on the type of silica present. The ACGIH standard is also intended for workplace applications.~~

The Occupational Safety and Health Administration permissible exposure limit (PEL) (8-hour time weighted average (TWA)) for crystalline silica (as respirable quartz) is either 250 millions of particles per cubic foot of air (mppcf) divided by the value "%SiO_2 + 5" or 10,000 µg/m^3 divided by the value "%SiO_2 + 2." The OSHA PEL (8-hour TWA) for crystalline silica (as total quartz) is 30,000 µg/m^3 divided by the value "%SiO_2 + 2." The OSHA PELs (8-hour TWAs) for cristobalite and tridymite are ½ the values calculated above using the count or mass formulae for quartz.. The American Conference of Industrial Hygienists (ACGIH) has recommended a Threshold Limit Value - Time-Weighted Average Limit (TLV - TWA) of 25 µg/m^3 and the National Institute for Occupational Safety and Health .Recommended Exposure Limits for crystalline silica is.50 µg/m^3. The OSHA, ACGIH and NIOSH standards are intended for workplace applications.

The State of California has developed ambient guidelines for annual average concentrations to protect against chronic noncancer health effects for the general public, including those in the general population that are most sensitive. These are referred to as Reference Exposure Levels (RELs). California has developed an REL for respirable (i.e., $PM_{2.5}$) silica of 3 µg/m^3. The California standard used for the comparison to the projected ambient air concentration that the public would potentially exposed from the proposed Project Site.

At AECOM's request, Tiller completed an analysis of the crystalline silica content of the fine aggregate on the Site. The analysis was completed on the fine aggregate because this is the fraction that could become airborne. That analysis showed that 25% of the fine aggregate is crystalline silica.

~~Based on the results of the NAAQS modeling analysis, the uncontrolled emissions of dust would result in a maximum annual ambient air concentration of silica of 3.8 µg/m3. The mitigated emissions would result in a maximum annual ambient air concentration of silica of 0.26 µg/m3, which is well below the California silica guideline.~~

Alternative 1 – 5- to 10-Year Operation

The model predicted that the mitigated impacts (after implementation of the Tiller Fugitive Dust Control Plan) from Project sources plus the addition of appropriate background concentrations would not result in exceedances of the NAAQS for PM, PM_{10} ,or $PM_{2.5}$. The results of the modeling analysis indicate that the mitigated dust levels would be below these levels. It is unlikely that fugitive dust would adversely affect the water quality in the St. Croix River or nearby creeks. Mitigated emissions of dust would result in a maximum annual ambient air concentration of silica of 0.26 µg/m^3, which is well below the California silica guideline.

The impacts described could occur on any day when mining activities were being conducted at the maximum rates described. A reduction in the daily mining rate would result in lower impacts to the environment.

Alternative 2 – No-Build Alternative

The No-Build Alternative is based on the existing use continuing at the Site. The Site would remain as an unreclaimed open space and would not be a source of increased air pollutant emissions.

Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

The proposed mining rates do not vary between Alternatives 1 and 3. Since the ambient air quality analyses are based on annual and daily emissions, and the potential to emit (PTE) calculations for each mining phase represent the worst-case emissions while the facility is operating at maximum capacity, there would be no difference between the maximum or mitigated impacts between Alternatives 1 and 3.

The only differences between Alternatives 1 and 3 are that air emissions would occur for fewer years under Alternative 3 but may occur more frequently each year.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

The proposed mining rates would increase from a maximum of 6,720 tons per day under Alternatives 1 and 3 to an estimated 8,000 tons per day. The number of haul and reclamation trucks would increase to 368 per day. An additional excavator and front end loader might be needed to load the additional trucks. The increase in mining rate would result in higher daily and annual air emissions and deposition than Alternatives 1 and 3. ~~but rough calculations indicate that the maximum mitigated concentrations would likely remain below the NAAQS.~~ However, the ambient air quality modeling analysis for Subalternative 3A indicates that the maximum mitigated concentrations would remain below the NAAQS. Air emissions would occur over 150 working days rather than fewer days per year over a longer period under the other build alternatives.

For Subalternative 3A, the maximum annual ambient air concentration of silica of 0.37 µg/m3, which is also well below the California silica guideline.

ES 2.11 Noise

The following is based on noise monitoring and a model developed by Tiller's consultant David Braslau Associates Inc. and additional monitoring and modeling work conducted by SBP Associates, Inc.

Alternative 1 – 5 to 10 Years of Operation

Operations at the Site would not cause a net increase in L_{50} sound levels on the Riverway, but the noise from mining operations may be audible in the Riverway at maximum mining rates due to the frequency of the noise compared to ambient noise on the Riverway; however, sound levels do not exceed applicable standards.

Noise standards would be exceeded at a limited number of residences along TH 97 during maximum hauling conditions. However, the low and maximum traffic conditions (with the exception of Subalternative 3A) would not change as a result of the Project, and the noise impacts to residences and Scandia Elementary School are not predicted to change from current conditions. Noise levels when gravel hauling is occurring would be noticeably higher than during low noise traffic conditions.

The impacts described could occur on any day when mining activities were being conducted at the maximum rates described. Noise impacts would be reduced for receptors along TH 243, and State Scenic Byway TH 95 north of TH 97, which would not carry haul traffic from other Class C add-rock sources until the resources from the Zavoral Site are exhausted, a distance of approximately 7 miles. If the Zavoral Site were not permitted, it would not result in lower noise impacts to receptors along the haul route because the aggregate hauling would still occur to the Scandia Mine from other locations.

Alternative 2 – No-Build Alternative

Noise levels would not increase at the Zavoral Site. The No-Build Alternative would not result in lower noise impacts along the existing haul route because the aggregate hauling would still occur from other locations.

Alternative 3 – 3.3 to 5 Years of Operation

Because the noise analyses are based on 6-minute averages, and the noise estimates for each mining phase represent the worst case while the facility is operating at maximum capacity, there would be no difference between the maximum impact between Alternatives 1 and 3. The only difference between Alternatives 1 and 3 is that noise would be generated for fewer years at the Zavoral Site under Alternative 3, but may occur more frequently each year.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

Noise levels are expected to be somewhat higher than Alternatives 1 & 3 due to the additional trucks on-site necessary to achieve the higher mining rate. Noise would occur for a longer period over the days worked at the Site and could be higher due to the higher tonnage required to be mined over the 150 working days. During hauling periods, noise levels along the haul route would be higher than for Alternatives 1 and 3; levels would be expected to be higher than those experienced during peak hauling in the past, but would occur over an estimated 1-year period.

ES 2.12 Visual Impacts

Very little of the Site is visible from sensitive viewpoints at any location because past mining activities have lowered the Site terrain to elevations lower than the river bluff to the west and the rolling terrain to the east. Visibility of the Site is also strongly influenced by screening of the Site from tree stands during both seasonal leaf-on and leaf-off conditions.

Tiller's Mining and Reclamation Plan has incorporated screening elements such as berms and plantings, as well as reclamation strategies that help mitigate impacts to key viewing areas. Proposed and existing screening berms located along State Scenic Byway TH 95 and along the southwest perimeter of the Site occur within the 50-foot and 100-foot mining setbacks. The purpose of the berms is to screen the mining

and reclamation activities from nearby vehicle, bike, and pedestrian traffic in the area. Construction of the berms would occur as the Site is being developed and may include transplanting of native White pine trees from within the Site to provide additional screening.

The potential was evaluated for Project activities to be visible from or near sensitive viewpoints on State Scenic Byway TH 95, along the west side of the Site, TH 97, a bike path along TH 95, residences accessed from the highway, and from within the St. Croix Scenic Riverway, including high bluffs along the Wisconsin side of the Riverway.

The Project would not be visible from the Riverway or from the Wisconsin bluffs on the east side of the river. No part of the Project Site is visible from the river, which is located at a lower elevation than the Site. Bluffs vegetated with stands of trees (with an estimated height of 60 feet) along the east side of the Site block all views of the Site from any location on the river. The vegetated bluffs also block views from the bluffs on the Wisconsin side of the river. In general, views of the Site interior from Wisconsin are either not present or very difficult to discern through the filtering of distance and vegetation. There are few sensitive viewing areas that provide unimpeded views of the Site during either seasonal leaf-on or leaf-off conditions.

As shown in the photographic simulations for the three key viewpoints on the bike path along TH 95, TH 97, and State Scenic Byway TH 95, the effects on existing scenic integrity and scenic attractiveness would be negligible. No change would occur in the scenic integrity of the Site as viewed from the key viewpoints, as portions of the existing Site have already been modified by past mining activities.

Alternative 1 – 5- to 10-Year Operation

The majority of the visual impact of the Project would result from short-term Site preparation activities. Short-term direct effects to the visual character of the analysis area would result from Site preparation activities and early reclamation activities. Site preparation activities include realignment of the Site access and construction of a turning lane, internal main haul road construction, construction of screening berms, and tree removal.

In general, long-term effects of mining and reclamation activities would be not be visible or would be partially visible from sensitive viewpoints. This is because the interior Site terrain would be further excavated to a lower elevation than adjacent properties, which would limit visibility into the Site. In addition, views of the Site are blocked by tree stands in both leaf-on and leaf-off conditions as viewed from the bike path, TH 97, State Scenic Byway TH 95, and nearby residences.

In summary, little change would occur in the scenic attractiveness of the overall landscape viewed from any sensitive viewpoint or area during mining activities due to complete or partial screening of proposed activities by existing landforms and vegetation or by proposed berms. When mining and reclamation phases are complete, the Site would be restored to a natural landscape appearance, which could enhance the scenic attractiveness of the Site.

Alternative 2 – No-Build Alternative

Under the No-Build Alternative, no impacts would occur to visual resources as the Project would not be developed. The area would remain unreclaimed. Future agricultural or rural residential land use would need to comply with the City comprehensive plan and zoning.

Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

The visual impacts under Alternative 3 would be identical to those described for Alternative 1 but would occur over a shorter period of time. This would result in more mining occurring for more weeks each year and more material being mined per year. These activities would be completely or partially screened by existing landforms or vegetation. As described for Alternative 1, no significant impacts were identified.

Subalternative 3A – Reduced Timeframe 150-Working Day Operation

The visual impacts under Subalternative 3A would be identical to those described for Alternative 3 but would occur over a shorter period of time. This would result in more mining occurring for 30 weeks over approximately 1 year. These activities would be completely or partially screened by existing landforms or vegetation. As described for Alternative 3, no significant impacts were identified.

ES 2.13 Scandia Mine

Operations at the Scandia Mine would not change as a result of bringing add-rock material from the Zavoral Site to the Mine. As a result, there would be no change in the effect on fish, wildlife, and vegetation at the Scandia Mine as a result of the Project.

Subalternative 3A would result in higher traffic volumes at the Scandia Mine for more hours a day than is currently experienced. The Scandia Mine operates under a CUP issued by the City. Condition 14 of this permit requires Tiller to restrict truck traffic that imports add-rock to the Mine from using the CR 1 (Lofton Avenue) access during non-daylight hours. Tiller would not be able to comply with this current requirement to restrict the use of CR 1 (Lofton Avenue) access during non-daylight hours under Subalternative 3A.

ES 3 POTENTIAL MITIGATION MEASURES

This section summarizes potential mitigation measures that were identified to reduce the impact of the Project. The following potential mitigation measures have been identified and would be considered as possible conditions of any future CUP for the Project should it be approved:

ES 3.1 Reclamation

Tiller would need to include a reclamation plan in its CUP application. The City would use this EIS and recommended mitigation measures to review the plan. The reclamation plan must meet City ordinance requirements and must result in successful reclamation. The City may need to amend the definition of "topsoil" in its Development Code to permit the use of the mitigation approaches discussed in this EIS.

Section 5.1 provides a list of related to soils, Site preparation, weed mix, seeding methods, cover crops, tree planting, invasive species control, and similar items that Tiller would be required to address in their

reclamation plan included in a CUP application if the Project proceeds. Other reclamation mitigation measures are:

- Require Tiller to provide a funding mechanism to conduct any and all required monitoring at the Site.
- Require a vegetation establishment and monitoring period of at least 5 years after completion of the Project.
- Develop an adaptive management plan to address long-term management issues.
- Identify the responsible party and funding source for active long-term stewardship of the Site. Monitor the proposed transplanting of native White pine trees to verify maintenance and watering and to assess survival rates. If survival rates do not fall within a predetermined range established by the City, replacement trees should be provided by Tiller.
- Establish specific criteria for measuring and defining reclamation success that are acceptable to the City (i.e., percent cover requirements for seeded native species; limits on aggressive native species, invasive and exotic species, and so on). The diversity of the proposed reclamation must be met in order for the cover type and wildlife habitat evaluations in this EIS to be acceptable.
- Specify actions that would be taken by Tiller if reclamation were determined not to be successful and conditions under which reseeding, overseeding, and/or spot seeding or other management methods would be required.

ES 3.2 Bicycle and Pedestrian Facilities

The City of Scandia Trail Plan presents near- and long-term improvement plans for trails in the area and connections to regional trails. The following measures should be considered in relation to the Project.

- Tiller should provide funds to improve the existing pedestrian/bicycle trail along TH 95 in the mine area, and establish connecting to existing trails.
- The proposed trail on TH 97 is planned as an off-road trail to be constructed in the long-term plan. The proposed trail on State Scenic Byway TH 95 is also an off-road trail. The trail crossing at TH 97 and TH 95 is in the long-term plan. If a crossing is placed at this location while the Zavoral Site is operational, advanced signing for the trail crossing should be added.
- A trailhead is shown at TH 97 and State Scenic Byway TH 95. If the Zavoral Site is operational, the location of the trailhead should be relocated due to the proximity of the intersection to hauling vehicles.
- New crossings on TH 97 at Oakhill Road and Ozark Avenue are called out for design with traffic controls. This would most likely be some type of warning flashers, not traffic signals. The City may want to delay installing crossings at these locations until the mining is complete.

ES 3.3 Other Mitigation

- Require Tiller to provide a funding mechanism to conduct any and all required monitoring at the Site.
- Construct the berm on the south end of the Site as close to the mining and reclamation limits as possible. This would result in lower off-site peak flow rates and increased on-site infiltration.
- Require Tiller to keep records of when the Zavoral Site Well is pumped, and provide these to the City, Washington County Department of Public Health and Environment and the MnDNR for groundwater monitoring activities. This should document both the daily use and total annual pumped volume from the Zavoral Site Well. The daily total should not exceed 10,000 gallons at a maximum pumping rate of 1,200 gpm. The total annual pumping should not exceed 1,000,000 mgy.
- Require that the WCD monitoring point installed for the pump test and collection of baseline data in Zavoral Creek be monitored during the lifetime of the Project. This monitoring should be funded by Tiller.
- Monitor the Black ash swamp seepage subtype wetland boundary mapped by CCES (CCES January 2010) that established the baseline boundary of the seep along Zavoral ravine. This monitoring should be funded by Tiller.
- Although no Blanding's turtles were identified at the Site, the MnDNR has requested that Blanding's turtle mitigation measures be applied to the Project. These measures are included in **Appendix C**.
- Require Tiller to monitor all on-site construction equipment for leaks and receive regular preventive maintenance. Fueling and maintenance of vehicles would occur within the active mining phase and no "topping off" of vehicle fuel tanks should be allowed.
- Require that any aboveground storage tank (AST) at the Site to be located more than 500 feet from surface water to reduce the potential for impacts to surface water.
- Notify the Minnesota Pollution Control Agency about all ASTs within 30 days of installation by submitting an AST Notification Form.
- Require Tiller to sample and analyze groundwater for diesel range organics. If it is ever determined that gasoline is to be stored on the Site, gasoline range organics and benzene should be added to the analyte list.
- Construct the new driveway access directly across from TH 97 as required by Mn/DOT for safe access.
- Require Tiller to record and report the number and source location of trucks hauling add-rock to the Scandia Mine to ensure that additional truck traffic would not result from hauling from the Zavoral Site at peak demand concurrently with other Class C add-rock sources.
- Install MMUTCD compliant truck warning signs on State Scenic Byway TH 95 to advise drivers of trucks crossing TH 97 in and out of the Zavoral Site. The installation of warning flashers is another option but should be discussed with Mn/DOT to evaluate the safety impacts.

- Monitor the mitigation methods used at the Site to reduce emissions of fugitive dust for the life of the Project. Records of the sweeping and water application would be maintained to document the fugitive dust control measures. The City should require Tiller to provide a funding mechanism to conduct any and all City-required monitoring at the Site to confirm that sufficient dust control measures are being implemented.

- Require Tiller to identify methods to control tracking on public roadways as part of their Dust Control Plan.

- Require noise mitigation techniques, such as developing berms and screens for the Zavoral Site, are implemented. Tiller should provide a funding mechanism for monitoring.

- Require the use of broadband alarms for Tiller equipment and an on-site circular traffic pattern for haul trucks.

- Monitor to ensure that the proposed screening and reclamation strategies are successfully implemented.

- Establish a maximum stockpile height limit of approximately 880 feet mean sea level. Stockpiles limited to this elevation would be effectively screened by proposed and existing berms. Locating stockpiles on the west side of the Site should be minimized, as the upper slopes of stockpiles would have a greater potential to be within the viewsheds of sensitive viewpoints.

- Limit non-daylight lighting to what is required for safety and security. All such lighting should consist of shielded, downward directed lighting.

- Require that all trees be inspected for raptor nests prior to any tree clearing.

- Require Tiller to coordinate with the City regarding which berms would be removed after the project is completed.

ES 4 AREAS OF CONTROVERSY

ES 4.1 EIS Timing and Comprehensive Plan

Take Action - Conserve Our Scandia (TA-COS) is a group of concerned residents that are opposed to the development of the gravel mine on the Zavoral property. TA-COS's stated mission is "To promote sustainable development in Scandia while endorsing conservation of its waters, wildlife, natural and historic resources and beauty, referring to the Scandia Comprehensive Plan as its visionary guide."

In appearances before the Scandia City Council on November 16, 2010, and December 7, 2010, and in letters dated November 23, 2010, and December 6, 2010, TA-COS raised two primary objections to allowing Tiller to continue its application for the CUP.

First, the TA-COS representative stated that Tiller failed to meet its obligation to complete the EIS within 280 days as required by Minn. Stat. § 116D.04. 2A(h).

Second, the TA-COS representative stated that the Scandia City Code now prohibits mining on the Zavoral property and Tiller is not entitled to rely on prior zoning codes (Development Code, Chapter 2, Sections 1.3 and 2.4).

In regard to the first item, the City granted the extension in time to prepare the EIS. This is not an uncommon situation and the proposer and RGU were in agreement on granting the extension.

In regard to the second item, the City maintained its position to treat Tiller's 2008 application under the comprehensive plan and ordinances effective at the time of Tiller's application. The Zavoral Site and the Scandia Mine are both within the Agriculture District established in the City's 2020 Comprehensive Plan, which was the adopted plan at the time of Tiller's CUP application. The adopted Development Code at the time of the application included mining as an allowed conditional use in the Agriculture District.

ES 4.2 National Park Service Request

NPS has requested that soundscapes, traffic, and slope stability be added as controversial issues. The soundscape of the Lower St. Croix National Scenic Riverway, and related impacts are addressed in Section 4.15 of this EIS. Traffic impacts are addressed in Section 4.13, and slope stability is addressed in Section 4.11 of this EIS.

ES 4.3 Previous Mining Project and Reclamation

PAC members provided historical information regarding the previous mining activities on the Site, including correspondence indicating that reclamation was completed in 1998. Those activities were conducted under a CUP issued by Washington County for a different mining project when the County was the zoning authority for the Site. The County's regulations and the CUP for the previous use on the Site are not applicable to a proposed new mining operation or any other new use that might be proposed for the Site.

The City of Scandia is now the zoning authority for this Site and has adopted new standards for mining operations and reclamation. Tiller would be required to obtain a new CUP to operate a mine on this Site. The CUP would include requirements for operation and reclamation of the new project.

ES 5 ISSUES TO BE RESOLVED

The purpose of this EIS is to provide decision-makers, consisting of the Scandia City Council and other permitting agencies, with the information required to determine if the Project were to have significant impacts and which of the alternatives should be selected:

- Alternative 1 – 5- to 10-year Operation
- Alternative 2 – No-Build
- Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation
- Subalternative 3A – Reduced Timeframe 150-Working Day Operation (approximately 1-year operation)

These alternatives are described in Section 3.0 of this document.

Section 4.0 of this document identifies the present environment, effects of the alternatives, and mitigation measures.

1.0 PROJECT DESCRIPTION

1.1 PROJECT OVERVIEW

1.1.1 Project Description

The Tiller Corporation, Inc. (Tiller) proposes to operate a gravel mine on the site of a dormant, unreclaimed gravel mine in the City of Scandia, Washington County, Minnesota. The 114-acre site (Zavoral Site or Site) is located along St. Croix Trail North (State Trunk Highway [TH] 95), a State Scenic Byway near its intersection with TH 97. Tiller proposes to mine and reclaim 64 acres of the 114-acre Site. Of the 64 acres proposed for mining and reclamation, 55 acres were previously mined. An unmined 9-acre area is also included in the proposed mining area (**Figures 1 and 2**).

Tiller prepared a Conditional Use Permit (CUP) Application for the Zavoral Mining and Reclamation Project (or Project; Tiller November 2008). The City's Development Code required that Tiller prepare an environmental assessment worksheet (EAW) for the Project as part of the CUP Application. An EAW was prepared per Minn. R. ch. 4410.4300 (Sunde Engineering 2008). The City of Scandia was the Responsible Governmental Unit (RGU) for the preparation and review of the EAW. On March 3, 2009, the City Council determined that the Project had the potential for significant impacts and that an Environmental Impact Statement (EIS) was needed to determine the Project's potential for significant environmental impacts.

City, County, and State regulations would govern the proposed mining use on the Site:

- The Site is located within the City of Scandia and partially within the Lower St. Croix National Scenic Riverway (Riverway) as designated under the Wild and Scenic Rivers Act (Public Law 92-542 as amended; 16 U.S.C. 1271-1287; WSRA) and Minnesota Statute (Minn. Stat.) 103F.351 **(Figures 2 and 3)**. Minn. R. ch. 6105.0370 § 9 prohibits sand and gravel operations within the St. Croix River District Zone and scenic easement area. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the St. Croix Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6.

- The City of Scandia's Development Code and Mining Ordinance require that Tiller obtain a CUP to operate a mine on the Site.

- The protection of resources within these jurisdictions is guided by the City of Scandia Comprehensive Plan, the City's Development Code, and the Cooperative Management Plan (CMP).

- The Washington County Comprehensive Plan also describes a scenic easement that is partially within the Site. However, the proposed mining area is located outside these limits.

Tiller proposes to develop the gravel mine in phases. Active mining would occur to an average depth of 15 feet, (ranging from approximately 10 to 70 feet deep). Tiller does not propose to excavate below the groundwater table and would maintain the required minimum 3-foot separation from the bottom of the excavation and the groundwater table. The depth from the maximum depth of the mining excavation to groundwater would range from approximately 25 to 50 feet. Reclamation of the Site would take place in

phases that would occur concurrently with mining. Post-reclamation, the depth from ground surface to groundwater would range from approximately 45 to 78 feet.

Gravel would be excavated at the Zavoral Site, loaded into trucks, and transported, primarily to the existing Scandia Mine (or Mine) located between Lofton Avenue and Manning Trail just north of 218th Street in the City of Scandia (**Figure 4**). The Scandia Mine is also operated by Tiller. Material from the Zavoral Site would be mined as pit-run material and used as add-rock to provide material that would meet the specified gradations of marketable aggregate at the Scandia Mine. Some of the material mined at the Zavoral Site may also be transported directly to construction project sites or other facilities for use and/or processing.

Add-rock – rock of certain size ranges or quality that is not available at a facility but is needed to meet specifications for the production of various aggregate products made at the facility or pit-run material.

Pit-run material – gravel as it occurs in natural deposit.

The add-rock from the Zavoral Site may be processed at the Scandia Mine or may be used without processing. Tiller plans to use the material from the Zavoral Site to replace material currently transported to the Scandia Mine from various locations, the most recent being from Franconia Township in Minnesota and from the Osceola area in Wisconsin.

The Zavoral Site was actively mined by multiple operators from the 1960s through the 1980s. Previous mining operations included topsoil and overburden removal; aggregate extraction, crushing, and washing; hot mix asphalt production; material stockpiling; and hauling materials from the Site. The mine operated at the Zavoral Site was taken out of production in the 1980s. Production equipment was removed, but the Site was not reclaimed. Stockpiles remaining on the Site have been used as a source of aggregate. Much of the material in the stockpiles has been removed over the last 8 to 10 years, but irregular landforms remain.

The Scandia Mine operates under an existing CUP (2008 and Annual Operating Permit [AOP] approved by the City of Scandia. The AOP for the Scandia Mine (City of Scandia March 2011), shows that 123,380 tons (2009) and 131,000 tons (2010) of add-rock were brought to the Scandia Mine. Tiller verbally confirmed that this consisted entirely of Class C add-rock (see Section 4.13 for definition). EAWs were completed for mining and processing operations on the Scandia Mine in 1987 and updated to reflect operation changes in 1999.

1.1.2 Revised Mining Proposal

The Project proposal addressed in this EIS is different from Tiller's original proposal as described in the EAW and the original Scoping Decision Document (SDD; City of Scandia April 2009).

Tiller originally proposed to use the existing Zavoral Site Well for processing and gravel washing activities as part of their Project proposal. As part of the coordination conducted with the Minnesota Department of Natural Resources (MnDNR), AECOM determined that Barton's water appropriation permit had expired. As part of previous mining activities at the Site, Barton Construction operated the Site's multi-aquifer bedrock well (Minnesota Unique Number 00210498), referred to as the Zavoral Site Well for purposes of this EIS. Available well records show that the Zavoral Site Well is cased to a depth of 245 feet and is

completed as an open hole in two aquifer systems, the Franconia-Ironton-Galesville Aquifer and the Mt. Simon Aquifer, to a total depth of 648 feet. More information on water use and the Zavoral Site Well is presented in Section 4.7 of this document.

The 1989 Minnesota Ground Water Act strictly limits new water use permits in the Mt. Simon-Hinckley Aquifer in a metropolitan county (Minn. Stat. § 103G.271 4a). The intent of the law is to protect use of the Mt. Simon-Hinckley Aquifer for drinking water purposes in metropolitan counties and prohibit use of this resource for lower priority and nonessential purposes such as lawn watering. A potential renewal of the water appropriation permit for the multi-aquifer Zavoral Site Well would be carefully evaluated by the MnDNR.

Tiller's analyses of the Zavoral Site noted that reinitiating the use of the Zavoral Site Well at the levels the well is capable of producing would require significant investment to address MnDNR water appropriation permit requirements. Tiller has an existing Water Appropriation Permit for mining and processing activities at the Scandia Mine. As a result of this and additional material analysis conducted by Tiller as described below, the SDD was revised (City of Scandia January 2010) to reflect Tiller's revised proposal.

The changes in the Tiller proposal are summarized below.

1.1.2.1 Water Use and Processing

As previously described, Tiller has determined that the material mined at the Zavoral Site could be used without being processed at the Zavoral Site. Instead, that material would be transported as add-rock, primarily to the Scandia Mine to provide material that would meet the specified gradations of marketable aggregate.

Tiller revised their Project proposal to eliminate all aggregate processing activities (including washing) at the Zavoral Site. More information on Tiller's proposed mining operations and reclamation plan is included in Section 3.1 of this document.

1.1.2.2 Alternatives

Tiller refined their proposed Project alternatives as described in Section 3.0.

1.2 NEED FOR THE PROPOSED PROJECT

The Project would meet two primary needs.

- It would provide local aggregate material to surrounding communities that, in turn, would be used in state, county, and local public improvement projects, and private construction projects. The use of Zavoral Site add-rock at the Scandia Mine would allow Tiller to maximize use of the material at that Mine.

- It would result in the reclamation of previously mined areas at the Zavoral Site. Reclamation would improve the character of the Site and increase the stability of the soils, thereby minimizing environmental effects of unreclaimed areas due to potential erosion and sedimentation.

A mining site that is lacking a particular grain size required to meet marketable material requirements may need to bring in “add-rock” to supplement the specifications for different products. In this case, the Scandia Mine requires add-rock to provide material that would allow them to maximize the use of the material at that Mine.

The Zavoral Site deposits are characterized as Superior-lobe gravels due to the way they were deposited by glacial activity. The Superior-lobe gravels contain abundant particles of strong, nonreactive crystalline rock, and only minor amounts of undesirable rock types such as shale or sulfide-bearing slate. Economically viable deposits of sand and gravel occur where they were deposited by nature, whether the location is convenient or not. The availability of the highest quality remaining Superior-lobe sand and gravel deposits in eastern Washington and central Dakota counties is threatened by suburban sprawl (Southwick et al. 2000).

The deposit at the Zavoral Site is a high-quality construction aggregate source. The sand and gravel at the Zavoral Site is characterized as a Richfield terrace deposit. The construction aggregate source evaluation completed by the Minnesota Geological Survey (MGS) further classified aggregate deposits in the seven-county metropolitan area. The deposit at the Site was classified as an excellent to good primary source. For classification as an excellent to good primary source, the following criteria must be met:

- More than 20% of the material is retained on a number 4 sieve
- Deposit is thicker than 10 feet
- Overlying sediment is no thicker than 10 feet
- Water table is more than 20 feet below land surface
- Deposit must contain less than 1.5% total spall materials

Part of the reason the deposit at the Site is of such high quality is due to the origin of the material itself. According to Southwick et al. (2000), the highest quality sand and gravel deposits in the seven-county metropolitan area were deposited by meltwater from glaciers that advanced from the northeast through the Lake Superior basin during the last glaciation. Sand and gravel from the Superior-lobe contain particles of strong, nonreactive crystalline rock, with minimal amounts of shale or sulfide-bearing slate, otherwise known as deleterious materials. Deleterious materials reduce the quality of the aggregate, due to their susceptibility to degradation. Advances in technology demand an increased need for higher quality specifications of aggregate products. That means the amount of deleterious materials allowed in the aggregate product decreases. Higher quality specifications improve the life-cycle cost of infrastructure.

Southwick et al. (2000) further noted that a “pit” in Section 18 near the intersection of State Scenic Byway TH 95 and TH 97 produced samples that average 0.25% each of shale, iron oxide, and unsound chert.

The hot-mix asphalt plant at the Scandia Mine produces a variety of mixes based on customer demand. These mixes require a very specific gradation of aggregates to meet specifications. Aggregates used for base materials, structural fill, and other construction purposes also require specific gradations of

aggregate materials. While the Scandia Mine yields significant amounts of the required aggregate sizes or gradations, it does not have all of the required sizes in the ratios that are required to make specifications to meet market demand. The result is an abundance of certain sizes of aggregate. This is the case at the majority of aggregate production facilities throughout Minnesota.

Tiller has imported add-rock to the Scandia Mine over the past 20 years. This is done to fully use the naturally occurring sand and gravel resource. The add-rock hauled to the Mine enables nearly 100% utilization of Scandia Mine resources. The unprocessed add-rock brought to the Scandia Mine has been over 265,000 tons in a year.

Use of the material from the Zavoral Site as opposed to the more distant sources currently used at the Mine reduces environmental impacts related to hauling, such as the use of fossil fuels and air impacts, as well as costs.

A resource commitment is considered irreversible when direct and indirect impacts from its use limit future use options. Irreversible commitments apply primarily to nonrenewable resources, such as aggregate deposits. A resource commitment is considered irretrievable when the use or consumption of the resource is neither renewable nor recoverable for future use. Irreversible commitments apply to loss of production, harvest, or use of natural resources. Mining the aggregate from the Zavoral Site prior to any other development at the Site would meet the need for aggregate material in the metropolitan area and prevent the irreversible commitment of the gravel resource at the Site.

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2.0 PERMITS AND APPROVALS

2.1 REQUIRED PERMITS AND APPROVALS

The Zavoral Project would require the permits and approvals listed in **Table 4**.

Table 4: Anticipated Required Permits and Approvals

Jurisdiction	Permits, Approvals, and Other Guidelines
State of Minnesota	
Minnesota Department of Transportation	• Access Permit (TP 1721)
Minnesota Pollution Control Agency	• National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) general permit for Stormwater Discharges Associated with Construction Activities (MN R100001) and/or the NPDES/SDS General Permit for Construction Sand and Gravel, Rock Quarrying and Hot Mix Asphalt Production Facilities (MNG 490000). • Air Emissions Permit
Minnesota Department of Natural Resources	• Endangered Species Take Permit (if Butternut trees are reclassified from Special Concern to Endangered).
Local Government Unit	
City of Scandia	• Conditional Use Permit – Mining Operation • Annual Operating Permit
Carnelian-Marine-St. Croix Watershed District	• Permit for Stormwater Management

2.2 PROJECT ADVISORY COMMIITTEE

A Project Advisory Committee (PAC) was established by the Scandia City Council to facilitate the open exchange of information and to obtain input on the EIS analyses and mitigation measures as they were developed. The PAC is advisory in nature and is composed of members identified in **Table 5**. The City of Scandia values the input of the PAC members, recognizes their contribution, and thanks them for their participation.

The PAC meetings were moderated by Trudy Richter of Richardson, Richter and Associates, Inc., a member of the AECOM consultant team retained by the City to prepare the EIS. The goal of the PAC was to engage in open, purposeful, and transparent discussions so that there is a shared understanding of the environmental review process and the information developed or used as part of that process.

The PAC met five times to provide input during the EIS process, review of project technical documents, and review of the draft EIS. The PAC has provided important advisory input to the process, as cited in this EIS.

The PAC meetings were open to the public and residents, City officials, and other interested parties attended the meetings, asked questions, and provided comments. Information presented at the PAC meetings was made available on the City's webpage.

Table 5: Project Advisory Committee Members

Jed W. Chesnut Scandia Resident	Lisa Schlingerman Scandia Resident
Bill Clapp Scandia Resident	Dan Seemon U.S. Army Corps of Engineers
Melissa Doperaski Minnesota Department of Natural Resources	Jim Shaver Carnelian-Marine-St. Croix Watershed District
Thomas Krinke Scandia Planning Commission	Jyneen Thatcher Washington Conservation District
Karen Kromar Minnesota Pollution Control Agency	Kristin Tuenge Scandia Resident
Jim Larsen Metropolitan Council	Michael White Area Resident
Jill Medland National Park Service, St. Croix National Scenic Riverway	

2.3 AREAS OF CONTROVERSY

2.3.1 EIS Timing and Comprehensive Plan

Take Action - Conserve Our Scandia (TA-COS) is a group of concerned residents that are opposed to the development of the gravel mine on the Zavoral property. TA-COS's stated mission is "To promote sustainable development in Scandia while endorsing conservation of its waters, wildlife, natural and historic resources and beauty, referring to the Scandia Comprehensive Plan as its visionary guide."

In appearances before the Scandia City Council on November 16, 2010, and December 7, 2010, and in letters dated November 23, 2010, and December 6, 2010, TA-COS raised two primary objections to allowing Tiller to continue its application for the CUP.

First, the TA-COS representative stated that Tiller failed to meet its obligation to complete the EIS within 280 days as required by Minn. Stat. § 116D.04. 2A(h).

Second, the TA-COS representative stated that the Scandia City Code now prohibits mining on the Zavoral property and Tiller is not entitled to rely on prior zoning codes (Development Code, Chapter 2, Sections 1.3 and 2.4).

In regard to the first item, the City granted the extension in time to prepare the EIS. This is not an uncommon situation and the proposer and RGU were in agreement on granting the extension.

In regard to the second item, the City maintained its position to treat Tiller's 2008 application under the comprehensive plan and ordinances effective at the time of Tiller's application. The Zavoral Site and the Scandia Mine are both within the Agriculture District established in the City's 2020 Comprehensive Plan, which was the adopted plan at the time of Tiller's CUP application. The adopted Development Code at the time of the application included mining as an allowed conditional use in the Agriculture District.

2.3.2 National Park Service Request

The National Park Service (NPS) has requested that soundscapes, traffic, and slope stability be added as controversial issues. The soundscape of the Lower St. Croix National Scenic Riverway, and related impacts are addressed in Section 4.15 of this EIS. Traffic impacts are addressed in Section 4.13, and slope stability is addressed in Section 4.11.

2.3.3 Previous Mining and Reclamation

PAC members provided historical information regarding the previous mining activities on the Site, including correspondence indicating that reclamation was completed in 1998. Those activities were conducted under a CUP issued by Washington County for a different mining project when the County was the zoning authority for the Site. The County's regulations and the CUP for the previous use on the Site are not applicable to a proposed new mining operation or any other new use that might be proposed for the Site.

The City of Scandia is now the zoning authority for this Site and has adopted new standards for mining operations and reclamation. Tiller Corporation would be required to obtain a new CUP to operate a mine on this Site. The CUP would include requirements for operation and reclamation of the new project.

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3.0 PROPOSED PROJECT AND ALTERNATIVES

3.1 PROPOSED PROJECT

3.1.1 Zavoral Site Activities

Zavoral Site activities and the Mining and Reclamation Plan described in this section are the same for the two build alternatives (Alternatives 1 and 3). Alternative 1 is Tiller's preferred alternative and represents a 5- to 10-year operation. Under Alternative 3, mining and reclamation would occur under a reduced timeframe of 3.3 to 5 years. Subalternative 3A has been added to address questions from PAC members regarding a possible 150-working day alternative. Subalternative 3A could take approximately a year to complete based on 5 working days a week with time taken out for holidays and bad weather days. Alternative 2 is the No-Build Alternative. These alternatives are described in more detail in Section 3.3 of this document and are summarized in **Table 2**.

Mining would be conducted in phases starting on the northern portion of the Site and progressing southward, moving generally in a counter-clockwise direction. Reclamation would occur concurrently with mining. Three mining phases and four reclamation phases would occur as shown in **Figures 5 through 9**. **Figure 10** shows the maximum mining depths Tiller proposes for the Site. Excavating the Zavoral Site to 840 feet above mean sea level, as shown in Figure 10, would be the worst-case scenario that was used for creating figures and the analysis included in the DEIS. Depth of mining will vary throughout the Zavoral Site and will depend on the quality of material encountered. **Figure 11** shows the depth to groundwater from Tiller's proposed maximum mining depth. **Figure 12** shows the depth to groundwater from ground surface post-reclamation.

The mining activity for Alternatives 1 and 3 would be conducted using the same operational plan and layout. The difference is the allowable timeframe. The following activities would occur at the Zavoral Site:

- Clearing and grubbing the Site of vegetation, as necessary.
- Removing overburden from areas to be mined, and stockpiling the material on-site for potential future use in reclamation.
- Excavating raw aggregate materials.
- Transporting mined aggregate materials (add-rock and/or pit-run gravel); the majority of which would likely be delivered to the Scandia Mine near Manning Trail and 225th Street for use in material produced at that Mine.
- Using the Zavoral Site Well for dust suppression only.
- Delivering and/or storing fuel-related materials such as oil, anti-freeze, grease, and hydraulic fluid on-site.
- Conducting reclamation activities, including grading, placing topsoil or amending Site soils, and seeding and tree transplanting.

The proposed mining operations would result in lowering and reconfiguring the surface topography, and the reconfiguration and redirection of the existing surface drainage system.

Access to the Site would be off of TH 97 at its intersection with State Scenic Byway TH 95 on the west side of the Site (**Figure 5**). A new Site access road would be constructed in alignment with TH 97. The realignment of the Site access and the addition of a right-turn lane are required by the Minnesota Department of Transportation (Mn/DOT).

In general, the reclamation of the Zavoral Site would progress in increments. Reclamation would proceed as phases of mining are completed. City ordinance requires that the amount of reclamation be proportional to mining. The reclamation plan proposes that perimeter areas be sloped and the interior areas backfilled and graded to reclamation grades. Topsoil would be imported from other sites or existing Site soils would be amended (Section 3.1.1.3) and vegetation established to reduce erosion.

If the City approves a CUP for the Project, based on City regulations Tiller would be allowed to operate Monday through Friday 7:00 a.m.–7:00 p.m., unless other hours or days of operation are authorized by the City. The proposed mining area is shown in **Figures 5 through 9**. Mining limits would conform to City requirements, which require a 50-foot setback from property boundaries and a 100-foot setback from the road right-of-way.

The proposed mining activities can be grouped into three categories:

- Site preparation
- Mine operation
- Mine reclamation

3.1.1.1 Site Preparation

Site preparation would occur over the first 3 to 4 weeks of operation. No buildings or structures would be constructed. Site preparation includes:

- Realigning the Site access road and constructing a right-turn lane
- Constructing the internal main haul road
- Constructing screening berms and removing trees

In a review conducted by Mn/DOT in 2009, the agency required that the Zavoral Site access onto State Scenic Byway TH 95 be moved south to line up with TH 97 and that a northbound right-turn lane be constructed (Mn/DOT letter to City of Scandia, January 22, 2009). The right- turn lane would be consistent with the design of the existing left-turn lane. This would also match the design on the southbound approach. The sight distance requirements were met based on Mn/DOT reviews of the existing TH 97 and State Scenic Byway TH 95 intersection, and the 2007 and 2009 rehabilitation projects (Mn/DOT letter to City of Scandia, June 29, 2011). In a recent review of the development this year, Mn/DOT reaffirmed that the improvements outlined in the 2009 letter would be required. The realignment of the Site access would be completed simultaneously with the construction of the main haul road shown

in **Figure 5**. Secondary internal haul roads would be constructed during the active phases of mining. Construction of haul roads would require the following equipment: one bulldozer, one compactor, one scraper, one grader, and three to four off-road trucks.

The construction of screening berms would occur along the southwest perimeter of the Site. The screening berms would be constructed within the 50-foot mining setback, which is located between the Site boundary and the mining limits as shown in **Figures 5 through 9**. The screening berms would be constructed from overburden materials from the Phase 1 mining area. In compliance with the City's Ordinance No. 103 the berms would have a total height of not less than 6 feet and would maintain a minimum slope of 3:1 (horizontal:vertical). The berms would be seeded and mulched. A silt fence would be placed at the base of the berm closest to the neighboring property until vegetation becomes established. The screening berms would remain as needed to provide screening throughout the life of the Project, with the potential for removal and reconstruction during certain phases of reclamation. The equipment expected for screening berm construction would include one bulldozer, one scraper, and three to four off-road trucks.

Trees would be removed within the mining limits as necessary. Some of the White pine trees would be transplanted into the Phase 1 reclamation area per the planting schematic as described in the final reclamation plan (Section 3.1.1.3). The remainder of the removed trees would be harvested for wood products or used as biofuel. Equipment expected for tree removal would include one excavator, one chipper, one skid loader, and three to four haul trucks. Equipment that could be used to supplement activities during Site preparation would include an excavator, a front-end loader, and a skid loader. A jobsite trailer (8 feet by 25 feet) may be placed within Phase 1.

3.1.1.2 Site Operation

As with most mining operations, overburden would initially be removed from new areas to be mined. The overburden would either be stored on-site within the active mine phase for later use in reclamation, or used immediately in reclamation. At times, mining and reclamation activities would be performed concurrently. This is a common practice, as it is an efficient method of using the overburden materials being extracted in the active mine phase. The concurrent activities also allow for the efficient use of the portable equipment that would be brought on-site to perform mining activities.

A portion of the overburden would be used to construct the berm along the southwest perimeter of the Site during the initial stages of the Project. Since the majority of the mining would take place on previously disturbed areas, little overburden removal would be required.

Once overburden has been removed from the active mine phase, an active mining face would be initiated. At the active face, an excavator or front-end loader would extract the aggregate material and place the material directly into haul trucks (**Figure 13**). Aggregate would not be stockpiled at the Zavoral Site. The excavator and/or front-end loader would follow the active mine face as it moves through an active mine phase. Secondary haul roads would be constructed and maintained to provide an efficient means of transportation from the active mine face to the main haul road. The equipment expected to operate within an active phase would include one excavator or front-end loader, 15 to 20 haul trucks, one bulldozer, one grader, and one water truck. The operational equipment is portable and would be brought to the Site as needed. The excavator, front-end loader, dozer, and haul trucks would be used to extract and transport the aggregate material. The grader and water truck would be used to maintain haul roads

and enforce dust suppression. In addition to the equipment, a jobsite trailer (8 feet by 25 feet) would be placed in the active phase.

Figure 13: Photograph of Add-Rock Loading from Tiller's Maple Grove, Minnesota, Operation

Note: A different type of truck that could be used on public roadways would be used at the Zavoral Site.

3.1.1.3 Site Reclamation

Reclamation activity is composed of four phases as shown in **Figures 5 through 9**. With the exception of Phase 1 Reclamation, which consists of the approximately 4-acre previously mined area where no new mining is proposed, reclamation would proceed as mining phases are completed.

Stockpiles remaining from past mining at the Site would be removed and slopes would be graded to a maximum of 4:1 (horizontal:vertical) and shaped as shown in the final reclamation plan. The Site would be seeded with native prairie grass species and White-pines would be transplanted from future mining areas. Perimeter areas would be sloped and the interior areas backfilled and graded to the approximate restoration grades as shown in **Figures 5 through 9**. Six shallow depressions would be constructed with the intent to create a more natural landscape (**Figure 9**). Overland flow would be directed to the low-lying areas, where runoff would infiltrate and recharge groundwater.

Site soils are composed of predominantly sandy and silt loam soil types typical of the St. Paul Baldwin Plains. The soils mapped within the 64-acre mining and reclamation area include Antigo silt loam with 2-6% slopes, Emmert gravelly loamy coarse sand with 15–25% slopes, Gotham loamy sand with 1–6% slopes, Pits-gravel, and Santiago silt loam with 6–15% slopes (**Figure 14**). Of these soil types, the majority of the reclamation areas occur within Pits-gravel and Gotham soils with smaller areas occurring within Antigo, Emmert, and Santiago soil types. Remnants of these soil types occur within the mining and reclamation area. Topsoil removed from these soil types during overburden removal would be stockpiled for use within each of the reclamation areas. Previously mined portions of the Site are classified as Pits-gravel soil type and no longer have the original topsoil present.

Equipment used to conduct reclamation activities would include one bulldozer, one compacter, one skid loader, and one grader. The reclamation equipment would be moving, grading, and compacting material to achieve the required compaction densities. A front-end loader or excavator, three to four off-road trucks, and one scraper would likely operate in concurrence with mining, moving overburden material from the active mining phase to the area being reclaimed. A grader and water truck would be used to maintain haul roads and apply dust suppression.

Figures 15 and 16 depict the three mining phases and the four reclamation phases, respectively.

3.1.1.3.1 *Phase 1 Mining and Reclamation*

Phase 1 Reclamation would be conducted for approximately 4 acres concurrently with Phase 1 Mining of approximately 22 acres. Phase 1 Reclamation is located within the St. Croix River District and scenic easement (**Figure 5**). The maximum active and open area during Phase 1 Mining and Reclamation would be approximately 27 acres and would take place over 4 weeks.

Reclamation of this area would involve removing existing stockpiles and then final grading of the area. Slopes within the Reclamation Phase 1 area would be graded to a maximum of 4:1 (horizontal:vertical). Once final grading and topsoil placement is complete for the Reclamation Phase 1 area, trees would be transplanted into the area followed by seeding the area with a native prairie seed mix.

3.1.1.3.2 *Phase 2 Mining and Reclamation*

Phase 2 Reclamation would be conducted for approximately 22 acres concurrently with Phase 2 Mining of approximately 17 acres Phase 2 Reclamation would be approximately 22 acres (**Figure 6).** Reclamation Phase 1 would be vegetated by the start of Mining Phase 2. The maximum active and open area during Phase 2 Mining and Reclamation Phase 2 would be approximately 40 acres and would take place over 11 weeks.

The Phase 2 Reclamation area is located in the northwest part of the Project. After mining is completed in this area, final grading and topsoil placement would be completed before temporary or permanent seed is installed to stabilize the soil. The main haul road located in Phase 2 Reclamation would remain active in order to access Mining and Reclamation Phases 2, 3, and 4.

3.1.1.3.3 *Phase 3 Mining and Reclamation*

Phase 3 Reclamation would be conducted for approximately 17 acres (**Figure 7**) concurrently with Phase 3 Mining of approximately 21 acres. Phase 2 Reclamation would be vegetated by the start of Mining Phase 3. The maximum active and open area during Phase 3 Mining and Reclamation would be approximately 38 acres and would take place over 8 weeks.

The Phase 3 Reclamation area is located in the southern part of the Project. After mining is completed in this area, final grading and topsoil placement would be completed before temporary or permanent seed is installed to stabilize the soil.

3.1.1.3.4 *Reclamation Phase 4*

Phase 4 Reclamation would start once Mining Phase 3 is complete. Phase 4 Reclamation would be approximately 21 acres (**Figure 8**). Phase 3 Reclamation would be vegetated by the start of Reclamation

Phase 4. The maximum active and open area during Reclamation Phase 4 would be approximately 21 acres. Timing for the reclamation in Phase 4 is 9 weeks.

3.1.1.4 Mining Setbacks and Screening

The proposed and existing screening berms located along State Scenic Byway TH 95 and along the southwest perimeter of the Site occur within the 50-foot and 100-foot mining setbacks (**Figure 9**). The 50-foot and 100-foot mining setbacks are currently included as proposed reclamation areas in the reclamation plan.

The purpose of the berms would be to screen the view of mining and reclamation activities from nearby vehicle, bike, and pedestrian traffic in the area. Construction of the berms would take place as the Site is being developed and may include transplanting of native White pine trees from within the Site to provide additional screening. Transplanting activities for the screening areas would occur simultaneously with the transplanting activities proposed in Reclamation Phase 1.

The screening berms would remain as needed to provide screening throughout the life of the Project, with the potential for removal during certain phases of reclamation.

3.1.1.5 Reclamation Plan Summary and Review

Tiller's consultant, CCES, conducted a biological assessment (**Appendix A.1**), Reclamation Plan (**Appendix A.2**), and Forestry Management Plan (**Appendix A.3**) for the Project. Tiller's Tree Inventory is included as **Appendix A.4**. The following section is based on these plans and the AECOM consultant team's review of these plans. Reclamation must meet the requirements of the City's mining ordinance.

Two types of reclamation activities would take place at the Site, ongoing reclamation activities and mass reclamation activities. Ongoing reclamation activities generally occur each season. Often, materials suitable for reclamation, but not suitable for aggregate production are encountered and these materials are used for ongoing reclamation. In addition, local construction projects often encounter organic materials not suitable for the specific project, and if these materials are suitable for topsoil, they could be accepted and placed in the ongoing reclamation area.

Mass reclamation activities occur concurrently with removal of topsoil and overburden from an area in preparation for mining. The combined activities of topsoil and overburden removal and reclamation are commonly referred to as a stripping/reclamation project. These stripping/reclamation projects occur less frequently depending on aggregate demand. Tiller has stated that it is their intent to proportionally open new areas for mining and reclaim areas during these stripping/reclamation projects. It is important to note that the mining and reclamation areas would not always be exactly the same size in aerial coverage. Overburden removal and reclamation are three dimensional. For example, materials removed from a certain area in preparation for mining may or may not be enough and may be more than enough to reclaim exactly the same number of acres being opened. However, when considering mass reclamation combined with the ongoing reclamation, over time, newly opened areas and reclaimed areas are proportional (CCES May 2011).

There are two possible reclamation approaches for the Site, based on two "topsoil" options. The first option was proposed in Tiller's original reclamation plan for the Site. This approach focuses on revegetating the Site with native dry prairie vegetation using an engineered or manufactured topsoil

consisting of sandy subsoil available at the Site with added organic soil amendments. This method capitalizes on the relatively sterile and noxious weed-free soil conditions that would exist post-mining. However, the use of manufactured topsoil does not meet the Scandia Ordinance No. 103 definition of topsoil. As a result, City staff and AECOM requested that a more detailed description of this first approach be prepared and a second approach be prepared to meet City requirements.

Tiller prepared the requested prairie establishment and topsoil specifications for the Site (CCES October 2011; **Appendix A.2**). That document compares the two potential reclamation approaches for the Site. Prairie Reclamation Approach 1 is the native prairie revegetation approach that is proposed in the original Zavoral Mine Reclamation Plan. Prairie Reclamation Approach 2 is an alternative approach that meets the City reclamation and revegetation standards, adheres to City ordinances for required topsoil thickness, and takes into account comments from City staff since the submittal of the May 3, 2011, Reclamation Plan. Either option would allow for future development consistent with the AG-C zoning classification. Both approaches are described in detail in **Appendix A.2** and are summarized below:

Prairie Reclamation Approach 1: This approach focuses on reclamation of native dry prairie vegetation using an engineered topsoil consisting of sandy subsoil with added soil amendments. This method capitalizes on the relatively sterile and noxious weed-free soil conditions that would exist post-mining. Currently, topsoil is absent from much of the proposed mining area due to previous mining activity so stockpiling of all available topsoil would be needed for reclamation. As topsoil is stripped or removed, it would be set aside on the Site for spreading over the reclamation areas.

Topsoil would consist of on-site material generated from removal of the soils that overlay the gravel deposits being mined and existing berms. Topsoil over the existing gravel deposits would be separated from any subsoil and overburden removed during the stripping process. If topsoil would need to be stored for longer than a month, a temporary cover crop would be installed over the storage areas to prevent erosion.

To generate the required volume of topsoil for each reclamation area, Tiller proposes to supplement topsoil sources by combining the sandy subsoil available on-site with compost or organic materials imported onto the Site. This engineered or manufactured topsoil would be designed to provide adequate organic matter and nutrients for the seed mixes and trees to establish within each reclamation area. This approach focuses on revegetating the Site with native dry prairie vegetation and capitalizes on the relatively sterile and noxious weed-free soil conditions that would exist post-mining.

Weed-free organic soil amendments would be imported from a controlled location and mixed with sterile sandy soils on-site to create topsoil that is suitable for native dry prairie seedling establishment but nutrient-poor to a degree that would inhibit the growth of the most potentially problematic noxious weed species. Direct broadcast native seeding would be performed following topsoil establishment. Vegetation establishment monitoring, native species inter-seeding, and weed management are conducted as needed to meet diversity performance standards that will be consistent with a moderate-quality, naturally occurring dry prairie plant community on sand-gravel soils in the St. Croix River Valley.

Prairie Reclamation Approach 2: This approach closely follows the City's mining reclamation ordinance. Under this approach, Tiller would stockpile the limited remaining native topsoil located within the proposed mining areas (approximately 9 acres) and would import additional topsoil of at least equal quality from various other local sources. This approach proposes a minimum of 4 inches of topsoil, and

an average of 6 inches of topsoil throughout the reclaimed prairie areas. Following establishment of topsoil within reclaimed areas, a simplified native mesic prairie species mix would be broadcasted and worked into the topsoil. The simplified native mesic prairie mix would achieve the City's minimum quality and vegetation diversity requirements and would provide coverage of native prairie graminoids and forbs to provide an improved habitat condition, suppress weed establishment, and facilitate cost-effective vegetation management in the short and long terms. Vegetation establishment monitoring, native species inter-seeding, and weed management would be conducted as needed to meet or exceed the minimum vegetation performance standards that are consistent with the City ordinance for reclaimed mining areas.

Comparison of Approaches

Use of manufactured topsoil may result in less competition with weedy species for the following reasons:

- Organic amendment of existing and future overburden soils would enhance moisture-holding capacity of the soils, which would aid in seed germination and plant establishment. However, it would not meet the current City ordinance.
- Decomposition of supplemental organic materials in amended/engineered soils would provide a long-term nutrient source for establishing vegetation within areas that are now lacking in nutrient quantity and quality.
- Engineered soil would minimize the import of weed seed since imported material would be partially decomposed organic material and not unknown or uncontrolled topsoil or subsoil from areas outside of the Site.
- Engineered soils have the advantage in maintaining uniformity of soil characteristics across the reclamation areas resulting in a higher likelihood of consistent vegetative coverage.

The predominant vegetation at the Site in its current condition alludes to the poor quality of soil material present today. Reuse of this material would result in similar low-quality vegetative conditions unless overall soil health is improved. Preparing the Site for optimal native vegetation establishment upfront helps to minimize long-term management costs associated with weed control, prescribed burning, and supplemental seeding activities in areas not meeting predetermined vegetative performance criteria.

However, the reclamation must meet City ordinance requirements and must provide a base suitable for maintaining moisture and have suitable organic content to result in successful reclamation. The City may need to amend the definition of "topsoil" in its Development Code to allow either reclamation approach.

A suitable test of the success for the first approach may be to allow for its use in the first phase of reclamation and, if successful, allow for its use in succeeding phases of reclamation. If unsuccessful, the City could require Tiller to import topsoil for succeeding phases, or make other changes in the reclamation approach. This would require close monitoring of the first phase of reclamation and the development of strict and measurable definitions of reclamation success.

Other recommended improvements and modifications to the reclamation plan are presented in Section 5 of this EIS.

3.1.1.6 Stormwater Management

A Stormwater Pollution Prevention Plan (SWPPP) would be implemented for the Zavoral Site in compliance with the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) permit (Section 4.10).

3.2 SCANDIA MINE ACTIVITIES

3.2.1 Background

The Scandia Mine is accessed from County Road (CR) 15 (Manning Trail), CR 1 (Lofton Avenue), and 218th Street North. All three roads are paved (**Figure 4**). The access points have been reviewed by the City of Scandia and Washington County during past permit reviews.

The scope of this EIS includes the identification and analysis of potential impacts that would result from importing aggregate material from the Zavoral Site to the Scandia Mine. No changes in the current mining operations or the reclamation plan are proposed at the Scandia Mine, other than replacing current Class C add-rock sources with material from the Zavoral Site.

The Scandia Mine is an active aggregate production facility operated by Tiller. The Mine has been active since at least 1962 and Tiller has been operating portions of the Mine for over 20 years. Prior to the incorporation of Scandia in 2006, New Scandia Township and Washington County were the permitting authorities, first issuing permits in the late 1980s. Permitted activities include the removal and processing of aggregate (crushing, screening, and washing), the production of hot-mix asphalt, and the recycling of concrete and asphalt products. Final product is sold locally. The operation is located on approximately 435 acres, of which 191 acres would be mined and reclaimed at the conclusion of the mining operation. Environmental review for portions the mining facility, in the form of an EAW, was completed in 1987 as part of the initial permitting process. A second EAW was completed in 1999 to analyze revisions to the mining limits, including the initiation of mining into groundwater.

Mining limits were revised by adding areas to be mined on the eastern side of the property and removing areas to be mined that were more environmentally sensitive on the western side of the property. Mining of common borders is done in conjunction with normal mining operations. The 1999 EAW contemplated mining the common border between the Scandia Mine and the Dresel Contracting, Inc (Dresel) site. Mining between the Scandia Mine and the Dresel site was authorized in permits issued by Washington County and New Scandia Township. In 2008, the City of Scandia approved CUPs and AOPs for the Scandia Mine and Dresel sites. These permits also anticipate mining the common border between the sites. In 2009, Tiller purchased the Dresel property and the City of Scandia transferred the 2009 AOP issued to the Dresel site to Tiller. In 2010, the City of Scandia incorporated the two sites into one AOP. Operations at the Scandia Mine remain consistent with the scope of operations and mining limits reviewed in the previous EAWs, CUPs, and AOPs.

The EAWs completed for the Scandia Mine in 1987 and 1999 (City of Scandia website at: http://www.ci.scandia.mn.us/index.asp?Type=B_LIST&SEC={B8DD8405-7011-4E96-A86B-5FCD4C42F5A7}#{8CD85CD2-E083-49ED-96BD-0A30CA116158} include analysis of the potential impacts of mining and processing activities and the proposed reclamation plan.

A citizen's petition was submitted to the Environmental Quality Board (EQB) by a Scandia resident regarding the approval of Tiller's CUP for a mining operation. The main issue addressed by the citizen's petition was that Tiller had accelerated its mining timetable with its proposal for mining into the groundwater. The EQB determined that the City of Scandia was the appropriate governmental unit to decide the need for an EAW. Prior EAWs completed in 1987 and 1999 included an analysis of Tiller's mining operations. Plans submitted for the CUP that included mining into the groundwater and creation of the proposed lake were part of the phasing plan identified in the earlier EAWs. These plans provide no substantial change in the proposed project that would affect the potential for significant adverse environmental effects, therefore qualifying the project as exempt from further environmental review. Permits and safeguards required by local, state, and federal regulations have not changed, and Tiller is in compliance with these permits and safeguards. The City's hydrogeologist's review of the existing groundwater studies for the Scandia Mine concluded that the impacts of mining into the groundwater would have a negligible effect on groundwater tables in the area and on lake levels. The potential impacts evaluated in the 1987 and 1999 EAWs were identified, and no new impacts were identified when the research was reviewed in 2008. The City determined that the Project was exempt from further environmental review.

The information provided below is a summary of operations at the Scandia Mine. It is important to note that add-rock has been hauled to the Scandia Mine consistently over the last 20 years or more and would continue to be hauled to the Mine throughout its remaining life regardless of whether the Zavoral Site was used. The source of the add-rock has no material impact on the operation of the Scandia Mine. The types of processing activities, the volume of material processed, the life of the Mine, mining limits, phase limits, erosion control measures, and other aspects of the operation would remain the same regardless of the add-rock source.

Raw aggregate material mined at the Zavoral Site would be transported to the Scandia Mine for processing. Tiller has indicated that the materials transported from the Zavoral Site would replace the materials from Franconia Township, Minnesota, and the Osceola area in Wisconsin. The following activities would occur at the Scandia Mine:

- Aggregate material brought in from the Zavoral Site would be blended with aggregate material mined at the Scandia Mine or used in the production of hot mix asphalt.
- A portion of the aggregate material transported to the Scandia Mine may be processed as needed through a series of crushers, screens, conveyors, wash decks, and classifiers to produce commercial grade construction aggregates.
- Finished construction aggregate products would be stockpiled at the Scandia Mine until they are hauled off-site by trucks to various construction sites.
- Water for processing activities at the Scandia Mine would be drawn from the existing Scandia Mine permitted production well. Water collected in the sediment ponds from washing activities may also be recycled and reused for processing.

3.2.2 Scandia Mine Operations

The mining operation includes removal of overburden; mining and removal of gravel; crushing, washing, screening, and stockpiling materials; recycling concrete and asphalt products; production of hot-mix asphalt; and reclamation activities. Overburden is removed from areas to be mined and is stockpiled on-site and later used for reclamation of completed phases. Aggregate is excavated above groundwater using front-end loaders. A dragline or excavator is used to excavate material within groundwater. Processing consists of crushing, washing, screening, and stockpiling. The locations of these activities vary as mining faces proceed through the mining phases. Recycling of concrete and asphalt occurs at the Mine. Most of the asphalt is recycled through the hot-mix asphalt plant, and the balance of the asphalt and all of the concrete are processed into various aggregate products.

A portion of the processed aggregate and recycled product is loaded onto trucks using front-end loaders, the trucks are weighed, and the product is delivered to projects throughout the area. The balance of the processed aggregate and recycled asphalt is used in a hot-mix asphalt plant, which operates at the Mine. The hot-mix asphalt is stored in overhead silos and is loaded into trucks by gravity, the trucks are weighed, and the product is delivered to projects throughout the area.

Washing at the Scandia Mine occurs as needed based on market demand. The Scandia Mine currently holds an MnDNR water appropriations permit for 18 million gallons per year (mgy) for washing activity and 2 mgy for dust control. In the recent past, there has been no significant demand for washed product. Washing most recently occurred in 2002 and a total of 10.35 mgy of water was used, well below the currently permitted appropriation. The amount of washed product may change if the demand for aggregate specifications that require washed aggregates increases. Washing that may occur at the Scandia Mine when the Zavoral Site is supplying the Mine would result from increased market demand for washed product not because of add-rock imported from the Zavoral Site. Importing add-rock from the Zavoral Site would have no impact on the volume of water used at the Scandia Mine. Any future washing at the Scandia Mine would be conducted in accordance with the MnDNR Water Appropriations Permit and the Scandia Mine's CUP.

Mining would occur above the groundwater level and into groundwater concurrently in each of the remaining phases at the Mine. Importing add-rock from the Zavoral Site, or any other site, has no impact on phase boundaries or mining limits at the Scandia Mine.

3.2.3 Scandia Mine Stormwater Management

Surface water is managed during active mining in accordance with the NPDES/SDS SWPPP and is consistent with local surface water management plans. This plan includes a number of best management practices (BMPs), which are incorporated into daily Site operations. The BMPs have been designed and implemented to avoid untreated stormwater discharge from the Site, minimize potential for erosion and sedimentation throughout the operation of the Site, and provide for Site stabilization at the conclusion of mining activity. Erosion and sedimentation control practices used on-site during active mining include silt fence, vegetated screening berms, stormwater sedimentation ponds, wetland buffers, and dust control. Silt fencing is placed as necessary along the limits of each mining phase in areas where topography does not accommodate internal surface water drainage next to sensitive areas. Screening berms around the perimeter of mining areas are vegetated to reduce erosion and to help contain fugitive dust.

A sedimentation basin is located on the floor of the mining operation to handle internal drainage. When needed, water from the sedimentation basin is pumped upland to a secondary sedimentation basin for additional treatment. Vegetative buffer strips are preserved around wetland areas. These buffer strips filter runoff and reduce the potential for sedimentation to occur within the wetland basins.

Add-rock that is hauled to the Site is off-loaded over a mining face as opposed to placed into a traditional stockpile. The stormwater management practices in place for the mining operation serve the imported add-rock materials as well.

3.3 ALTERNATIVES

3.3.1 Alternatives to Be Evaluated in this EIS Process

The Revised Scoping Decision Document (City of Scandia January 2010; RSDD) identified three alternatives to be evaluated in this EIS.

The estimated volume of gravel resource at the Zavoral Site was originally determined to be approximately 1.5 million tons at the time the EAW was submitted (Sunde Engineering 2008). By December 2009, Tiller had conducted additional exploratory borings and Project evaluations that indicated the Site would be better suited as an add-rock source. The additional borings indicated the estimated volume of material be revised to between 0.8 to 1.2 million tons in the RSDD.

The difference between the two proposed build alternatives is the time period over which mining and reclamation would occur at the Site. The timeframe for Alternative 1 is 5 to 10 years and for Alternative 3 is 3.3 to 5 years. Under Alternative 3, to complete the mining within the reduced timeframe, mining activity would need to occur either more frequently, for longer durations, or a combination of both.

Alternative 2 is the No-Build Alternative under which the existing land uses on the Zavoral Site would remain and the Scandia Mine would continue to import add-rock from Franconia Township, Minnesota, and the Osceola area in Wisconsin. The No-Build Alternative does not include the reclamation activities of previously mined areas that are included in Alternatives 1 and 3.

3.3.1.1 Alternative 1 – 5- to 10-year Operation

This is Tiller's preferred alternative. The estimated up to 1.2 million tons of reserve would be mined over a period of 5 to 10 years[1] **(Table 6).**

Table 6: Alternative 1 Mining Schedule

Mining Timeframe	5 Years	10 Years
Tons/Year Mined	240,000	120,000
Estimated Weeks of Operation/Year	12	6
Years per Mining Phase	1.67	3.33

1 Assumes average operations, based on past traffic information submitted, of 20 loads/hour, 20–24 tons/load, 10-hour days.

3.3.1.2 Alternative 2 – No-Build Alternative

The Zavoral Site would remain as it is under the No-Build Alternative. The gravel resource would not be used. This aggregate that would primarily be used for the Minneapolis-St. Paul metropolitan area's roads, and infrastructure would not be available. Portions of the Site previously disturbed by mining would remain in their currently unreclaimed condition. Class C aggregate would continue to be hauled to the Scandia Mine from other sources.

3.3.1.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

Under this alternative, the resource would be mined over a shorter period of time. The estimated up to 1.2 million tons of reserve would be mined over a period of 3.3 to 5 years[2] **(Table 7).**

3.3.1.4 Subalternative 3A – Reduced Timeframe 150-Working Day Operation (approximately 1 year)

This modified scale alternative (see Section 3.3.2.3 of this EIS) was introduced by PAC members. Comparative information has been added to the EIS regarding this Subalternative (**Table 7**).

Table 7: Alternative 3 and Subalternative 3A Mining Schedule

	Alternative 3		Subalternative 3A
Mining Timeframe	3.3 Years	5 Years	Approximately 1 Year
Tons/Year Mined	360,000	240,000	1.2 million
Estimated Weeks of Operation/Year	18	12	30
Years per Mining Phase	1.1	1.67	Mining and reclamation completed in approximately 1 year.

3.3.1.5 Project Site with Reasonable Mitigation Measures

The Minnesota Environmental Quality Board (EQB) rules require consideration of mitigation measures identified through comments on the EAW. This EIS considers all relevant mitigation measures suggested through public and agency comments and recommends incorporation of reasonable mitigation measures into Project design and permitting as warranted.

3.3.1.6 Modified Scale Alternative

Subalternative 3A – Reduced Timeframe 150-Working Day Operation (approximately 1 year)

At the November 2011 PAC meeting, Tiller acknowledged that they could mine the material from the Site in approximately 150 working days. PAC input has indicated that this alternative would warrant further evaluation.

2 Assumes average operations, based on past traffic information submitted, of 20 loads/hour, 20–24 tons/load, 10-hour days.

Under this alternative, the Project would essentially be the same as the current build alternatives but would occur in a significantly reduced timeframe. As a result of the reduced timeframe, the daily traffic volumes and the hours of operation would increase in order to mine and transport the material from the Site.

Traffic: Daily traffic volumes would increase under this alternative, because limiting active mining to 150 working days does not allow the flexibility to distribute the occurrence of haul events. The maximum traffic levels determined for Alternatives 1 and 3 are not likely to occur on a daily basis. However, limiting mining operations to 150 working days would require a consistent high volume of truck traffic.

Based on 1.2 million tons of material and 23-ton haul trucks that would be required to move the amount of material within 150 working days, approximately 348 trucks or 696 trips could be expected per day. This is an increase from Alternatives 1 and 3 in which a maximum of 280 trucks or 560 trips are expected. Traffic generated by reclamation activities would not change. Reclamation traffic is expected at a maximum of 20 trucks or 40 trips per day. This would result in an estimated peak traffic level of 736 trips a day.

Hours of Operation: Based on City regulations, the Project would be allowed to operate Monday through Friday 7:00 a.m. to 7:00 p.m. In the past, hauling operations have occurred from 7:00 a.m. to 7:00 p.m. or 12 hours per day. The average workday has been 10 hours. Therefore an expected 10-hour workday was used for analysis in both Alternatives 1 and 3. The 150 working days would result in 12-hour workdays in order to remove the aggregate within the reduced timeframe.

The Scandia Mine operates under a CUP issued by the City. Condition 14 of this permit reads “The Applicant shall restrict truck traffic that imports Add Rock to the site from using the Cr 1 (Lofton Avenue) access during non-daylight hours. Non-daylight hours shall be defined as one-half hour after sunset to one-half hour before sunrise.” To use the Cr 1 (Lofton Avenue) access and operate 12 hours per day, the hauling would have to occur from approximately the second week in March through approximately the second week in October. Rerouting trucks to use the Scandia Mine’s Manning Trail access is not feasible because this route increases the miles per trip by approximately 33%.

Months of Operation: Based on City regulations, the Project would be allowed to operate January through December. It is reasonable to expect that operations could occur during any month of the year, with the exception of reclamation activities. Reclamation grading can only occur when the soils are not frozen and seeding should ideally be completed during the growing season.

Site Preparation: There would be no change in the timeframe for Site preparation. These activities require 3 to 4 weeks of construction at the beginning of the Project to prepare the Site and include:

- Realigning the Site access road and constructing a right-turn lane
- Constructing the internal main haul road
- Constructing screening berms and removing trees

Mining Operations: Mining operations would occur as described in the Mine Plan for the other build alternatives. The timeframe would be reduced to 150 working days. There would be no change in the timeframe for reclamation as described for Alternatives 1 and 3.

3.3.2 Alternatives Eliminated from Consideration

An alternative may be excluded from analysis in the EIS under the following conditions (EQB 2010).

- When it does not meet the underlying need for or purpose of the project.
- When it would likely not have any significant environmental benefit compared to the project as proposed.
- When another alternative, of any type, that would be analyzed in the EIS would likely have similar environmental benefits, but substantially less adverse economic, employment, or sociological impacts.

The following alternatives were eliminated from consideration during the EAW and scoping process.

3.3.2.1 Alternative Sites

Off-site alternatives are not being investigated because they do not meet the Project purpose and need of making use of significant aggregate resources that are found within the Zavoral Site. Site alternatives are limited to the presence of the natural resource. This resource is located within the Minneapolis-St. Paul metropolitan area and may cost-effectively serve the needs of the region. A regional study identified significant aggregate resource areas within the metropolitan region, including the general area in which the Zavoral Site is located, and describes the region's need for these resources in the future (Southwick et. al. 2000).

3.3.2.2 Technology Alternatives

Technology alternatives are not within the scope of the alternatives to be considered in the EIS. Best practicable technologies for the various activities would be utilized as part of Alternative 1.

3.3.2.3 Modified Scale Alternative

Modified design or layout alternatives are outside of the scope established for this EIS. However, the area represented for either of the build alternatives (Alternative 1 or Alternative 3) may be modified depending upon the results of the analysis completed for the EIS and the permit requirements for operations on the Site.

The scale of the Project has been modified as reflected in the RSDD (City of Scandia 2010). The Zavoral Site Well that Tiller had planned to use as a water source for aggregate processing activities at the Site in their original Project proposal is cased to a depth of 245 feet and is completed as an open hole in two aquifer systems—the Franconia-Ironton-Galesville Aquifer and the Mt. Simon Aquifer—to a total depth of 648 feet. As part of the coordination conducted with the MnDNR as part of this EIS process, AECOM determined that the water appropriation permit for this well had expired.

The 1989 Minnesota Ground Water Act strictly limits new water use permits in the Mt. Simon-Hinckley Aquifer in a metropolitan county (Minn. Stat. § 103G.271 4a). A potential renewal of the water appropriation permit for the multi-aquifer Zavoral Site Well would be carefully evaluated by the MnDNR.

Tiller's analyses of the Zavoral Site noted that reinitiating the use of the Zavoral Site Well at the levels the well is capable of producing would require significant investment to address MnDNR water appropriation permit requirements. This, in addition to further assessment of the aggregate source and its suitability for add-rock at the Scandia Mine, resulted in Tiller revising their Project proposal to eliminate all aggregate processing activities (including washing) at the Zavoral Site.

Elimination of the 9-acre Area Not Previously Mined from the Project

One of the comments received from the PAC suggested prohibiting mining activity on the 9-acre area that had not been mined in the past. This scenario was evaluated to determine if it should be assessed as a modified scale Project alternative:

The entire 64-acre Site that Tiller proposes to mine is within the Agricultural (AG) Zoning District designated under the zoning regulations in place at the time that Tiller submitted its application for a CUP to the City. Mining is an allowed use on lands within this district. To prohibit mining within the 9-acre area, the City would need to find that mining the area would result in significant impacts that cannot be mitigated. Analysis of the potential impacts of mining the 9-acre area for this EIS did not identify significant impacts:

- Vegetative cover in the 9-acre area consists of moderate quality woodland that has been reduced in quality from its presettlement state by previous agricultural activities on the Site. The woodland has no protection under state or federal rules.
- No rare or threatened plant or animal species or species of concern have been identified in the 9-acre area, based on field studies. The area does not provide critical habitat for rare or threatened species, or species of concern.
- Mining the area would not result in adverse impacts to surface water or groundwater, noise, visual quality, traffic or other environmental factors analyzed for this EIS.
- Reclamation activities would create new woodland areas and natural communities that would mitigate for the loss of the woodland on the Site.

Tiller considers the 9-acre area that has not been previously mined a critical component to meeting the Purpose and Need for the Project, based on the following:

To provide the required 4:1 (horizontal:vertical) slope and setbacks, the elimination of this area from mining would result in up to 50% of the total volume of aggregate material not being mined. Exploratory borings indicate that the highest quality aggregate occurs at the southern portion of the Site, which includes the 9 acres that have not been previously mined. Tiller designed the Project with the intent to utilize the entire aggregate resource available within the 64-acre mining limits. Removing the 9 acres from the Project significantly reduces the amount of high-quality construction aggregate, a limited natural resource that could be mined.

4.0 PRESENT ENVIRONMENT, EFFECTS OF ALTERNATIVES AND MITIGATION

4.1 LAND USE

4.1.1 Zavoral Site

4.1.1.1 Affected Environment

The 114-acre Zavoral Site is located within the south ½ of Section 18, and the north ½ of Section 19, Township 32 North, Range 19 West, along St. Croix Trail North (TH 95), a State Scenic Byway near its intersection with TH 97, City of Scandia, Washington County, Minnesota (**Figure 1**). The Site currently consists of a mixture of unreclaimed, formerly mined, vacant land; forested land; and small areas of agricultural land. Existing cover is described in Section 4.4. The Site is bounded:

- On the south by wooded bluff lands and Quinnell Avenue North
- On the west by agricultural land and State Scenic Byway TH 95
- On the north by agricultural land and woodland
- On the east by wooded bluff land, the Soo Line Railroad, and the Riverway

Over the last 70 years, land use within the Zavoral Site has transitioned from predominantly cropland in the late 1930s to its current condition as vacant open space largely disturbed by past mining activities. In the late 1960s, sand and gravel mining started to become prevalent at the Site. By the mid to late 1970s, mining had displaced much of the former cropland. Active mining continued into the 1980s.

Figure 17 presents the 2007 City of Scandia land use map. Within a 1-mile area of the Site, current land use consists primarily of single-family residential (52%), agricultural (30%), parks and open space (12%), and seasonal residential (5%). The majority of this surrounding area is being used as rural residential and agricultural/vacant land. The nearest residences are located approximately 600 feet to the south and west, and 645 feet to the northwest of the proposed mining limits.

Land use within 500 feet of the proposed haul route on TH 97 between the Zavoral Site and the Scandia Mine area land use consists primarily of single-family residential (49%) and agricultural (42%). The majority of this surrounding area is being utilized as rural residential and agricultural/vacant land (**Figure 18**).

Gravel mines are located in communities throughout the St. Croix River Valley. According to the Twin Cities Aggregate Resources Study (Southwick et al. 2000) conducted jointly by the Metropolitan Council, the MGS, and the MnDNR Division of Lands and Minerals, Washington County has large aggregate reserves.

4.1.1.2 Planning Authority for the Zavoral Site

The Zavoral Site is within the jurisdiction of the City of Scandia and partially within the St. Croix National Scenic Riverway as designated under the WSRA and the federal and state Lower St. Croix River Acts.

Minn. R. ch. 6105.0370 § 9 prohibits sand and gravel operations within the St. Croix River District Zone and scenic easement area. Protection of scenic resources within these jurisdictions is guided by the City of Scandia Comprehensive Plan, and the CMP and EIS for the Lower St. Croix National Scenic Riverway. The Washington County Comprehensive Plan also describes a scenic easement that is partially within the Site. The proposed mining area is located outside these limits. However, Tiller proposes to conduct reclamation activities on approximately 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement area. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the St. Croix Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6.

4.1.1.3 Proposed Land Use

The City of Scandia's 2020 Comprehensive Plan was the effective plan at the time of Tiller's application for a CUP for the mining project. The Comprehensive Plan recommended that the primary uses in the Agriculture (AG) District include agricultural production, single-family residences, and parks and open space.

4.1.1.4 Zoning

The Zavoral Site and the Scandia Mine were both designated within AG District under the City's 2020 Comprehensive Plan, the adopted plan at the time of the Tiller application for the Zavoral Mining and Reclamation Project (2008). The Development Code that was in place at the time of the Tiller CUP application for the Zavoral Mining and Reclamation Project included mining as an allowed use within the AG District, with a CUP.

On March 17, 2009, the Scandia City Council adopted the City's 2030 Comprehensive Plan. The potential locations of new mining operations were discussed as the new Comprehensive Plan and Zoning Ordinance were developed, and one of the goals of the plan was to limit the locations where new mining operations would be allowed in the City of Scandia. The Zavoral Site is within the area now designated as Agricultural Core Area (AG-C) in the 2030 Comprehensive Plan. The 2030 Plan included policies that mining not be included as an allowed use in the AG-C District. Since adoption of the plan, the City's Development Code has been updated to implement the plan's recommendations. The Council adopted the new Development Code in November 2010. Mining is not an allowed use in AG-C areas in the new Code.

These changes in the Comprehensive Plan and Development Code have led to a controversial issue associated with this Project as described in Section 2.3.1 of this document.

4.1.1.5 Nearby Public Natural and Recreational Resources

The areas discussed below are shown on **Figure 3**.

4.1.1.5.1 *Falls Creek Scientific and Natural Area*

The Falls Creek Scientific and Natural Area (SNA) is located approximately 0.85 miles north of the Project boundary and approximately 0.9 miles north of the mining and reclamation limits. The SNA is owned by the MnDNR. According to the MnDNR, the mission of the SNA program is to preserve and perpetuate the ecological diversity of Minnesota's natural heritage, including landforms, fossil remains, plant and animal

communities, rare and endangered species, or other biotic features and geological formations, for scientific study and public edification as components of a healthy environment.

The MnDNR states, Falls Creek is one of the most diverse natural areas remaining in Washington County. Folded and faulted rocks at this site show the largest displacement of any known Paleozoic rocks in Minnesota, revealing Decorah, Platteville, Glenwood, and St. Peter formations. Steep ravines line the intermittently active stream beds. Slopes face north or south primarily, with ground flora varied accordingly. Pine canopy openings on south slopes permit growth of many species native to bluff prairies. Oak forest occupies the drier ridge tops. The site is unique for its stand of virgin hardwood and White-pine forest, which is rare along the St. Croix. The SNA is open to the public for hiking, nature photography, bird watching, snowshoeing, and other activities that do not disturb the natural conditions (DNR webpage no date).

4.1.1.5.2 *Farmington Bottoms State Natural Area*

The Farmington Bottoms SNA is located in Wisconsin approximately 0.20 miles east of the Project boundary and approximately 0.30 miles east of the proposed mining and reclamation limits. Farmington Bottoms is owned by the NPS and was designated an SNA in 2002 by the Wisconsin Department of Natural Resources (WDNR). According to the WDNR, Farmington Bottoms contains excellent examples of floodplain forest, emergent aquatics, and forested seeps. Located along a little developed stretch of the St. Croix, the site features an extensive tract of old-growth lowland forest with running sloughs and backwaters. Silver maple is the dominant canopy species with Green ash, hackberry, and American elm. Basswood, Red oak, cottonwood, Black willow, and Yellowbud hickory are also present in smaller numbers. The understory is rather patchy in composition. Some areas are dominated by Wood nettle, others by grasses and sedges. Shallow water areas contain abundant bulrush, rice cut grass, and prairie cord grass. Herbaceous plants include Cardinal flower, Ostrich fern, ironweed, Fringed loosestrife, and False dragonhead. Rough, deeply dissected terrain borders the lower St. Croix River with a local relief exceeding 350 feet. Banks at the base of the river terrace often contain seepages that harbor large populations of the state-endangered Bog bluegrass (*Poa paludigena*). The surrounding upland forest contains oak, basswood, Big-tooth aspen, Paper birch, and an occasional White pine. The shrub layer is generally sparse with American hazelnut and Gray dogwood, and scattered patches of dry prairie and savanna vegetation occur on the warmer western and southern exposures. The forest provides critical habitat for many rare bird species including the state threatened Red-shouldered hawk (*Buteo lineatus*) and prothonotary (*Protonotaria citrea*), and Cerulean warbler (*Dendroica cerulea*). Other resident birds include Great egret (*Ardea alba*), Bald eagle (*Haliaeetus leucocephalus*), Louisiana waterthrush (*Seiurus motacilla*), and Blue-gray gnatcatcher (WDNR webpage no date).

4.1.1.5.3 *Lower St. Croix National Scenic Riverway*

The proposed mine abuts the Riverway (**Figure 3**). The NPS manages the Riverway. **Figure 3** identifies the boundary of the Riverway and the areas that are owned by the NPS. The Riverway was created by Congress in 1972 by amendment to the WSRA (Public Law 92-542 as amended; 16 U.S.C. 127 1- 1287). The purpose of establishing the Riverway under the WSRA is to protect its free-flowing character; water quality; and scenic, recreational, and geologic values for this and future generations. The Riverway is a narrow corridor that runs for 52 miles along the boundary of Minnesota and Wisconsin, from St. Croix Falls/Taylors Falls to the confluence of the Mississippi River at Prescott/Point Douglas. Minnesota municipalities within the Riverway boundary include Taylors Falls, Scandia, Marine-on-St. Croix,

Stillwater, and Oak Park Heights. Much of the land within the Riverway boundary, particularly within municipalities, is privately owned. Development on private lands within the boundary is managed by scenic easements acquired by the NPS and/or by local Riverway ordinances. The MnDNR has adopted state rules that form the basis for local Riverway ordinances. Local governments are required to adopt and enforce ordinances based on the State's rules (local ordinances can be more restrictive than state rules, but not less). The City of Scandia's "St. Croix River District" includes the lands within the city limits that are also within the Riverway boundary. Users may participate in a wide range of activities including motor-boating, canoeing, swimming, camping, and picnicking (DOI/NPS et al. 2002).

4.1.1.5.4 *Rutstrum Wildlife Management Area*

The Rutstrum Wildlife Management Area (WMA) is located approximately 0.27 miles northeast of the Project boundary and approximately 0.3 miles northeast of the mining and reclamation limits. The WMA is owned by the NPS and managed by the MnDNR. The Rutstrum WMA is a 24-acre area located along the St. Croix River. It consists of about 83% open water and emergent vegetation marsh and about 17% floodplain forest. The Rutstrum WMA was donated by famed canoeist Calvin Rutstrum in the late 1950s. The WMA is only accessible by water from the St. Croix River. Users may participate in boat access hunting opportunities for deer, small game, water fowl, and turkey. In addition, floodplain forest wildlife viewing is also available (DNR webpage no date).

4.1.1.5.5 *St. Croix Scenic Byway (TH 95)*

St. Croix Scenic Byway TH 95 is located directly west of the Zavoral Site. According to the St. Croix Scenic Byway, the byway follows a route established in 1855 between Point Douglas, Minnesota, and Superior, Wisconsin. Although intended as a highway for troop movement, the road quickly attracted a flood of civilian and commercial traffic. The 124-mile Byway route passes through three Minnesota counties: Washington, Chisago, and Pine.

State Scenic Byway TH 95 is a two-lane road going along the St. Croix River in this area and very scenic. When the traffic from TH 97 enters onto TH 95, it can be heavy but thins out again at milepost 43.9 where a lot of the traffic exits to cross the bridge into Wisconsin (St Croix Scenic Byway webpage no date).

4.1.1.5.6 *William O'Brien State Park*

The William O'Brien State Park is located approximately 1.25 miles south of the Project boundary and approximately 1.3 miles south of the mining and reclamation limits. The park is owned and managed by the MnDNR. The 1,753-acre park is located on the St. Croix River in Washington County with access from TH 95. The park was established in 1947. Users may participate in a wide range of activities including camping, hiking, fishing, cross country skiing, bird watching, and picnicking (DNR webpage no date).

4.1.1.5.7 *Wind in the Pines Park*

The Wind in the Pines Park is located approximately 0.85 miles north of the Project boundary and approximately 0.9 miles north of the mining and reclamation limits. The park is owned and managed by the City of Scandia. This 44-acre site is located along TH 95 across from Pilar Road. The Park is bounded by the Falls Creek SNA to the north and the Lower St. Croix National Scenic Riverway to the east. According to the City of Scandia, the park offers diversity of old growth forest and pristine prairies, providing invaluable wildlife habitat and unparalleled scenic value. Wind in the Pines Park is thought to

be one of the most diverse ecological areas left in Washington County by the MnDNR. The park is open to the public for hiking, nature photography, bird watching, snowshoeing, and other activities that do not disturb the natural conditions (Wind in the Pines Park webpage no date).

No significant impacts to nearby public natural and recreational resources have been identified. Potential impacts to these resources are addressed under the applicable sections of this EIS.

4.1.1.6 Impacts on Current and Future Land Use

4.1.1.6.1 *Alternative 1 – 5- to 10-year Operation*

If the Project were approved, the existing land use on the Site would be altered from its current mixture of unreclaimed, formerly mined vacant land, forested land, and small areas of agricultural land to a mining operation. Mining, hauling, and reclamation activities would take place at the Site over a 5- to 10-year period. Upon the completion of mining, the Site would be reclaimed. Based on Tiller's reclamation and forestry management plans, the Site would be revegetated with native prairie and coniferous woodland that would provide stable soil conditions for future land uses (**Figure 19**; CCES may 2011).

The portion of the Site within the St. Croix National Scenic Riverway would be reclaimed by removing existing stockpiles and completing minor grading. Tiller proposes to plant this area with prairie seed mixes and native White-pines.

Tiller does not own the Site proposed for mining and therefore does not have control over post-mining and reclamation land use at the Site. However, due to requests from PAC members and residents regarding potential future use of the Site post-project, the City has reviewed this issue. Future post-mining land uses at the Site would need to comply with the City of Scandia Development Code at the time that development is proposed. The current code allows for a variety of agricultural uses, public parks and recreation facilities, and single-family residential use. The proposed reclamation plan would result in a Site that is suitable for the uses allowed in the Development Code.

The City has adopted by reference the Washington County regulations for the St. Croix River Shoreland Overlay District. Single-family residential is the allowed use in this District, which would have the greatest density. Within this area, the minimum lot size for new development is 2.5 acres in the City of Scandia (rural district). This would potentially allow for one residential lot if it meets the following dimensional standards for the District, including:

- Minimum lot width is 200 feet.
- Buildings and septic systems must be set 200 feet from the ordinary high water level and 100 feet from the bluff line.
- No structures or grading on slopes are greater than 12%.

The City of Scandia Development Code AG-C District applies to the 111.3 acres outside the St. Croix River District and alternatives include Lot Averaging and Open Space Conservation Subdivision (OSCS). Development for the 111.3-acre area would be as guided by the Development Code as described below.

Using the lot averaging approach to development: the overall maximum density would be 4 units per 40 acres. The AG-C District allows a maximum density of 4 units per 40 acres. Allowed lot sizes are 2.0 to 5.0 acres, or over 20 acres for traditional development. If the landowner were to develop the Zavoral Site after mining this would allow for a maximum of 11 residential units (114 acres/40 acres*4 units).

Using the OSCS approach: the developer would need to create a "yield plan" as part of preliminary plat submittal that shows the maximum number of dwelling units permitted given the minimum lot size and lot widths for conventional subdivisions and other requirements of the code. This would allow for an estimated maximum of 19 residential lots if they meet the following dimensional standards for the District, including:

- Of the land area proposed for development, 55% would need to be dedicated permanently as open space or agriculture.
- Overall base density of the parcel would be the same as for a lot averaging: 4 per 40. Lot sizes in OSCS can be a minimum 1.5 acres.
- Density bonuses can increase the number of dwelling units allowed, if the developer protects open space, agricultural land, and cultural features. The maximum bonus allowed is 75%.

Based on the criteria for the 4-acre area within the St. Croix River District and the remaining 111.3 acres outside of the District, the estimated maximum number of residential lots (using the OSCS method) for the entire 114-acre Zavoral Site would be 20.

The final grading described in the reclamation plan would result in contours to conform to the City of Scandia's Reclamation Standards contained in Section 8 of Chapter 4 of the Development Code Mining and Related Activities Regulations. The final Site condition would be similar to surrounding landforms characterized by gently sloping fields and steeper sloping bluff areas. In reclamation areas that border forested bluffs, Tiller proposes to plant native coniferous trees to create a natural transition between the existing forested landscape and the newly planted reclamation areas. This transition zone would allow existing tree species along the forested bluffs to seed into the reclamation areas.

The western portion of the Site would slope from the existing grade along the State Scenic Byway TH 95 right-of-way down to the finished floor of the mining area. In this area, slopes would not exceed 4:1 (horizontal:vertical) in accordance with City regulations. The slopes of the bluff east of the Site are typically steeper than this ranging from approximately 1:1 to 3:1. The slopes along the northern portion of the Site would fan out to meet the existing slope along the northern portion of the property, which gradually drops in elevation from approximately 910 feet above mean sea level (msl) to approximately 870 feet msl. The mining area floor would be graded to achieve a gently rolling landscape (CCES May 2011).

For reclamation areas that border agricultural fields to the southwest and to the north of the Zavoral Site, the transition would be from gently sloping agricultural fields to native dry and mesic prairie. Screening berms that occur along the southwest and west perimeters of the Project may be removed to create a gradual transition between adjacent land uses. In addition, native vegetation in the screening areas may remain post-reclamation to provide screening of the Zavoral Site (CCES May 2011).

Established drainageways occur along the bluffs east of the Project that convey stormwater runoff down through the bluffs to the St. Croix River. There would be a rise of 1 to 6 feet from the base of the reclamation area to the eastern edge of the mining limits, which would allow the Project to remain internally drained after reclamation. Tiller proposes to create six depressions within the reclamation area. These created depressions would be designed to provide for infiltration and prevent stormwater from collecting and stagnating, which otherwise could result in converting the depressions to wetland type of environments. The depressions would be planted with a native seed mix that would establish as a mesic to wet prairie plant community and would include species that tolerate a wider range of moisture levels than the dry prairie species (**Figure 9**). These created depressions would have a depth from 0.5 feet to 1.5 feet and range in size from approximately 20,000 square feet to 75,000 square feet.

The majority of post-reclamation areas within the Project would remain internally drained, a condition established from past mining activity that would not impact the function of the existing drainageways. The exception is the northwestern area of the Project. This area would be reclaimed during Reclamation Phase 2. The removal of the BMPs would not occur until vegetation and soil stability are well established. Until stability of the area is evident, stormwater flow would be diverted to the interior of the Site (CCES May 2011).

4.1.1.6.2 *Alternative 2 – No-Build Alternative*

The land use would not be altered from its current mixture of unreclaimed, formerly mined vacant land, forested land, and small areas of agricultural land. The gravel resource would not be used. Establishment of native prairie and coniferous forest would not occur and the portion of the Site within the St. Croix National Scenic Riverway would not be reclaimed. Vegetation succession would continue to occur as described in Sections 4.4.and 4.5

Residential development at the Site could occur as described under Alternative 1, but grading and vegetation establishment would be required. This alternative would also allow the Site to remain as open space, be developed for public recreational facilities, or be used for agriculture under the current City Development Code. Evaluation of these possible land uses is beyond the scope of this EIS.

4.1.1.6.3 *Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation*

The impacts would be the same as with Alternative 1 but would occur in a reduced timeframe. As a result, the area would be available for post-mining and reclamation use earlier than under Alternative 1.

4.1.1.6.4 *Subalternative 3A-Reduced Timeframe 150-Working Day Operation*

The impacts would be the same as with Alternative 3 but would occur in a compressed timeframe. Mining hauling, and reclamation activities would take place at the Site for approximately 1 year. As a result, the area would be available for post-mining and reclamation use earlier. Mining-related activity would be required more frequently or for longer durations, or a combination of both, in order to bring the Project to completion within the 150-working day timeframe.

4.1.2 Potential Mitigation Measures

The Project is consistent with existing and proposed land use. No mitigation measures are recommended. Mitigations measures related to reclamation are included in Section 5.0.

4.2 ENVIRONMENTAL HAZARDS

4.2.1 Database Search

The RSDD required that a database search be conducted for potential on-site and off-site sources of environmental impacts relative to the Zavoral Site. This search was conducted in general accordance with the American Society for Testing and Materials (ASTM) Standard E1527-05 entitled Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process. Standard environmental record sources are defined in Section 8.2.1 of the ASTM standard. These records consist of selected federal and state environmental databases. ASTM also specifies the appropriate search distances from the Zavoral Site for which these records should be reviewed.

Environmental Data Resources, Inc. (EDR) provided specified state and federal regulatory list information for potential sites of environmental concern located at or in the vicinity of the Zavoral Site. EDR maintains a geographic information system (GIS) listing of various state and federal databases in accordance with the ASTM standard. The database search was based upon ASTM-specified standard record sources. Additionally, databases searched by EDR satisfy records review requirements of the all appropriate inquiry rule. EDR includes these databases, when available, as a part of its report. Descriptions of each database are provided in Part GR-1 of the EDR database report (**Appendix D**). The databases reviewed by EDR were the most recently available as of July 14, 2011.

The EDR report includes various reports detailing database information for each of the sites identified/geocoded within the specified radius. Additional sites with recognized environmental risks were identified, but EDR was not able to map them to specific locations due to insufficient or contradicting address information. These sites were included in EDR's report as "orphan" sites.

The following subsections summarize the findings from the database review.

4.2.1.1 Zavoral Site

The Zavoral Site was not listed in any of the databases searched by EDR.

4.2.1.2 Adjacent Properties

Wally's Small Engine Repair (Wally's) located at 20965 St. Croix Trail North was listed as a Conditionally Exempt Small Quantity Generator of Hazardous Materials (CESQG). No violations associated with their CESQG status were identified in the EDR Report. Wally's is identified in the Minnesota Pollution Control Agency (MPCA) "What's in My Neighborhood" (WIMN) database due to the CESQG listing. No other adjacent properties were identified in the EDR report. No known contamination was associated with Wally's; thus, it is not likely to affect the Zavoral Site.

4.2.1.3 Additional ASTM Listings

Ekdahl Estates, located approximately ¼ mile southwest of the Zavoral Site, was identified in the EDR report and in the MPCA WIMN database. The WIMN listing was the result of a construction stormwater permit obtained for Ekdahl Estates. No known contamination was associated with Ekdahl Estates; thus, the area is not likely to impact the Zavoral Site

A total of 39 underground storage tank (UST) listings were identified in the EDR Orphan Summary. All of the UST listings were associated with properties in Osceola, Wisconsin, or Prescott, Wisconsin. None of these UST listings have potential to impact groundwater beneath the Zavoral Site based on distance and separation relative to the St. Croix River.

4.2.2 Potential Mitigation Measures

Since no nearby sites present an environmental risk to the Zavoral Site, no mitigation is recommended.

4.3 ECONOMIC IMPACTS

4.3.1 Local Jobs

Tiller has identified anticipated labor requirements for the Project. Some of the Site employees required for the Project may or may not result in local hiring. However, the ongoing need for employees and the reduction in costs to haul add-rock to the Scandia Mine could allow Tiller to extend the period of employment for employees.

Tiller has identified anticipated labor requirements for the Project. Under Alternatives 1 and 3 and Subalternative 3A, the number of employees would range from 10 to 25 each working day. The types of jobs would include equipment operators, truck drivers, and laborers. Based on the agreements Tiller has in place with various labor unions, the average pay rate for these employees would be $28.50 per hour.

Additional labor would be needed for clearing trees from the Site in preparation for mining. Site clearing would employ four to 14 people for a period of approximately 3 weeks. Based on information from contractors familiar with Site clearing, the average pay is $20.00 per hour.

Since this Project is replacing Class C add-rock from other sites, a change in truck driver employment is not anticipated. As a result, some of the Site employees required for the Project may or may not result in local hiring. However, the ongoing need for employees and the reduction in costs to haul add-rock to the Scandia Mine could allow Tiller to extend the period of employment for employees.

4.3.2 Tourism

Tourism in the area is largely related to the St. Croix River and river corridor, nearby public natural and recreation areas, and cultural heritage resources such as the Gammelgården Museum (approximately 2 miles from the Site) and the Hay Lake School and Erickson Log House Museum (approximately 3 miles from the Site).

The area along the St. Croix River is scenic and provides a range of recreational and scenic driving opportunities. William O'Brien State Park is located approximately 2.5 miles south of the Zavoral Site on State Scenic Byway TH 95. Recreation traffic is a component in increasing average daily traffic on TH 97 and State Scenic Byway TH 95 during the spring to fall timeframe. The trunk highways have sufficient reserve capacity to handle the change in traffic volume for seasonal traffic. Periods of congestion may be experienced during peak weekend travel times or on a holiday weekend, with or without the Project.

Removing the current hauling traffic from the river crossing at TH 243 and the portion of State Scenic Byway TH 95 north of the Zavoral Site should be beneficial to vehicles using these roadways to get to the state park or enjoy other recreational opportunities in the area.

No water quality or quantity impacts that would affect the experience of people using the river were identified.

Analyses conducted for this EIS determined that although mining noise could be audible to people using the St. Croix River, it would fall below applicable standards. Air quality analysis predicted that the mitigated impacts (after implementation of the Tiller Fugitive Dust Control Plan) from Project plus the addition of appropriate background concentrations would not result in exceedances of applicable standards or adversely affect the water quality in the St. Croix River.

The Project would not be visible from the Riverway or from the Wisconsin bluffs on the east side of the river. In general, long-term effects of mining and reclamation activities would be not be visible or would be partially visible from sensitive viewpoints. This is because the interior Site terrain would be further excavated to a lower elevation than adjacent properties, which would limit visibility into the Site. In addition, views of the Site are blocked by tree stands in both leaf-on and leaf-off conditions as viewed from the bike path, TH 97, State Scenic Byway TH 95, and nearby residences.

Property taxes, the value of some properties, and aggregate material removal production tax income have the potential to be affected by the Project as described in the following subsections.

4.3.3 Public and Emergency Services

The City of Scandia and Washington County would be capable of providing public and emergency services for the Project under their existing organization. The City would need to obtain additional staff and consultant resources to monitor the mining project for compliance with permit requirements and any mitigation measures that the City would implement. It is recommended that the City require Tiller to establish a funding mechanism for this additional need.

4.3.4 Property Taxes for the Zavoral Site

Most of the Zavoral Site is classified for property tax purposes as Non-Homestead Rural Vacant Land, with an estimated market value of approximately $8,000 per acre. If and when the Site is mined, the classification of the property (the area to be mined including buffer areas) would change to Commercial. The land value is not likely to change, but the property tax classification rate would change. Property taxes are calculated by multiplying the value times the class rate and then multiplying by the local property tax rate.

The class rate for vacant land is 1.25%. Property taxes payable to the City of Scandia on (for example) 100 acres of land valued at $8,000 per acre, or $800,000 total, would be calculated as follows:

$800,0000	X	0.0125	X	0.33557	=	$3,355
Land Value		*Class Rate*		*City Tax Rate, 2011*		*City Tax*

The class rate for commercial land is 1.5% for the first $150,000 of value, and 2% for the remainder. For the same example, the property taxes payable to the City of Scandia would be calculated as follows:

$150,000	X	0.015	X	0.33557	=	$755
$650,000	X	0.02	X	0.33557	=	$4,362
$800,000						$5,117
Land Value		*Class Rates*		*City Tax Rate, 2011*		*Total City Tax*

The difference in taxes payable to the City of Scandia due to reclassification of the property after commencement of mining would be, in this example, approximately $1,762 per year. Because of how property taxes are levied (a total levy is set, then spread against all the taxable property) this is not additional revenue that would accrue to the City. An increase in taxes payable for the Zavoral Site would have the effect of lowering the tax burden of other property within the taxing jurisdiction. The impact on individual properties would be so small as to not be noticeable.

The above example does not include impacts on the other local property taxing jurisdictions (county, school district, watershed district, or others) nor does it include an estimate of the increased collection of the state property tax that is payable for property classified as commercial. A change in classification from vacant land to commercial would also affect calculations for the Metropolitan Area Fiscal Disparities Levy. It is impossible to determine how this might affect the pool overall or Scandia in particular, and any impact would be extremely small.

4.3.5 Nearby Property Values

AECOM consultant team member BRKW Appraisals, Inc. a real estate valuation services firm, conducted an analysis of the impact that the Project could have on nearby property values (**Figure 20; Appendix B.1**). A 1-mile potential impact area was established as the basis of this analysis. This 1-mile radius extends northward to the intersection of State Scenic Byway TH 95 and Pilar Avenue, westward to near Parish Avenue, southward to near 197th Street, and eastward across the St. Croix River to a point approximately1/3 mile westerly of 280th Street. The area encompasses approximately 3,043 acres of land and water. On the Minnesota side, the majority of development involves small acreage home sites (generally 1.5 to 12 acres) along with various larger sites that reach a maximum size of 115 acres.

This analysis has been made with the "Extraordinary Assumption"[3] that the Project would meet or exceed all MPCA requirements in terms of mining operation. This would be required as part of the permitting process for the Project.

To determine the impact, if any, from the introduction of a gravel mining operation into the area, a study was made of sales of single-family residences within and without gravel mining and sites with perceived environmental hazard areas (i.e., demolition landfill and former superfund site). It is noted that home prices have been declining over recent years due to a variety of economic problems. To avoid the corruption of data from this downturn, single-family home sale activity in the years 2006 and 2007 was

[3] The term Extraordinary Assumptions is defined by the Uniform Standards of Professional Appraisal Practice (USPAP) 2010, Page 3, as "an assumption, directly related to a specific assignment, which, if found to be false, could alter the appraiser's opinions and Conclusions."

selected. This timeframe is a period of market stabilization and change from the rapid increase of property values in the first half of the decade and the sharp declines of the past few years. Based upon this study, it was concluded that a negative impact would most likely occur to property values within, but not beyond, $^{1}/_{4}$ mile of the Zavoral Site.

If the question is placed to a ~~perspective~~ prospective property owner as to whether they would prefer living near a gravel mining operation or other residential land use, the answer would invariably be other residential. However, in a property transaction that item becomes one of many factors to be considered such as number and size of bedrooms, age/condition, floor plan layout and utility, amenities, and so forth. The sales data contained in this analysis reveals that the market fails to recognize a measurable impact, based on proximity to an existing gravel mine or perceived hazard areas. However, the Zavoral Site has not been operated as a gravel mine for over 20 years. The proposed mining operation has the same effect as the introduction of a new gravel mining operation into an area. The current economic situation includes declining property values. The introduction of a perceived negative factor into this environment can have a stronger impact than if appearing in a growth market where demand is more important. The impact could be reflected in price and/or the time a property remains on the market.

It is logical to assume that the value of properties abutting a new gravel mining operation could be adversely affected. This effect dissipates with distance from the mining operation. It was concluded that the impact is limited to a radius of 1/4 mile from the Site. Within that area an up to 2% potential property value reduction was concluded for properties between the bluff and the St. Croix River. A similar situation would exist on the southern side of the Site where an impact up to 2% was estimated, except for the Westphal ownership, which abuts the southern Site boundary and thus may have a somewhat greater impact. A potential property value reduction of up to 5% potential value loss has been established for this property.

Properties within ¼ mile to the southwest, west, northwest, and north have the potential of being more exposed to the gravel mining operation. Based on Tiller's proposal, an 8-foot-high berm would be installed along the western boundary. However, this is less of a barrier than that available to the properties to the east and south. After analyzing the situation, it was concluded that an impact of up to 5% would reflect the potential value loss to those properties. No value loss was ascribed to the Fusco property, which is a vacant site that is being zoned for commercial use and is not affected.

In determining the value loss, the Assessor's 2011 Estimate of Market Value was used. Consideration has also been given to the impact of the potential value losses to the real estate taxes from the individual properties. The resulting tax rates were compared with the potential maximum individual value losses to arrive at the potential annual loss of real estate tax income if these losses were actually realized (to all taxing authorities that base the tax amount on property value). This tax income would not actually be lost unless a sale or new assessed value was established. Any property tax "loss" from these individual properties would be redistributed over other properties in Scandia. The potential value losses are concluded as shown in **Table 8**.

Table 8: Property Value-of Potentially Affected Properties

Property Address	Owner	Property Idenficiation No.	2011 Asessor's M. V. for 2012 R.E. Tax	Percent of Potential Value Loss	Potential Value Loss	2011 % Tax Rate	Potential Annual Real Estate Tax Loss
Southeast Sector							
	Zavoral	18-032-19-43-0001	$484,200	2.00%	$9,684	1.01%	$98.23
	Nat. Park Ser.	18-032-19-43-0002/34-0002		0.00%	$0	0.00%	$0.00
20923 Quint	O'Halloron	19-032-19-12-0001	$587,600	2.00%	$11,752	1.03%	$121.05
20853 Quint	Plowman	19-032-19-12-0003	$242,300	2.00%	$4,846	1.00%	$48.34
20921 Quint	Bowlin Family	19-032-19-12-0005	$461,100	2.00%	$9,222	1.01%	$93.47
20919 Quint	Smith	19-032-19-12-0006	$492,400	2.00%	$9,848	1.01%	$99.93
Quint	McClanahan	19-032-19-12-0007/0012	$442,200	2.00%	$8,844	1.01%	$89.14
20789 Quint	Clary	19-032-19-12-0008	$482,900	2.00%	$9,658	1.01%	$98.00
20733 Quint	Fitzpatrick	19-032-19-13-0003/0011	$446,500	2.00%	$8,930	1.01%	$90.31
20699 Quint	Bowin Robert	19-032-19-13-0004/0009	$453,500	2.00%	$9,070	0.99%	$89.90
	Schlingerman L.	19-032-19-13-0005/0006/0010	$448,300	2.00%	$8,966	1.06%	$94.69
20661 Quint	Schlingerman A.	19-032-19-13-0007/24-0017	$172,100	2.00%	$3,442	0.82%	$28.38
- 205th	Clapp, S.	19-032-19-13-0008	$648,400	2.00%	$12,968	1.04%	$135.50
20685 Quinnell	Westphal	19-032-19-21-0002/0003	$380,000	5.00%	$19,000	0.99%	$187.99
		19-032-19-24-0007/0008/0009					
		19-032-19-24-0013/0014					
16797 - 205th	Wallace	19-032-19-24-0015	$157,200	2.00%	$3,144	0.85%	$26.79
	Wurzingler	19-032-19-24-0012	$4,200	2.00%	$84	0.93%	$0.78
20595 Quinnell	Tuenge	19-032-19-24-0011	$156,600	2.00%	$3,132	0.85%	$26.51
20457 Quinnell	Sumerby	19-032-19-13-0001/42-0002	$547,700	2.00%	$10,954	1.00%	$109.62
20455 Quinnell	Eberhart	19-032-19-13-0002	$200,500	2.00%	$4,010	0.99%	$39.69
20525 St. Croix T.	Dietrich	19-032-19-24-0021	$383,400	2.00%	$7,668	0.99%	$75.88
16810 - 205th Ct	Hannah	19-032-19-31-0005	$474,500	2.00%	$9,490	1.00%	$94.60
16775 - 205th Ct	Pary	19-032-19-31-0006	$438,300	2.00%	$8,766	1.00%	$87.38
Southwest Sector							
xxxx St. Croix T.	Scrock	19-032-19-22-0002/0003	$360,800	5.00%	$18,040	0.53%	$95.61
16297 Scandia T.	Fusco	18-032-19-33-0001/0002	$151,000	0.00%	$0	2.42%	$0.00
21060 St. Croix T.	Boesel	18-032-19-44-0001/0003	$342,200	5.00%	$17,110	0.46%	$79.43
16601 Scandia T	Buck	18-032-19-44-0001	$197,300	5.00%	$9,865	0.90%	$88.76
16141 Scandia T	Anderson	18-032-19-43-0010	$444,400	5.00%	$22,220	0.95%	$210.58
16390 - 209th	Herlke	19-032-19-22-0005	$262,900	5.00%	$13,145	0.94%	$123.90
16850 - 209th	Welsh	24-032-20-11-0003	$261,200	5.00%	$13,060	0.95%	$123.43
20939 Quadrant	Fehey	24-032-20-11-0002	$247,400	5.00%	$12,370	1.25%	$154.47
20969 Quadrant	Schwartz	24-032-20-11-0001	$196,200	5.00%	$9,810	1.16%	$114.10
Northwest Sector							
20965 St. Croix T.	Srock	18-032-19-32-0004/23-0002	$325,200	5.00%	$16,260	0.66%	$107.80
21420 St. Croix T	Maguson	18-032-19-32-0002	$392,100	5.00%	$19,605	0.99%	$194.50
16290 Scandia T.	Hendrickson	13-032-20-41-0001	$206,000	5.00%	$10,300	0.77%	$79.40
16240 Scandia T	Wolkerstorfer	13-032-20-41-0004	$368,900	5.00%	$18,445	1.00%	$183.90
16140 Scandia T.	Gilberson	13-032-20-41-0005	$267,400	5.00%	$13,370	0.95%	$126.70
Northeast Sector							
17001 - 220th	Page, G	18-032-19-31-0006	$363,600	5.00%	$18,180	0.96%	$175.37
21565 St. Croix T.	Lundgren	18-032-19-24-0002/13-0003	$252,000	5.00%	$12,600	0.55%	$68.90
	Nat. Park Serv.	18-032-19-42-0003/12-0005	$0	0.00%	$0		
		18-032-19-43-0001/42-0001					
	McGinley	18-032-19-13-0002	$143,200	5.00%	$7,160	1.33%	$95.53
		Totals	$12,885,700		$405,018		$3,758.54
		Rounded to	$12,886,000		$405,000		$3,800.00

The projected negative impact would remain as long as the facility was in operation. The impact would diminish as reclamation occurred, to a level of zero with completion of the successful reclamation.

This analysis presents possible impacts to property values for use in an EIS process. The County Assessor would not prospectively lower property values or related tax rates for groups of properties based on changes that may or may not occur in the future. The values would not be modified unless sales took place or documented appraisal information for individual properties was submitted for County consideration in the valuation process.

4.3.6 Aggregate Material Removal Production Tax

Minn. Stat. § 298.75 provides for the payment of a production tax on aggregate material removal in certain areas of the state, including Washington County and adjoining Chisago County. The production tax is 21.5 cents per cubic yard or 15 cents per ton of aggregate material excavated in the county. The tax is payable when the aggregate material is transported from the extraction site or sold, whichever occurs first. The tax also applies to aggregate that is imported from a Minnesota county that does not impose the tax, or from another state.

The tax is collected by the county auditor. The county may retain up to 5% for administration and the remainder is credited as follows:

- 42.5% to the county road and bridge fund.
- 42.5% to the city or town in which the mine is located, to be expended for maintenance, construction of roads, highways and bridges.
- 15% to a special reserve fund for restoration of abandoned pits, quarries or deposits located within the county.

The formula for distribution of this tax was made more favorable to cities in 2009. With two active sand and gravel mines in the city, Scandia's revenue from the tax was $17,033.85 in 2009 and $13,035.21 in 2010. The forecasted revenue without the Zavoral Project is about $10,000 for both 2011 and 2012. Scandia credits this revenue to its Public Works Department Budget in the General Fund, which pays for all road maintenance expenditures.

Tiller proposes to extract up to 1.2 million tons of aggregate from the Zavoral Site. At 15 cents per ton ($180,000) and after deducting 5% for administration, this would generate $171,000 in taxes to be distributed, $72,675 (42.5%) of which would be payable to Washington County, $72,675 (42.5%) of which would be payable to the City of Scandia, and $25,650 to Washington County's reserve fund for restoration of abandoned pits.

Tiller has indicated that the add-rock material excavated from the Site would replace add-rock currently excavated and hauled from other sites in Chisago County and/or Wisconsin. To the extent that the add-rock replaces material now excavated in Chisago County, the gravel tax paid to Chisago County would be reduced by the amount that would be paid to Washington County for material excavated from the Zavoral Site. This would be new revenue to Washington County and to the City of Scandia.

If add-rock material is currently imported by Tiller from Wisconsin to the Scandia Mine, Tiller should already be paying the aggregate tax to Washington County. Replacing this with material excavated in Scandia, at the Zavoral Site, would not generate new tax revenue. Because Tiller has not provided a detailed breakdown of the imported material from Wisconsin, nor does it report that information to Washington County, it is not possible to estimate how much this might reduce the estimate of new aggregate tax revenue to be paid to Washington County and Scandia.

4.3.6.1 Alternative 1 – 5- to 10-Year Operation

No significant changes in local jobs, demand for public or emergency services, or tourism are anticipated. Public service change would be expense of monitoring the Project.

After mining is complete, the land classification for the Zavoral Site would likely revert from Commercial to Vacant Land (unless the land is developed for some other use.) The longer the mining operation continues, the longer the property would pay property taxes at the higher commercial rate.

The projected negative effect on nearby property values would remain as long as the facility is in operation. The impact would diminish as reclamation takes place, to a level of zero with completion of the reclamation plan. Thus, any effect on property values would occur for a longer period of time under Alternative 1.

Table 9 shows the maximum amount of aggregate tax revenue to be generated annually for each of the alternatives.

4.3.6.2 Alternative 2 – No-Build Alternative

No changes in local jobs, demand for public or emergency services, or tourism would occur. No changes in Zavoral Site property tax would occur. Nearby property values would not be affected. No aggregate tax revenue would be collected for the Zavoral Site.

4.3.6.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

No significant changes in local jobs, demand for public or emergency services, or tourism are anticipated. Public service change would be expense of monitoring the Project.

Less tax benefit would be realized than under Alternative 1 due to the Site reverting back to the lower-taxed classification more quickly.

The projected negative effect on nearby properties would occur for a reduced period of time under Alternative 3.

Based on the estimated amount of material to be excavated from the Zavoral Site, **Table 9** shows the maximum amount of aggregate tax revenue to be generated annually for each of the Project alternatives. Alternative 3 would be preferred based on a present-value analysis of the stream of payments from the aggregate tax. This assumes that the tax rate (15 cents per ton) would not change over the life of the Project.

4.3.6.4 Subalternative 3A – Reduced Timeframe 150-Working Day Operation

No significant changes in local jobs, demand for public or emergency services, or tourism are anticipated. Public service change would be expense of monitoring the Project.

Less tax benefit would be realized due to the Site reverting back to the lower-taxed classification more quickly.

The projected negative effect on nearby properties would occur for an approximately 1-year period.

The aggregate tax revenue for the City of Scandia would be approximately $72,670 accrued over approximately 1 year (**Table 9**). Alternative 3 or Subalternative 3A would be preferred based on a present-value analysis of the stream of payments from the aggregate tax.

Table 9: Estimate of Maximum Annual Aggregate Tax Revenue

		Minimum Tons	Maximum Tons
Alternative 1: 5- to 10-year Operation		120,000	240,000
	Gross Tax	$18,000	$36,000
	Scandia Share	$7,267	$14,535
	Years	10	5
Alternative 2: No-Build	*No Tax Generated*		
Alternative 3: Reduced Timeframe - 3.3- to 5-year Operation		240,000	360,000
	Gross Tax	$36,000	$54,000
	Scandia Share	$14,535	$21,802
	Years	5	3+
Subalternative 3A: 150 Working Days		1.,200,000	1.,200,000
	Gross Tax	180,000	180,000
	Scandia Share	72,670	72,670
	Years	1	1

4.3.7 Potential Mitigation Measures

The possible impacts to property value and tax base were identified for use in this EIS process. The County Assessor would not prospectively lower property values or related tax rates for groups of properties based on changes that may or may not occur in the future. The values would not be modified unless sales took place or documented appraisal information for individual properties was submitted for County consideration in the valuation process. The impacts described are speculative and temporary; therefore, no mitigation is recommended. The City would need to obtain additional staff and consultant resources to monitor the mining project for compliance with permit requirements and any mitigation measures that the City would implement. It is recommended that the City require Tiller to establish a funding mechanism for this additional need.

4.4 COVER TYPES

4.4.1 Zavoral Site

4.4.1.1 Affected Environment

Tiller's biological assessment for the Site is included in **Appendix A.1**. According to the MnDNR Ecological Classification System, ecological land classifications are used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. The Zavoral Site is located entirely in the St. Paul Baldwin Plains and Moraines Subsection of the Minnesota and Northeast Iowa Morainal (MIM) Section.

The MIM is a long band of deciduous forest, woodland, and prairie that stretches nearly 350 miles from Polk County in northwestern Minnesota to the Iowa border. Over ½ half of this area consists of rugged to hummocky moraines deposited along the eastern margin of the Des Moines ice lobe during the last glaciation. Another quarter of the area consists of rolling till or basal till deposited as drumlins. Small sand plains occur locally within the moraines. A rather large sand plain, the Anoka Sand Plain, is present north of the metropolitan area. This level plain is formed from sand deposited by meltwater from the Grantsburg sublobe, a spur of ice emanating from the east flank of the Des Moines lobe (MnDNR 2006).

The presettlement pattern of upland vegetation in the MIM reflects substrate texture and landform topography. These features affected vegetation directly through their influence on moisture and nutrient availability, insolation, and local temperature, and also indirectly through their influence on the frequency and severity of fires. Sandy flat areas were dominated by prairie, savanna, and oak and aspen woodlands. This is especially true of the Anoka Sand Plain and sandy terraces along the major rivers. In these areas, droughty soils and absence of impediments to the spread of fire promoted fire-dependent prairie and woodland vegetation. A large area of prairie, savanna, and oak woodland was also present on gently undulating glacial till in the southern part of the section, adjacent to the extensive prairie lands of western Minnesota. The low-relief landscape in this part of the section afforded few impediments to the spread of fire, including fires that spread into the section from the adjacent prairie region. Woodland and forest dominated sites in the section where fire was uncommon or rare. Fine-textured drift deposited in hummocky moraines supported mesic forests dominated by Sugar maple, basswood, American elm, and Northern red oak. Even small reductions in fire frequency afforded by streams, lakes, or topographic breaks permitted the formation of forest on finer-textured soils; once formed these forests were highly resistant to burning (MnDNR 2006).

Floodplain and terrace forests were present historically along the valleys of the major rivers, the Mississippi, Minnesota, and St. Croix, and are still prominent today along many stretches of these rivers. Forests of Silver maple occupy the active floodplains, while forests of Silver maple, cottonwood, Box elder, Green ash, and elm occupy terraces that flood infrequently. These valleys are also characterized by herbaceous and shrubby river shore communities along shorelines and on sand bars, and in some areas by cliff communities on steep rocky river bluffs. Closed depressions that pond water in the spring provide habitat for open wetlands such as marshes, wet meadows, shrub swamps, and wet prairies. Peatlands are uncommon in the section and usually develop following formation of sedge or moss mats over sediments in former lake basins (MnDNR 2006.).

4.4.1.1.1 *Plant Communities*

A variety of upland and wetland plant communities, Southern mesic cliffs, and former gravel mining areas were documented during the June/July 2009 field surveys of the Site conducted as part of the biological assessment (**Appendix A.1**). Of the 114 acres surveyed, approximately 64 acres are proposed to be mined and reclaimed. The existing cover types within the Zavoral Site are described below (**Figure 21**).

Southern mesic cliffs are open lichen- and moss-dominated plant communities on dry-mesic to mesic, shaded, northwest- to east-facing cliffs in rugged terrain in southeastern Minnesota. Vascular plants are largely restricted to crevices and ledges (MDNR, December 2011).

Areas from the bluff line down (east) to the St. Croix River are relatively undisturbed White-pine hardwood and Maple-Basswood forests that run contiguously from the north and south property boundary and extend off-site in both directions. These forest types are of a high to moderate ecological quality with a diversity of tree species found throughout including White-pine (*Pinus strobus*), Red oak (*Quercus rubra*), White oak (*Quercus alba*), Paper birch (*Betula papyrifera*), Sugar maple (*Acer saccharum*), basswood (*Tilia americana*), ironwood (*Ostrya virginiana*), Bitternut hickory (*Carya cordiformis*), Black ash (*Fraxinus nigra*), Butternut (*Juglans cinerea*), hackberry (*Celtis occidentalis*), American elm (*Ulmus americana*), Big-tooth aspen (*Populus grandidentata*), and Blue beech (*Carpinus caroliniana*)

The forested area below the bluff line is included within an MnDNR designated Regionally Significant Ecological Area (RSEA) of the Twin Cities. The classification of RSEA denotes the presence of a high-quality plant community with the potential to have suitable habitat for rare species located within it. On the Zavoral Site, the RSEA is composed primarily of the White-pine hardwood forest along the steep east-facing bluff, Maple-Basswood forest within the southernmost ravine system, and Black ash swamp seepage subtype wetlands located along the eastern boundary of the Site within ravine systems adjacent to the railroad tracks. The Maple-Basswood forests within the survey area showed evidence of moderate impacts from invasive earthworms, such as reduced leaf litter and reduced leaf mold (likely due to earthworm herbivory), reduced herbaceous species cover in the ground layer, soil compaction, and soil erosion.

At the time of the survey, the majority of upland area located above the bluff (west) had been previously used for sand and gravel mining and was currently inactive. This part of the Zavoral Site is dominated by altered/nonnative short and long grass, altered/nonnative short and long grass with sparse trees, and altered/nonnative forest and woodland plant communities. Many small- to medium-sized spoil piles occur throughout this area and are now revegetating with a mix of native and nonnative grasses and forbs including primary and secondary noxious weeds. The Minnesota Department of Agriculture defines certain plants as noxious weeds because they are injurious to public health, the environment, public roads, crops, livestock, and other property (MDA No Date).

The primary noxious weeds found in this cover type include Poison ivy (*Toxicodendron radicans*), Bull thistle (*Cirsium vulgare*), and Canada thistle (*Cirsium arvense*). Secondary noxious weeds found in this plant community include Giant foxtail (*Setaria faberii*), Spotted knapweed (*Centaurea maculosa*), Common lambsquarters (*Chenopodium album*), Common milkweed (*Asclepias syriaca*), Quackgrass (*Agropyron repens*), and Annual ragweed (*Ambrosia artemisiifolia*). Other dominant vegetation found within the Zavoral Site includes young cottonwood (*Populus deltoides*) and White pine (*Pinus strobus*) saplings and trees, which are typical early succession species (i.e., species that are the first to grow back

after disturbance has taken place). Very little potential habitat for rare species was found in this portion of the Zavoral Site.

Two Black ash swamp seepage subtype wetlands were documented within the property boundary (**Figure 21**). These Black ash-dominated plant communities were assessed to be of moderate ecological quality using the MnDNR's plant community assessment protocols. Steep ravine systems with seepage discharge areas support these streams and wetlands. Seepage wetlands and streams on the property support a diversity of native plant species and provide potential habitat for Bog blue grass (*Poa paludigena*),one of the rare species with potential to occur on the Site. However, no rare species were located in the Black ash swamp seepage wetland habitats during the surveys. Along the eastern edge of the property in two ravine systems are Black ash swamp seepage subtype wetlands (**Figure 21**) that are dominated by Black ash, Yellow birch (*Betula allegheniensis*), Skunk cabbage (*Symplocarpus foetidus*), and Spotted touch-me-not (*Impatiens capensis*).

Southern mesic cliffs are open lichen- and moss-dominated plant communities on dry-mesic to mesic, shaded, northwest- to east-facing cliffs in rugged terrain in southeastern Minnesota. Vascular plants are largely restricted to crevices and ledges.

Southern mesic cliff areas were found mainly in the northern half of the Zavoral Site (**Figure 21**). Due to the inaccessibility (i.e., steepness) of these cliff areas, many of the bedrock outcrops have not been directly disturbed by past land use practices. Herbaceous and woody plant species typical of moist cliff habitats are found in these areas, including large populations of Nodding trillium (*Trillium cernuum*), Blue cohosh (*Caulophyllum thalictroides*), Smooth cliff-brake (*Pellaea glabella*), Bulbet fern (*Cystopteris bulbifera*), Wild columbine (*Aquilegia canadensis*), Sugar maple, Black ash, and several moss and liverwort species.

4.4.1.1.2 *Wetland Determinations*

AECOM consultant team member Stantec, Consulting (formerly Natural Resource Consulting), conducted a wetland determination at the Site in May 2010 (**Appendix B.2**). Wetland delineations were conducted using methods described in the U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (Environmental Laboratory 1987), subsequent guidance documents (USACE 1991, 1992) and the Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (USACE 2009). According to procedures described in the 2009 Manual, areas that under normal circumstances reflect a predominance of hydrophytes (water-loving vegetation), hydric soils, and wetland hydrology (e.g., inundated or saturated soils) are considered wetlands. No wetlands were identified within the proposed 64-acre mining and reclamation area during wetland determinations conducted in May 2010.

At PAC Meeting 2, committee members identified the possibility of water use at the Zavoral Site impacting the Black ash swamp seepage subtype wetlands (Section 4.7) as a concern. PAC members requested that a wetland determination be conducted to establish a baseline boundary for the Black ash swamp seepage subtype wetlands. Tiller subsequently conducted a wetland determination for the entire 114-acre Site, which included the Black ash swamp seepage subtype wetlands, in September and October 2010 (**Appendix A.5**).

Three wetland areas (approximately 2.98 acres) were identified and delineated outside of the proposed mining and reclamation area (**Figure 22**). Wetland classifications follow Shaw and Fredine (1971) and Cowardin et al. (1979) and are summarized below.

- Wetland A is classified as part palustrine emergent saturated wetland (PEMB; Circular 39 Type 2) and part palustrine forested deciduous saturated wetland (PFO1B; Circular 39 Type 7).
- Wetland B is classified as part palustrine emergent saturated wetland (PEMB; Circular 39 Type 2) and part palustrine forested deciduous saturated wetland (PFO1B; Circular 39 Type 7).
- Wetland C is classified as part palustrine emergent saturated wetland (PEMB; Circular 39 Type 2) and part palustrine forested deciduous saturated wetland (PFO1B; Circular 39 Type 7).

No jurisdictional wetland would be directly affected by the proposed mining and reclamation activities. Section 4.7 of this document addresses the potential for indirect hydrogeologic impacts.

4.4.1.2 Impact Analysis

4.4.1.2.1 *Alternative 1 – 5- to 10-Year Operation*

AECOM conducted a GIS analysis to calculate the cover types that currently exist within the 114-acre Zavoral Site. **Table 10** provides the approximate number of acres of each cover type that currently exist on the Site (**Figure 21**) and the approximate number of acres of each cover type that would exist after the proposed mining activities are completed and the Zavoral Site is reclaimed (**Figure 19**). For a detailed discussion of the cover types that are proposed post-reclamation refer to Section 3.1.1.3.

Table 10: Existing and Post-Reclamation Cover Types for the Entire 114-Acre Zavoral Site

Estimated acreage of cover types for the entire 114-acre Zavoral Site under existing conditions (Before) and after reclamation (After)

	Before	After		Before	After
Types 1–8 Wetlands	2.98	2.98	Altered Nonnative Long Grasses	1.45	0
White-Pine Hardwood Forest	26.53	24.26	Altered Nonnative Short Grasses	2.94	2.94
Maple Basswood Forest	6.63	6.42	Altered Nonnative Long Grasses with Sparse Trees	17.00	4.25
Cropland	7.51	4.11	Altered Nonnative Short Grasses with Sparse Trees	31.14	0.28
Southern Mesic Cliff	1.38	1.38	Lawn/landscaping	0	0
Altered Nonnative Forest	6.01	4.41	Impervious Surfaces	1.04	2.22
Altered Nonnative Deciduous Woodland	7.77	0.08	Mesic Prairie	0	18.99
Dry Prairie	0	40.06	Other (Describe)	0	0
Black Ash Swamp	1.62	1.62	TOTAL	114.00	114.00

AECOM also conducted a GIS analysis to calculate the cover types that currently exist within 64-acre mining and reclamation area. **Table 11** provides the approximate number of acres of each cover type that currently exist on the Site (**Figure 21**) and the approximate number of acres of each cover type that would exist after the proposed mining activities are completed and the mining and reclamation area is reclaimed (**Figure 23**). For a detailed discussion of the cover types that are proposed post-reclamation refer to Section 3.1.1.3.

Table 11: Existing and Post-Reclamation Cover Types for the 64-Acre Mining and Reclamation Area

Estimated acreage of cover types for the 64-acre mining and reclamation area under existing conditions (Before) and after reclamation (After)

	Before	After		Before	After
Types 1-8 Wetlands	0	0	Altered Nonnative Long Grasses	~~1.55~~ 1.13	0
White-Pine Hardwood Forest	~~6.72~~ 5.69	3.42	Altered Nonnative Short Grasses	0	0
Maple Basswood Forest	0.21	0	Altered Nonnative Long Grasses with Sparse Trees	~~13.03~~ 13.04	0
Cropland	3.40	0	Altered Nonnative Short Grasses with Sparse Trees	~~28.18~~ 30.87	0
Southern Mesic Cliff	0	0	Lawn/landscaping	0	0
Altered Nonnative Forest	~~1.49~~ 1.61	0	Impervious Surfaces	0	1.17
Altered Nonnative Deciduous Woodland	7.06 7.69	0	Mesic Prairie	~~0.56~~ 0	18.97
Dry Prairie	~~1.80~~ 0	~~40.44~~ 40.02	Other (Describe)	0	0
Black Ash Swamp	0	0	TOTAL	64.00	64.00

In the approximately 9-acre area not disturbed by earlier mining, the Project would result in the loss of:

- 5.2 acres of White-pine hardwood forest
- 0.2 acres of Maple-Basswood forest
- 3.4 acres of cropland

The Tiller biological assessment for the Site described the Maple-Basswood forest as showing evidence of moderate impacts from invasive earthworms, such as reduced leaf litter and reduced leaf mold, reduced herbaceous species cover in the ground layer, soil compaction, and soil erosion. The 5.4 acres of White-pine hardwood forest and Maple-Basswood forest that would be lost due to the Project would be reclaimed to a combination of mesic prairie, dry prairie, and White-pine hardwood forest. Section 3.1.1.3 of this document provides additional detail regarding the reclamation plan.

Approximately 55 acres of altered nonnative cover types would be affected by mining activities. Approximately 40.8 acres of White-pine hardwood forest, Maple-Basswood forest, Black ash swamp seepage subtype wetlands, Southern mesic cliff, and cropland located outside the proposed mining limits would not be directly affected by mining activities.

Although the proposed mining would involve the loss of some wildlife habitat, approximately 86% (55 acres) of the impact would occur in previously mined areas that remain unreclaimed after previous mining on the Site and currently provide low-quality wildlife habitat, primarily for common, disturbance adapted edge species. These species would be temporarily displaced during mining activities, but many of the species would be expected to return to the area once mining and reclamation activities are complete. Since no nesting or roosting areas were identified, the raptors observed at the Site would not be expected to be negatively affected due to the large size of the areas that they use.

The Southern mesic cliffs and the Black ash swamp seepage subtype wetlands are located along the eastern edge of the property boundary outside the mining and reclamation limits. They are part of an MnDNR designated RSEA for the Twin Cities. At multiple PAC meetings, committee members voiced concern over whether the use of the on-site well for dust control would cause groundwater impacts that would negatively impact the Southern mesic cliffs and Black ash swamp seepage subtype wetlands. The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers. The shallow aquifers at the Site were not influenced by pumping in the deeper aquifer and the projected use of water from the Zavoral Site Well for dust control purposes would not be expected to impact these regionally significant features.

Mining would increase the amount of internal surface drainage at the Site, resulting in increased base flow conditions. This increase in the base flow is not expected to be significant but would provide an incremental increase in the groundwater flow into the seeps and creeks. The decrease in surface runoff should decrease sediment loading to the creeks, which in turn should benefit the creeks. Therefore, the Southern mesic cliffs and the Black ash swamp seepage subtype wetlands would not be directly or indirectly affected by the Project.

4.4.1.2.2 *Alternative 2 – No-Build Alternative*

No mining or reclamation activities would take place and there would be no effect to fish, wildlife, or ecologically sensitive resources within the Site. The loss of woodland and cropland not previously affected by mining and temporary displacement of wildlife would not occur. The gravel resource would not be used. No reclamation activities would take place on the Site and vegetation succession would be expected to continue.

4.4.1.2.3 *Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation*

Impacts to existing cover types would be the same under Alternative 3 as under Alternative 1. The loss of forestland and cropland would occur. The compressed timeframe proposed under Alternative 3 would have the advantage of reducing the length of time that wildlife is displaced from the Site due to mining activities and would allow for reclamation of habitat to begin sooner.

4.4.1.2.4 *Subalternative 3A – Reduced Timeframe 150-Working Day Operation*

Impacts to existing cover types would be the same as under Alternative 3. The loss of forestland and cropland would occur. The compressed timeframe proposed under Subalternative 3A would have the advantage of reducing the length of time that wildlife is displaced from the Site due to mining activities and would allow for reclamation of habitat to begin sooner.

4.4.2 Potential Mitigation Measures

Mitigation measures related to cover types are described under Section 3.1.1.3 through 3.1.1.5. The key component is that reclamation is monitored and managed to ensure that it is successful in order for suitable revegetation and wildlife habitat development to result.

Additionally, Section 4.7.2 identifies that monitoring of groundwater use and specific surface water features and the Black ash swamp seepage subtype wetlands should be monitored during operation of the Site.

4.4.3 Scandia Mine

The cover types within the Scandia Mine would not change as a result of the Project. Add-rock from the Zavoral Site would be hauled to the Scandia Mine and would be unloaded over an active face where it would be stored until needed. It would not be stored in individual stockpiles over the Mine floor. This practice of storing the add-rock material over the active face would continue regardless of the add-rock source. This activity would not open any areas to be mined prematurely nor would it change or disturb additional areas as storage takes place over the active mining area.

4.5 FISH, WILDLIFE, AND ECOLOGICALLY SENSITIVE RESOURCES AND THREATENED AND ENDANGERED SPECIES

4.5.1 Zavoral Site

4.5.1.1 Affected Environment

A query of the Minnesota Department of Natural Resources (MnDNR) Natural Heritage Information System (NHIS) identified 70 historic records of rare plants, animals, fishes, reptiles, mussels, and native plant community occurrences within a 1-mile radius of the Site. Of these 70 historic records, the MnDNR Natural Heritage Program staff determined that the following state-listed species would have the potential to occur on the Site and, if present, would have the potential to be affected by Project activities:

- Kitten-tails (*Besseya bullii*; Minnesota Threatened)
- Bog blue grass (*Poa paludigena*; Minnesota Threatened)
- American ginseng (*Panax quinquifolius*; Minnesota Special Concern)
- Red-shouldered hawk (*Buteo lineatus*; Minnesota Special Concern)
- Blanding's turtle (*Emydoidea blandingii*; Minnesota Threatened)
- Several threatened and endangered species of mussels occur within the St. Croix River. Two of these endangered mussel species, winged mapleleaf (*Quadrula fragosa*) and snuffbox (*Epioblasma triquetra*), are known to occur within 2,000 feet of the Project. However, these species do not occur on Site.

At the request of the MnDNR PAC member, AECOM requested an updated NHIS review from the MnDNR on November 30, 2011. AECOM requested an expedited (rapid turn-around) on this review. The MnDNR responded that they could not provide the expedited process. ~~A response is still pending.~~ On February 9, 2012 the MnDNR Natural Heritage Program staff provided an updated Natural Heritage database report (no new records) and stated that the EIS should include a discussion on the issues raised in the July 21, 2008 Natural Heritage letter and a discussion regarding the Butternut trees.

The MnDNR Natural Heritage Program staff, in a letter dated July 21, 2008, recommended that a rare species and significant natural features survey be conducted on the Site to determine the presence or absence of these state-listed species. As a result, a biological assessment (**Appendix A.1**) was completed for the entire 114-acre property by an MnDNR-approved surveyor employed by CCES. No

surveys were conducted for threatened and endangered mussel species within the St. Croix River because Project activities are not expected to directly or indirectly affect these species.

The biological assessment was conducted in June 12 through July 2 of 2009 (**Appendix A.1**). Field surveys of the 114-acre property were conducted to identify potential habitat for the rare species likely to occur on the property. Once potential habitats (i.e., specific habitats that have the potential to support rare species) were identified and located, thorough and detailed surveys of these habitats were completed to determine the presence of potential rare species.

None of the state-listed species identified in the MnDNR's July 21, 2008, letter or from the NHIS query were detected. However, three raptors were observed and recorded during the call-response surveys for Red-shouldered hawks within the Site during the May 2010 surveys (**Appendix A.6**), including two Red-tailed hawks (*Buteo jamaicensis*) and one Bald eagle (*Haliaeetus leucocephalus*, Minnesota Special Concern).

Also, a previously undocumented population of Butternut trees (*Juglans cinerea*; Minnesota Special Concern) was detected and documented as part of the CCES survey. A point location was collected with a submeter accuracy global positioning system (GPS) and incorporated within GIS using ArcGIS 9.2 for each Butternut tree location (**Figure 24**).

Of all of the individual Butternut trees detected throughout the property, one tree appears to be healthy and disease-free with all other individuals affected by an introduced (i.e., nonnative) fungal disease known as Butternut canker (*Sirococcus clavigignenti-juglandacearum*). It is estimated that this fungal disease has killed 80–90% of the Butternut trees in some regions of the United States and has caused a steep decline in Butternut populations of larger diameter at breast height trees of greater than 12 inches throughout Minnesota. Butternut is currently listed as Special Concern by the MnDNR and therefore does not require avoidance, protection, or mitigation for taking of the plant species under Minn. Stat. § 84.0895 (CCES December 2009). However, the status of the Butternut tree is currently proposed to change to endangered within the next year. If tree clearing occurs after this reclassification takes place, a taking permit from the MnDNR would be required (MnDNR May 2012).

The single Butternut tree that appears to be disease free is also the largest Butternut surveyed on the property and is located outside of the mining and reclamation area at the base of the bluff above the railroad tracks in the central part of the property. This tree is relatively isolated from the other individuals found elsewhere on the property.

Although no Blanding's turtles were identified at the Site, the MnDNR has requested that Blanding's turtle mitigation measures be applied to the Project (**Appendix C**).

4.5.1.2 Survey Methods

4.5.1.2.1 *Vegetation Survey Methods*

Meander surveys to document vegetation and the presence of rate species were conducted from June 12 through July 2 of 2009 (CCES December 2009). The following natural habitats and land cover types were surveyed and documented on the Site (**Figure 21**):

- White-pine hardwood forest
- Black ash swamp seepage subtype wetlands
- Maple-Basswood forest
- Southern mesic cliff with forest
- Altered nonnative grasslands, woodlands, and forests, as well as former gravel mining areas

A detailed description of each land cover type is found in Section 4.4.

4.5.1.2.2 *Rare Plant Survey Methods*

During June 12 through July 2, 2009, all potential areas of the Site were surveyed for the presence of state-listed plant species, with a focus on Kitten-tails (*Besseya bullii*; Minnesota Threatened), and Bog blue grass (*Poa paludigena*; Minnesota Threatened). State-threatened species are protected under Minn. Stat. § 84.0895, Protection of Endangered and Threatened Species. Surveys were also conducted for American ginseng (*Panax quinquifolius*; Minnesota Special Concern), because this species is cited in the MnDNR's July 2008 letter.

Surveys for Kitten-tails concentrated on the forested edges and woodland areas throughout the Zavoral Site where native vegetation was present. Suitable habitat for Kitten-tails typically is oak savanna, dry prairie, and oak woodland within the bluffs and terraces of the St. Croix, Mississippi, and Minnesota River valleys. The optimal time to survey for Kitten-tails is late May through June in Minnesota, when Kitten-tails are in flower and/or have set seed.

Surveys for Bog bluegrass focused on the Black ash swamp seepage subtype wetland communities occurring along the eastern boundary of the Zavoral Site. Bog bluegrass is most often found in forested and shrub-dominated wetland habitats that are fed by groundwater seeps and are dominated by Black ash and Yellow birch. The optimal time to survey for Bog bluegrass is late June through mid-July in Minnesota, when Bog bluegrass has set seed.

Surveys for American ginseng focused on the White-pine hardwood forest and Maple-Basswood communities found in the eastern and southern parts of the Site where a previously documented population was found in 1988 by an MnDNR botanist. American ginseng is typically found in mature hardwood forests with little competition in the ground layer, which is typical of the hardwood forests located within the Site. A historic record in the MnDNR's NHIS notes that "a few" American ginseng plants were located on the property in September 1988 by an MnDNR staff botanist on an east-facing forested slope, and that the long-term viability of this small population was estimated at "fair to poor." Special effort was made to attempt to relocate the historic American ginseng population discovered on the subject property in 1988 along the east-facing White-pine hardwood forest slope where it was presumed to be located. Surveys found no populations in this area or elsewhere on the Site.

A previously undocumented rare plant population was detected and documented on the subject property. Butternut (Juglans cinerea; Minnesota Special Concern) was identified. A point location was collected with a submeter accuracy GPS and incorporated within GIS using ArcGIS 9.2 for each Butternut tree location (**Figure 24**).

Butternut was the rare species found during the survey. No occurrences of Kitten-tails, Bog blue grass, or American ginseng were found during the survey.

4.5.1.2.3 *Red Shouldered Hawk Survey Methods*

Red-shouldered hawk (*Buteo lineatus*; Minnesota Special Concern) surveys were conducted on several occasions at the Site. The first surveys were conducted during June of 2009. During 2009, surveys were conducted along three transects within forested habitats associated with the river and bluffland by listening for territorial Red-shouldered hawk calls. Suitable habitats were scanned for nest trees, adult hawks, potential nest trees, or young near potential nesting sites. Scanning took place for 8 minutes at every survey location.

At the request of AECOM, additional call-response surveys for Red-shouldered hawks at the Site conducted to better ensure appropriate seasonal coverage. The surveys were repeated, for 2 days between May 22 and May 28, 2010, on March 29, 2011, and on April 12, 2011. The surveys covered the timeframe when adults would be expected to establish nesting sites and territories. The purpose of the call-response surveys was to assess the presence or absence of Red-shouldered hawks and active nest sites. Surveys were conducted to elicit a response within a ¼-mile radius of the survey points/transects within the 114-acre Site. Broadcast call-response surveys were conducted according to survey techniques described by Iverson and Fuller (1991), McLeod (1996), and McLeod and Andersen (1998). Red-shouldered hawk calls were broadcast at 22 points (**Figure 25; Table 12**), located at approximate 100-meter (0.06-mile) intervals along two survey transects within the property. Two survey transects were used to account for major topographic variations (bluff top/river bottom) and habitat (open herbaceous/forested) variations within the subject property. The surveys covered the expected timeframe when adults would be establishing nesting sites and territories. Surveys took place during daylight hours (½ hour after sunrise to ½ hour before sunset) and were not conducted during adverse weather conditions, such as heavy rain or high winds (CCES May 2011).

Prerecorded Red-shouldered hawk calls were played at each point using a portable digital audio (i.e., MP3) player and a handheld megaphone. The output of the megaphone was set to between 100 and 110 decibels at 1 meter from the source using a calibrated sound-level meter (McLeod 1996). The Red-shouldered hawk call broadcast was from the Stokes Field Guide to Bird Songs of Eastern and Central North America (Elliot et al. 1997). During call broadcasts, the megaphone was held at a height of approximately 1.5 meters and the megaphone was rotated 120 degrees between each 20-second broadcast. Each call was played three times consecutively at each point, with an observer turning 120 degrees for each call, such that the full 360-degree circumference was covered. Observers watched for flying hawks and listened for vocalized responses for 4 minutes immediately following the call broadcast. All members of the Order Falconiformes (e.g., hawks, eagles, vultures, and falcons) seen or heard during the survey were recorded. The locations of any response, both visual and auditory, were recorded in field notes. When flying birds were observed, the approximate direction of flight was also noted. While walking between points, observers recorded any raptor activity and scanned the forested areas for potential nests. The dominant habitat/plant community type was recorded at each survey point and is consistent with the 2009 land cover classification assessment of the Zavoral Site. The survey was conducted along two transects, each with 11 listening points **(Figure 25**). Listening points were located with a GPS and were transposed onto digital orthophotographs using ArcGIS™ 9.2 GIS software (CCES May 2011). **Table 12** summarizes the raptors detected during 2010 and 2011 surveys.

None of the state-listed species identified in the MnDNR's July 21, 2008, letter or from the NHIS query were detected. However, three raptors were observed and recorded during the call-response surveys for Red-shouldered hawks within the Site during the May 2010 surveys, including two Red-tailed hawks (Buteo jamaicensis) and one Bald eagle (*Haliaeetus leucocephalus*, Minnesota Special Concern).

4.5.1.2.4 *Blanding's Turtle Survey Methods*

A survey was conducted to determine the presence of Blanding's turtle (*Emydoidea blandingii*; Minnesota threatened.) Blanding's turtle surveys were conducted in June. A meander survey was conducted on eight dates in June within potential habitats that could support Blanding's turtles and/or turtle nesting sites to determine the presence of Blanding's turtle on the Site. The month of June is the optimal phenological period to survey for Blanding's turtles along the St. Croix River valley in Minnesota, as turtles are mobile and actively breeding and nesting at this time of the season. During Blanding's turtle meander surveys, ecologists surveyed for the presence of mature and immature Blanding's turtles (and other turtle species) within potential habitats throughout the entire 114-acre Site. Furthermore, ecologists surveyed for evidence of turtles (e.g., turtle tracks in sand and along roads), and evidence of turtle nesting (e.g., turtle nesting sites, predated nests or eggs). No occurrences of Blanding's turtles were detected during the survey.

Table 12: Summary of Raptors Detected during the 2010 and 2011 Surveys

Broadcast Point	Dominant Habitat Type [From 2009 MLCCS Land Cover Survey]	Number and Species of Birds Observed			
		Survey 1 (May 25, 2010)	Survey 2 (May 28, 2010)	Survey 1 (March 29, 2011)	Survey 2 (April 12, 2011)
1A	Maple Basswood Forest/ Road Edge	NR	NR	NR	NR
1B	Maple Basswood Forest	NR	NR	NR	NR
1C	White-Pine Hardwood Forest	NR	NR	NR	NR
1D	Altered Nonnative Short Grasses with Sparse Trees	1 Red-Tailed Hawk (V/A)	NR	NR	NR
1E	Altered Nonnative Short Grasses with Sparse Trees	NR	NR	NR	NR
1F	Altered Nonnative Deciduous Woodland	NR	NR	NR	NR
1G	Altered Nonnative Short Grasses with Sparse Trees	NR	NR	NR	NR
1H	Altered Nonnative Short Grasses with Sparse Trees	1 Red-Tailed Hawk (V/A)	NR	NR	NR
1I	Altered Nonnative Short Grasses with Sparse Trees	NR	1 Bald Eagle (V)	NR	NR
1J	Altered Nonnative Forest	NR	NR	NR	NR
1K	Altered Nonnative Short Grasses	NR	NR	NR	NR
2A	Maple Basswood Forest	NR	NR	NR	NR
2B	White-Pine Hardwood Forest/Ravine	NR	NR	NR	NR
2C	Black Ash Seepage Swamp Edge	NR	NR	NR	NR
2D	White-Pine Hardwood Forest	NR	NR	NR	NR
2E	White-Pine Hardwood Forest	NR	NR	NR	NR
2F	White-Pine Hardwood Forest /Ravine	NR	NR	NR	NR
2G	White-Pine Hardwood Forest	NR	NR	NR	NR
2H	White-Pine Hardwood Forest	NR	NR	NR	NR
2I	White-Pine Hardwood Forest /Stream	NR	NR	NR	NR
2J	White-Pine Hardwood Forest	NR	NR	NR	NR
2K	White-Pine Hardwood Forest	NR	NR	NR	NR

NR = no response, (V) = Visual Observation, (A) = Auditory Observation

4.5.1.3 Impact Analysis

4.5.1.3.1 *Alternative 1 – 5- to 10-year Operation*

No threatened or endangered species were found during surveys conducted on the Zavoral Site~~ or are known to exist on the Site~~. Therefore, ~~no~~ impacts to threatened or endangered species ~~would~~ are not likely to occur as a result of Alternative 1. A previously unknown population of the Minnesota special concern species Butternut was found on the Zavoral Site.

A total of 33 individual Butternut trees were identified within the 114-acre Zavoral Site (**Figure 24**). However, 32 of the Butternut trees identified are infected with Butternut canker. Only one Butternut tree appears to be healthy and disease free. The healthy Butternut tree would not be affected by mining and reclamation activities and is shown in **Figure 24**. The remaining infected 32 butternut trees would be removed from the Zavoral Site to minimize further spread of the disease to the remaining healthy Butternut tree on-site and any other trees nearby. Currently, removal of infected trees is the only method to control the spread of Butternut canker since there are no chemical treatments are available for use to control the destructive fungus (CCES May 2011).

The status of the Butternut tree is currently proposed to change from special concern to endangered within the next year. If tree clearing occurs after this reclassification takes place, a taking permit from the MnDNR would be required (MnDNR May 2012).

Although the proposed mining would involve the loss of some wildlife habitat, approximately 86% (55 acres) of the impact would occur in previously mined areas that remain unreclaimed after previous mining operations on the Site and currently provide low-quality wildlife habitat, primarily for common, disturbance adapted edge species,. These species would be displaced during mining activities, but many of the species would be expected to return to the area once mining and reclamation activities are complete.

4.5.1.3.2 *Alternative 2 – No-Build Alternative*

The No-Build Alternative would not affect threatened or endangered species, threatened or endangered species habitat, or other ecologically sensitive resources within the Site. No mining or reclamation activities would take place within the Site and vegetation succession would be expected to occur. The loss of woodland and cropland not previously affected by mining and temporary displacement of wildlife would not occur.

4.5.1.3.3 *Alternative 3 – Reduced Timeframe 3.3- to 5-Year Operation*

Impacts to threatened and endangered species and other ecologically sensitive resources resulting from Alternative 3 would be the same as for Alternative 1. The difference between Alternative 1 and Alternative 3 is the timeframe over which the impacts would occur. Under Alternative 3, which is the compressed timeframe, mining activity would be required either more frequently or for longer durations, or a combination of both, in order to bring the project to completion within the 3.3 – to 5-year timeframe. The compressed timeframe proposed under Alternative 3 would have the advantage of reducing the length of time that wildlife is displaced from the Site due to mining activities and allow for reclamation of habitat to begin sooner.

4.5.1.3.4 *Subalternative 3A – Reduced Timeframe 150-Working Day Operation*

Impacts to threatened and endangered species and other ecologically sensitive resources resulting from Subalternative 3A would be the same as for Alternative 3. The difference between Alternative 3 and Subalternative 3A is the timeframe over which the impacts would occur. Under Subalternative 3A, mining activity would be required for 150-working days over approximately 1 year. The compressed timeframe would have the advantage of reducing the length of time that wildlife is displaced from the Site due to mining activities and allow for reclamation of habitat to begin sooner.

4.5.2 Potential Mitigation Measures

Mitigation measures related to cover types are described under Sections 3.1.1.3 through 3.1.1.5. The key component is that reclamation is monitored and managed to ensure that it is successful in order for suitable revegetation and wildlife habitat development to result.

Additionally, Section 4.7.2 identifies that monitoring of groundwater use and specific surface water features and the Black ash swamp seepage subtype wetlands be monitored during the operation of the Site.

4.5.3 Scandia Mine

Operations at the Scandia Mine would not change as a result of bringing add-rock material from the Zavoral Site to the Mine. As a result, no change would occur in the effect on fish, wildlife, and vegetation at the Scandia Mine as a result of the Project.

4.6 PHYSICAL IMPACTS ON WATER RESOURCES

4.6.1 Zavoral Site

4.6.1.1 Affected Environment

4.6.1.1.1 *Site Drainage*

The Site has a total area of 63.6 acres, consisting of 52 acres that have no off-site discharge (are internally drained) and 11.6 acres that discharge off-site to three separate tributaries, all of which drain to the St. Croix River (**Figures 26 and 27**). All off-site drainage originates in perimeter areas of the Site along the northern, eastern, and southern Site boundaries. The north perimeter watershed, which is 3.43 acres in size, drains to Zavoral Creek and is partially composed of land in the scenic easement that is part of the St. Croix River District. A 2.19-acre area discharges to the unnamed creek, named Middle Creek in this EIS. The remaining 5.97 acres that drain off-site discharge to the South Creek, as named for this EIS. The watersheds discharging off-site have slopes ranging from 2% to 25% within the mining limits. In comparison, slopes along adjacent areas of the St. Croix River escarpment range up to 100% or higher. In the remaining 82% of the Site, runoff is trapped within depressions (internally drained) and does not leave the Site.

The affected environment includes areas downstream of the externally draining perimeter watersheds and the internally drained area. Areas downstream of the Site include steep escarpment areas adjacent to the St. Croix River, where small tributaries either traverse the escarpment or originate in the escarpment. These small tributaries have perennial flow starting near the base of the escarpment, supported by springs occurring there. Above the springs, there is flow in the tributaries during and shortly after periods of significant rain or snow melt. The small tributaries have steep gradients; flow velocities in them would be expected to be relatively fast and erosive as a result. Furthermore, the tributaries discharge to the St. Croix River, a very large stream compared to the tributaries. The areas in the St. Croix River that are subject to Project impacts are relatively small areas near the point where the tributaries discharge to the river. These small areas would be associated with locations where the relatively high velocity of the small tributary inflow is dissipated in the St. Croix River.

Short duration flow measurements were made for Zavoral Creek during the course of the EIS preparation. Other than that, no field data was collected. Information was developed from existing topographic mapping and other existing data, such as soils maps, that was used for the analysis of water resources.

Potential effects of the Project on water resources were investigated by analyzing Site runoff rates and infiltration in internally drained areas during operation and after reclamation, and then comparing these rates to existing conditions. Natural Resources Conservation Service (NRCS) runoff prediction methodology was used to predict peak flows for existing conditions, during mining and post-operation conditions (Soil Conservation Service 1986). The computer program XPSWMM, which implements NRCS peak flow estimation methods, was used to complete the analysis to estimate the flows discharged

from the Site to Zavoral Creek, Middle Creek, and South Creek (**Appendix B.3**). Peak runoff rates for the 2-year, 10-year and 100-year 24-hour duration storm events (2.8, 4.2 and 5.9 inches of rain respectively were estimated. The analysis included 2-year, 10-year, and 100-year recurrence interval 24-hour storm events for the discharges to Zavoral, Middle, and South Creeks (**Table 13**).

Table 13: Peak Off-Site Discharge Rates for Existing Conditions (24-hour Storms)

	Storm Recurrence Interval		
	2-year	10-year	100-year
Discharge to Zavoral Creek (cfs)	~~0.0~~ 0.0028	~~0.1~~ 0.1443	~~2.2~~ 2.1838
Discharge to Middle Creek (cfs)	~~0.0~~ 0.0007	~~0.0~~ 0.0357	~~0.8~~ 0.8046
Discharge to South Creek (cfs)	~~0.0~~ 0.0036	~~0.2~~ 0.1851	~~2.7~~ 2.7266

For the areas of the Site that are internally drained, all runoff infiltrates within depressions and becomes groundwater. The three creeks that the Site discharges to are all considered wetlands downstream of the Site but only have perennial flow downstream of springs originating along the base of the St. Croix River escarpment. Typically, flowing water is present in all three creeks downstream of the springs with depths ranging from 2 to 6 inches (CCES January 2011). Upstream of these springs, the creeks only have flowing water during and shortly after storm events or during snow melt periods.

Zavoral Creek, which has a total watershed area of approximately 1,500 acres, was gauged downstream of the Site by the Washington Conservation District (WCD) from June 2010 to November 2010 just upstream of a driveway culvert approximately 400 feet upstream of the St. Croix River. During this period Zavoral Creek averaged a depth of 1.4 inches and a flow rate of 0.3 cubic feet per second (cfs). The data shows the creek flowing steadily with several peaks in flow in response to rain events occurring in the recording period, with no peak lasting more than 2 hours. Rain Gauge Station 212881 of the MnDNR State Climatology Office, located on Forest Lake approximately 8 miles west of the Site, recorded over an inch of rainfall on the days containing the largest peaks in flows. The Middle Creek and South Creek watersheds are approximately 400 and 300 acres in size, respectively. Based on the Zavoral Creek gauge, Middle Creek and South Creek would also have shallow perennial flows downstream of springs occurring at the base of the escarpment, short duration peak flows during large storm events or snow melt, and areas with no perennial flow upstream of the springs.

On the St. Croix River, the nearest stream gauge is the U. S. Geological Survey (USGS) gauge 05340500, St. Croix River at St. Croix Falls. This gauge is located 18.7 miles upstream of the Site and has a watershed of 6,240 square miles, over 340,000 times greater than the existing watershed areas draining off-site. The average flow at this gauge over the 104 years on record is 3,610 cfs. Using a flow duration curve created from daily flows from 1902 to 2011, approximately 99% of the flows recorded at this gauge are above 800 cfs and 35% of flows recorded are above the average of 3,610 cfs with the highest flow of 60,900 cfs recorded on April 25, 2001.

Potential geologic hazards are related to the elevation relief between the Zavoral Site and the St. Croix River and the erodible nature of the soil. The surface soils consist of highly erodible granular materials.

These soils are generally stable unless water is introduced. Surface water drainage is the primary source of water that could lead to erosion and soil transport.

Existing on-site storage capacity for capturing and infiltrating stormwater was calculated by delineating the topographic depressions within the Site and using existing topographic mapping. The existing on-site storage capacity was calculated to be approximately 78.1 acre-feet. A 100-year recurrence interval 24-hour duration storm event at this location is 5.9 inches. This equates to a volume of 25.6 acre-feet of runoff assuming all rain becomes stored in a depression and is not lost to evapotranspiration or interception by vegetation. The existing depression areas are depicted in **Figure 27**. The analysis of the capacity for capturing and infiltrating stormwater was completed on the basis of potential overflow points (**Table 14**), of which the Site has three. The other five depression areas would discharge internally to the three listed in **Table 14**; the flow paths are shown in **Figure 27**.

Table 14: Existing On-Site Stormwater Storage

Depression Area	Overflow Elev. (ft)	Max Stage 100-year event (ft)	Max Depth 100-year event (ft)
2	866	859.4	3.4
7	854	851.5	1.5
6	862	854.4	0.4

Depression Area 7 would be the most likely to overflow under existing conditions. Further calculations, conservatively completed by ignoring infiltration, evapotranspiration, and interception, indicate that Depression Area 7 would overflow if a 100-year 24-hour storm (5.9 inches) would be followed the next day by another 100-year 24-hour storm. This result indicates the likelihood of an overflow event from existing depression areas to an off-site area is small under existing conditions.

4.6.1.1.2 *Existing Water Quality*

There is limited available water quality data for the creeks and St. Croix River near the Site. The WCD collected water quality samples from Zavoral Creek at varying dates between May 18, 2011, and June 30, 2011 (**Table 15**), all during periods of low flow. USGS records do not have any water quality data more recent than October 16, 2003, at their closest monitoring station, the St. Croix River at St. Croix Falls. The most recent water quality records available from the MPCA relevant to the Site are from September 14, 2006, for Station 06SC017, St Croix River near Rutstrum State WMA located 1,000 feet upstream of the Site. **Table 15** shows the comparison of the results from the WCD Zavoral Creek averages and MPCA Station 06SC017 data recorded on September 14, 2006.

Table 15: Water Quality Characteristics of Project Area Water Bodies

	St. Croix River	Zavoral Creek
Data Source	MPCA	WCD (average of 3 samples)
Date Sampled	9/14/2006	5/18-6/30/2011
Temperature (°C)	17.4	11.5
Dissolved Oxygen (mg/L)	9.8	10.6
pH	8.14	8.10
Conductivity (µmhos/cm)	222	532
Total Suspended Solids (mg/L)	2.8	3.0
Total Phosphorus (mg/L)	0.024	0.038

The data for Zavoral Creek represents the groundwater source for the baseflow of the creek, with the creek having relatively low water temperature and relatively high conductivity. Both streams have good levels of dissolved oxygen, relatively high pH, and relatively low total suspended solids. Zavoral Creek does have higher total phosphorus than the St. Croix River, indicating the groundwater source of Zavoral Creek yields greater phosphorus concentrations than found in the river.

4.6.1.2 Impact Analysis

Potential impacts of the Project on water resources were investigated by analyzing Site runoff rates during and after the Project, and then comparing these rates to existing conditions. The computer program XPSWMM was used for the analysis of existing conditions, during mining and post-operation conditions to estimate the flows discharged from the Site to Zavoral Creek, Middle Creek, and South Creek. Peak runoff rates for the 2-year, 10-year, and 100-year 24-hour duration storm events (2.8, 4.2 and 5.9 inches of rain, respectively) were estimated (**Table 16**).

Table 16 shows the reductions in the 2-year, 10-year, and 100-year peak flows comparing existing conditions to conditions during operation (**Figure 28**). During operation, a berm would be constructed on the south end of the Site as close to the mining limits as possible. This berm would be the boundary between internally drained and off-site discharge areas. For this analysis, it was assumed the berm is an existing ridge. It may be possible during Site grading to construct this berm closer to the Site perimeter. The closer the south berm can be installed to the mining limits, the smaller the watershed draining off-site. As this watershed gets smaller, the peak flow rates to the South Creek during mining and post-reclamation would decrease. During operation, the berm to be installed on the south end of the Site should be constructed as close to the mining and reclamation limits as possible. This would result in lower off-site peak flow rates and increased on-site infiltration than the estimates presented in this analysis.

Table 16: Peak Flow Reductions During Mining

	2-year Peak Flow (cfs)			10-year Peak Flow (cfs)			100-year Peak Flow (cfs)		
	Existing	During Mining	% Reduction	Existing	During Mining	% Reduction	Existing	During Mining	% Reduction
North (Zavoral) Creek Watershed	~~0.0~~ 0.0028	~~0.0~~ 0.0008	71%	~~0.0~~ 0.1443	~~0.0~~ 0.0406	72%	~~2.2~~ 2.1838	~~0.7~~ 0.6730	69%
Middle Creek Watershed	~~0.0~~ 0.0007	~~0.0~~ 0.0007	0%	~~0.0~~ 0.0357	~~0.0~~ 0.0357	0%	~~0.8~~ 0.8046	~~0.8~~ 0.8046	0%
South Creek Watershed	~~0.0~~ 0.0036	~~0.0~~ 0.0014	61%	~~0.0~~ 0.1851	~~0.0~~ 0.0757	59%	~~2.7~~ 2.7266	~~1.5~~ 1.5285	44%

The flow off-site from each watershed for 2-year, 10-year, and 100-year storm events are greatly reduced from existing conditions to post-reclamation (**Figure 29; Table 17**), which would benefit the streams to which the Site is tributary by reducing risks of erosion and sedimentation. The existing peak flow rate during a 100-year event of 2.2 cfs discharging to the Zavoral Creek would be reduced to 0.6 cfs. The other existing off-site discharge points to the Middle and the South Creeks would be eliminated post-reclamation.

Table 17: Peak Flow Reductions Post Reclamation

	2-year Peak Flow (cfs)			10-year Peak Flow (cfs)			100-year Peak Flow (cfs)		
	Existing	Post-Reclamation	% Reduction	Existing	Post-Reclamation	% Reduction	Existing	Post-Reclamation	% Reduction
North (Zavoral) Creek Watershed	~~0.0~~ 0.0028	~~0.0~~ 0.0008	71%	~~0.1~~ 0.1443	~~0.0~~ 0.0400	72%	~~2.2~~ 2.1838	~~0.6~~ 0.5937	73%
Middle Creek Watershed	~~0.0~~ 0.0007	~~0.0~~ 0.0000	100%	~~0.0~~ 0.0357	~~0.0~~ 0.0000	100%	~~0.8~~ 0.8046	~~0.0~~ 0.0000	100%
South Creek Watershed	~~0.0~~ 0.0036	~~0.0~~ 0.0000	100%	~~0.2~~ 0.1851	~~0.0~~ 0.0000	100%	~~2.7~~ 2.7266	~~0.0~~ 0.0000	100%

After mining and reclamation have been completed, the total watershed area with off-site discharges would be reduced from 11.6 acres to 1.3 acres, three million times smaller than the St. Croix River watershed near the Site. Approximately 1.3 acres (**Figure 30**) at the north end of the Site would discharge to Zavoral Creek. **Figure 9** shows the final reclamation contours. After reclamation, the total capacity of the Site to store and infiltrate runoff would be approximately 60.1 acre-feet, compared to the 25.6 acre-feet of rain falling in the internally drained area during a 100-year 24-hour storm.

The potential for overflow from internally drained areas during a large storm event was analyzed for the proposed grading of the Site for final reclamation conditions (**Table 18**). For the final proposed Site contours, one potential overflow point exists for the Site, which would discharge to the South Creek (**Figure 30**).

Table 18: Proposed Storage

Depression Area	Overflow Elevation (ft)	Maximum Stage 100-year event (ft)	Maximum Depth 100-year event (ft)
5	856	852.2	1.2

Additional analyses were completed to determine a relative probability of the storm or snow melt event that would need to occur to create overflow from the Site post-project. A conservative analysis was completed by ignoring infiltration, evapotranspiration, and interception that would occur during any rain event. It would take more than two back-to-back 100-year 24-hour storm events (5.9 inches per storm, 11.8 inches total) before Site overflow would occur. If the losses due to infiltration and interception were included in the analysis, there would be no off-site discharge resulting from back-to-back 100-year 24-hour storms. The potential of overflow post-reclamation is seen to be very small, less than the potential under existing conditions. Prior to reclamation, the potential for overflow would be less than under existing conditions as the Site becomes more internally drained as mining occurs and as part of ongoing stormwater management (**Figures 29 and 30**).

4.6.1.2.1 *Alternative 1 – 5- to 10-year Operation*

Potential impacts to water quality during operation include:

- Potential downstream sedimentation resulting from exposed soil at excavation areas during stripping and overburden removal
- Potential pollutants originating from construction equipment operation and washing
- Potential groundwater contamination from on-site equipment fueling
- Washoff of pollutants from areas draining off-site

Immediately after soil stripping, and prior to overburden removal, there would be several relatively short periods (a matter of days or less for each occurrence) when potential impacts to downstream water resources could occur. If significant rainfall events occurred during this period, erosion in externally draining perimeter areas of the Site could potentially affect downstream resources, including the three small tributaries receiving Site drainage and the St. Croix River. Stormwater and erosion control BMPs would be employed to minimize the potential for this.

After vegetative stabilization, and after overburden removal, the potential for these impacts becomes very small, and less than under existing conditions.

Potential impacts are proportional to potential impacts on flow rates. The Project, regardless of differences in phasing, would reduce peak flows off-site, reduce the risk of erosion, and greatly reduce the risk of overflow. The Project would improve infiltration, resulting in improved base flow conditions for the seeps, springs, and creeks, and enhancing the ability of area creeks to support aquatic life.

Water quality potential impacts are proportional to potential impacts on flow rates. The Project would reduce the peak flow rates from perimeter areas to downstream tributaries for both during mining and

post-mining periods (**Tables 16 and 17).** Post-mining conditions peak flow rates from the northernmost externally draining area of the Site would be reduced by 71– 74% for the 2-year, 10-year, and 100-year rain events, to 100% for the middle and southernmost externally draining areas. The potential water quality impacts would be proportionally decreased by the Project.

4.6.1.2.2 *Alternative 2 – No-Build Alternative*

There would be no change in potential impacts to water resources of downstream tributaries and the St. Croix River for the No-Build Alternative. No reduction in peak flow or increase in infiltration would occur.

4.6.1.2.3 *Alternative 3 – Reduced Timeframe 3.3- to 5 Year Operation*

The only difference between Alternatives 1 and 3 is the difference in time it would take for peak flow reductions and increases in infiltration to occur. Alternative 3 has a shorter overall schedule, and estimated peak flow reductions would occur sooner as a result.

Alternative 3 may reduce the risk for impacts to water resources because of the shorter timeframe of Site operation compared to the probability of occurrence of a major storm event. For instance, the probability of a storm event exceeding the 100-year event happening in 5 years is 5%, whereas for a 10-year Project duration (Alternative 1 maximum duration), the probability of this occurrence for a storm of this size is 10%. However, Alternative 3 would increase of the intensity of mining activity during Project operation, increasing the potential sources of pollution during the operation period.

4.6.1.2.4 *Subalternative 3A – Reduced Timeframe 150-Working Day Operation*

The only difference is the time it would take for peak flow reductions and increases in infiltration to occur. Subalternative 3A has a shorter overall schedule, and estimated peak flow reductions would occur sooner as a result.

Subalternative 3A may reduce the risk for impacts to water resources because of the shorter timeframe of Site operation compared to the probability of occurrence of a major storm event. However, Subalternative 3A would increase of the intensity of mining activity during Project operation, increasing the potential sources of pollution during the operation period.

4.6.2 Potential Mitigation Measures

The key component is that the SWPPP, erosion and sedimentation control, and BMPs are implemented and maintained.

A Stormwater Management Permit would need to be obtained from the Carnelian-Marine-St. Croix Watershed District (CMSCWD) that requires a stormwater plan to be submitted to the CMSCWD for review and approval. To meet CMSCWD permit requirements, the Project would not be allowed to increase peak flow discharge rates to off-site areas, would not be allowed to increase the runoff volume discharge off-site, and would require appropriate BMPs. The Project would need to meet all of these requirements via on-site infiltration in depressions and would not increase the level for duration of bounce in downstream waterbodies.

The BMPs to be implemented during the Project would include minimizing unnecessary equipment on-site and reducing soil from being tracked off-site by vehicles. On-site equipment washing and fueling

would be completed in a controlled manner that minimizes the release of pollutants, following enforceable BMPs included in the draft Project SWPPP. Similarly, on-site fueling would follow industry standard BMPs, as described in the draft SWPPP, and which would prevent groundwater contamination from this potential source of pollutants.

By minimizing the size of the watersheds that drain off-site immediately after overburden removal, the internal drainage on-site would increase and promote more infiltration, an outcome that would reduce potential off-site water quality impacts. The time soils are exposed would also be restricted, further minimizing potential impacts related to soil erosion and wash off. In addition, during the project, a double row of silt fences and associated vegetated filter strip in perimeter areas would help contain sediments and attached pollutants that may run off the Site, preventing pollutants from reaching the creeks or the St. Croix River.

The St. Croix River is currently listed as an impaired water of the state for mercury and polychlorinated biphenyls (PCBs). There would be no on-site sources of mercury or PCBs associated with the Project. The draft SWPPP states, “the overall watershed management strategy includes limiting sediment and nutrient loads to the spring creeks along the bluffs of the St. Croix River and maintaining groundwater recharge.” This overall strategy would be achieved by increasing internal drainage, preventing soil erosion, capturing sediment and minimizing impervious surfaces on-site. PCBs and mercury are mainly distributed to water resources through sediment transport. The proposed BMPs would minimize sediment transport and attached pollutants from discharging off-site to the greatest extent feasible. As vegetation establishes during reclamation it would help prevent runoff from the Site and would promote infiltration, which would improve water quality.

If diesel fuel is stored at the Site, groundwater should be sampled and analyzed for diesel range organics. If gasoline is stored on the Site, gasoline range organics and benzene should be added to the analyte list.

4.6.3 Scandia Mine

The Scandia Mine would continue to comply with the Scandia Mine’s SWPPP, which includes BMPs for daily site operations. These BMPs include silt fence, vegetated screening berms, sedimentation ponds, wetland buffers, and dust control. Add-rock from the Zavoral Site that would be imported to the Scandia Mine would be unloaded over an active face where it would be stored until needed. It is not stored in individual stockpiles over the Mine floor. This practice of storing the add-rock material over the active face would continue regardless of the add-rock source. This activity does not open any areas to be mined prematurely nor does it change or disturb additional areas as storage takes place over the active mining area. The additional add-rock from the Zavoral Site would not affect any current stormwater management practices already in place.

Refer to Section 4.7.3 for a discussion of Scandia Mine water use.

The potential for impacts on the surface runoff and water quality at the Scandia Mine due to the mining of the Zavoral Site is extremely low because use of add-rock from the Zavoral Site would not change the operations at the Scandia Mine.

4.7 WATER USE

4.7.1 Zavoral Site

4.7.1.1 Affected Environment

4.7.1.1.1 *Regional Surficial Geology*

The Zavoral Site is located in the area mapped as Upper River Warren Terrace, Glacial Till (Sand and Gravel), Middle Terraces, and Bedrock near the surface in the MGS Geologic Atlas of Washington County, Minnesota Surficial Geology Map (Meyer et al.1990). These deposits are remnants of Pleistocene Age glacial activity. Outwash from the Superior Lobe glacier was deposited in wide plains in the areas where glacial ice melted and flowed from the ice front. As the glacier retreated, ice blocks were left behind, buried in topographic lows on the bedrock surface. The gradual melting of these blocks created many deep depressions and several small lakes in Cottage Grove, Woodbury, and Afton. The outwash deposits consist of sand, loamy sand, and gravel that contains cobbles in places and are commonly overlain by 2 to 5 feet of fine-grained wind-blown loess deposits. The Upper Terrace deposits consist of sand, gravelly sand, and gravel and lie about 160 to 220 feet above the St. Croix River floodplain level. The terrace is pitted due to ice-block melt in the Lake Edith area of Afton. These upper glacial deposits are underlain in the vicinity of the Zavoral Site by glacial till consisting primarily of reddish-brown to reddish-gray, sandy-loam textured, unsorted sediment containing pebbles, cobbles, and boulders with some sand and gravel lenses or beds. Gravel mining is described as being common in the area.

4.7.1.1.2 *Regional Bedrock Geology*

The bedrock in the area of the Zavoral Site is mapped on the Bedrock Geology Map in the Geologic Atlas for Washington County, Minnesota (Swanson and Meyer 1990). **Figure 31** is a portion of the "Bedrock Map," which includes the Zavoral Site. **Figure 32** shows the stratigraphic column for the region. The uppermost bedrock unit in the area of the Zavoral Site is the Prairie Du Chien Group (Opc). Although present, most of the Prairie Du Chien Group has been removed within the area during a time when the bedrock was exposed to erosion, prior to deposition of the younger surficial materials described above. Remnants of this dolostone may be encountered on portions of the Site below these unconsolidated surficial materials.

The Jordon Sandstone (Cj) may present on the western portion of the Site. The upper portion of the Jordan Sandstone is a fine- to medium-grained quartz sandstone. The lower portion contains multicolored beds of mudstone, siltstone, and shale with interbeds of very coarse sandstone.

The St. Lawrence and Franconia Formations (Csf) are mapped as a single geologic unit; however, the two formations have very different characteristics in the area of the Site. The St. Lawrence consists of dolomitic shale and siltstone that is generally thinly bedded. The Franconia consists of thin-bedded to cross-bedded, fine- to coarse-grained sandstone. These geologic formations have very distinctive hydrologic properties that influence the Site groundwater conditions.

Ironton and Galesville Sandstones (Cu) underlay the Franconia Formation. The Ironton and Galesville are silty, fine- to medium-grained sandstones. They are poorly sorted in the upper units grading to well sorted in the lower portion of the formations.

The Eau Claire Formation (Ce) consists of siltstone, very fine-grained sandstone, and greenish-gray shale. It contains some cementation of the particles. The contact with the overlying Galesville Sandstone is gradual, but contact with the underlying sandstone is abrupt.

The oldest geologic unit of interest for the Zavoral Site is the Mt. Simon Sandstone (Cm). This sandstone unit consists primarily of fine- to coarse-grained quartzose sandstone.

4.7.1.1.3 *Groundwater Resources*

The groundwater resources in the vicinity of the Zavoral Site can be identified by the following four hydrogeologic units:

- Glacial Aquifer
- Prairie Du Chien-Jordon Aquifer
- Franconia-Ironton-Galesville Aquifer
- Mt. Simon Aquifer

> An aquifer is a rock or sediment that is saturated with groundwater and sufficiently permeable to transmit economic quantities of groundwater to wells and springs.

The Glacial Aquifer consists largely of the unconsolidated granular materials in the upper geologic profile. These materials are shallow and are mapped as having “high” sensitivity to pollution in the area of the Zavoral Site in the Washington County Geologic Atlas. This is due to the relatively shallow depth and the lack of a low permeable soil over the granular soils.

The Prairie Du Chien-Jordon Aquifer is the first bedrock aquifer in the area. These geologic units are considered one aquifer because groundwater can readily move between the two units. In addition, the Prairie Du Chien-Jordon Aquifer is also in direct contact with the Glacial Aquifer. This aquifer is mapped with a high to moderate sensitivity to pollution in the Washington County Geologic Atlas.

West and in the vicinity of the Zavoral Site, the shallow Glacial and Prairie Du Chien-Jordon Aquifers are the primary aquifers used as water sources by area wells. These aquifers produce adequate volume and quality for water use in this area.

The St. Lawrence Formation that underlies the Jordon Sandstone is defined as an aquitard or a confining layer, which is a low permeability unit and limits migration of water between aquifers.

The deep Franconia-Ironton-Galesville Aquifer consists of a single hydrogeologic unit that is separated from the Prairie Du Chien-Jordon Aquifer by the St. Lawrence Formation. This aquifer is used as a source of water north and south of the Site in the immediate vicinity of the St. Croix River. This is primarily because the upper aquifers have been removed by erosion and are not present near the river.

The Mt. Simon Aquifer is separated from the Franconia-Ironton-Galesville Aquifer by the Eau Claire Formation. The Mt. Simon Aquifer is infrequently used as an aquifer in the vicinity of the Zavoral Site. However, the Zavoral Site Well is a multi-aquifer well, open to both the Franconia-Ironton-Galesville and Mt. Simon Aquifers, and draws water from both aquifers.

4.7.1.2 Zavoral Site Water Use

Barton Construction formerly operated the Site's multi-aquifer bedrock well (Minnesota Unique Number 00210498). Available well records show that the Zavoral Site Well is cased to a depth of 245 feet and is completed as an open hole in two aquifer systems—the Franconia-Ironton-Galesville Aquifer and the Mt. Simon Aquifer—to a total depth of 648 feet. As part of the coordination conducted with the MnDNR as part of this EIS process, AECOM determined that Barton's water appropriation permit had expired.

The 1989 Minnesota Ground Water Act strictly limits new water use permits in the Mt. Simon-Hinckley Aquifer in a metropolitan county (Minn. Stat. § 103G.271 4a). The intent of the law is to protect use of the Mt. Simon-Hinckley Aquifer for drinking water purposes in metropolitan counties and prohibit use of this resource for lower priority and nonessential purposes such as lawn watering. A potential renewal of the water appropriation permit for the multi-aquifer Zavoral Site Well would be carefully evaluated by the MnDNR.

Tiller's analyses of the Project noted that reinitiating the use of the Zavoral Site Well at the levels the well is capable of producing would require significant investment to address MnDNR water appropriation permit requirements. As described in Section 2.0 of this document, due to this and additional evaluation of the resource and its potential use as add-rock, Tiller revised their Project proposal to eliminate all aggregate processing activities (including washing) at the Zavoral Site.

The total annual groundwater use from the Zavoral Site Well is limited to less than 1 million gallons; anything above this level would require a water appropriation permit. At the maximum allowable daily water use of 10,000 gallons per day (gpd), pumping could occur for a maximum of 100 days per year.

Tiller would limit the use of water from the Zavoral Site Well to what is required for dust control at the Site. Tiller's water use projection for dust control purposes is to pump less than 10,000 gpd at a rate of up to 1,200 gallons per minute (gpm). The total annual groundwater use would be less than 1mgy. This would keep the amount of groundwater use to a level below the threshold that requires a water appropriation permit from the MnDNR.

Pumping groundwater at the maximum rate of 1,200 gpm would result in pumping for approximately 8 minutes per day to reach the maximum allowable daily water volume of 10,000 gallons. If the pumping rate were reduced to 500 gpm, the maximum allowable daily water volume would be obtained within 20 minutes of pumping.

4.7.1.3 Area Well Information

Information about private wells at and around the Zavoral Site was obtained from the Minnesota County Well Index (CWI) database. The on-line database does not include information about public wells. Information about public wells was obtained directly from the Minnesota Department of Health. Information about the Zavoral Site Well and wells in the vicinity of the Site is included in the following subsections.

4.7.1.3.1 *Zavoral Site Well*

As described previously, the Zavoral Site Well is 648 feet deep. The well is cased to a depth of 245 feet and finished as a multi-aquifer open hole according to the well log provided in the CWI. The well is cased below the St. Lawrence Formation aquitard and is open to both the Franconia-Ironton-Galesville and Mt.

Simon Aquifers. The Zavoral Site Well was drilled through the Eau Claire Formation, (which is also an aquitard) and into the Mt. Simon Sandstone Aquifer. The top of casing of the well was surveyed at an elevation of 866.1 feet msl; the bottom of the well is at an elevation of 218.1 feet msl.

Figure 33 is a schematic cross-section that shows the relationship between the geologic formations, the wells in the area, and surface water features (Zavoral Creek and St. Croix River). **Figures 34 through 39** are geologic cross-sections for the Site showing Tiller's proposed maximum depth of mining and final reclamation contours.

> An aquitard is a geologic term for a formation that has a low permeability (ability to allow water to pass through it) that restricts the movement of water between two aquifers (water yielding geologic units).

The Zavoral Site Well is shown on **Figure 33**. The open-hole portion of the well begins in the Franconia Formation below the St. Lawrence Formation. Because the St. Lawrence Formation is an aquitard, pumping of the Zavoral Site Well would not be anticipated to influence groundwater in the shallow aquifers (Drift and/or Prairie du Chien – Jordan Aquifers) above the aquitard.

4.7.1.3.2 *Vicinity Wells*

Wells within 1.5-Mile Radius

There are 91 wells listed in the CWI database within a 1.5-mile radius around the Zavoral Site Well (**Figure 40**). Eighty-nine of these wells are private/residential wells and two are public/commercial wells.

Only 14 of these 91 wells are completed at depths such that the bottom of the well is at an elevation that is within the elevation of open section of the Zavoral Site Well. Since the geologic strata (and associated aquifers) dip slightly toward the west-southwest, it is likely that wells that are not deeper than the top of the open section of the Zavoral Site Well are completed in different (shallower) aquifers than the Zavoral Site Well.

The wells completed in shallower aquifers are not as likely to be affected by pumping from the Zavoral Site Well. **Figure 33** shows the relationship between the shallow wells and the Zavoral Site Well. The wells identified in **Figure 33** as Trails End Well and Magnuson Well are screened in the shallow Drift and Jordan Sandstone Aquifers, respectfully. These wells would not likely be affected by pumping of the Zavoral Site Well because the St. Lawrence Formation, separating the Franconia-Ironton-Galesville Aquifer (the uppermost aquifer tapped by the Zavoral Site Well) and the next shallower aquifer (the Jordan Sandstone), is acting as an aquitard. Since an aquitard restricts movement of water between aquifers, the Zavoral Site Well, which withdraws water from lower aquifers, should not affect the shallow wells screened above the St. Lawrence Formation aquitard.

The 14 deep wells within a 1.5-mile radius of the Site are all completed in the deep Franconia-Ironton-Galesville Aquifer. This is the upper aquifer that is intercepted by the Zavoral Site Well. None of these wells are completed in the deeper Mt. Simon Aquifer, the lower aquifer intercepted by the Zavoral Site Well. All 14 wells are located either north or south of the Zavoral Site Well, close to the St. Croix River.

The configuration of the deep wells is represented in **Figure 33** with the Zavoral Cabin Well. The Zavoral Cabin Well is located east of the Zavoral Site Well between the Site and the St. Croix River. The deep wells draw water from the same aquifer as the Zavoral Site Well. Pumping of the Zavoral Site Well would

be expected to influence the water levels in this aquifer. Water levels in wells near the Zavoral Site Well would be expected to decline during pumping. The decline in water levels would be expected to decrease farther away from the pumping well. At some distance, pumping would have little or no influence on the water levels in the aquifer. The distance from the pumping well, the amount of water removed, and the time over which the pumping occurs would influence the amount of decline in water levels in the aquifer.

Wells within 3-Mile Radius

There are 330 wells listed in the CWI database within a 3-mile radius from the Zavoral Site Well; 306 are private/residential wells and 24 are public/commercial wells.

Out of these 330 wells, only 30 wells are completed at depths such that the bottom of the well is at or below the elevation of the top of the open section of the Zavoral Site Well.

All 30 wells identified are completed in the Franconia-Ironton-Galesville Aquifer, except for one deeper well—New Scandia Fire Hall (Minnesota Unique Number 00593614) located about 8,500 feet west of the Zavoral Site Well. Like the Zavoral Site Well, the New Scandia Fire Hall Well is completed both in the Franconia-Ironton-Galesville Aquifer and Mt. Simon Aquifer, as a multi-aquifer well.

Almost all of the 30 wells are located north or south of the Zavoral Site Well and close to the St. Croix River. The only two wells in that group that are located west of the Zavoral Site Well are the New Scandia Fire Hall Well and the New Scandia TW-1 Well (Minnesota Unique Number 00593613).

4.7.1.4 Aquifer Test

4.7.1.4.1 *Aquifer Test Design*

AECOM initially simulated pumping of the aquifer around the Zavoral Site Well for 10 minutes at a rate of 1,200 gpm. Ten minutes is longer than the length of time required to reach the daily maximum volume of 10,000 gpd. The simulation was completed using a numerical computer program, PT1, presented by Walton (1989).

The results of the simulation performed indicated that, after 10 minutes of pumping, water levels would drop by 0.2 feet at a distance of 670 feet from the Zavoral Site Well. Based on the simulation, no drawdown would be observed at a distance of 1,682 feet.

However, to collect Site data, rather than rely on a simulation, AECOM also completed an aquifer test using the Zavoral Site Well. An aquifer test was proposed to evaluate the potential effect of pumping groundwater from the Zavoral Site Well upon groundwater resources and groundwater-dependent resources of the area around the Site. The aquifer test was designed to determine if the St. Lawrence Formation is an effective aquitard between the lower aquifers and the upper aquifers. The aquifer test was also used to measure the decline in water levels that would be expected to occur in wells screened in the Franconia Formation, the same aquifer from which the Zavoral Site Well draws water.

The aquifer test was also designed to measure the potential impact of pumping on surface water, including the seeps that exist in the bluffs east of the Site. **Figure 33** shows the relationship between the Zavoral Site Well and surface water bodies. The seeps and creeks are located at an elevation above the base of the St. Lawrence Formation. The St. Croix River is apparently located at or near the base of the

St. Lawrence Formation. However, based on the water levels shown in **Figure 33**, groundwater flows into the St. Croix River. Pumping could potentially reduce the total volume of groundwater that discharges into the river.

Water level measurements obtained during the aquifer test provided direct evidence of the effect of pumping from the Zavoral Site Well upon the surrounding environment. The data generated allowed a better characterization of the groundwater system and the interaction between groundwater and surface water near the Zavoral Site. The aquifer test pumped several times more water than the maximum daily water production of 10,000 gpd.

Three existing wells were monitored during the aquifer test (**Figure 41**). These wells are described below:

- The Zavoral Cabin Well is located about 1,300 feet east of the Zavoral Site Well. The Zavoral Cabin Well was measured (on May 24, 2010) to be 240 feet deep and, therefore, is completed in the Franconia-Ironton-Galesville Formation. It is representative of other wells close to the St. Croix River and it is the closest deep well to the Zavoral Site Well.

- The Trails End Well is located about 1,700 feet west of the Zavoral Site Well. Measurements conducted by AECOM determined that this 4-inch-diameter well is 139 feet deep. The well is shallower than the other nearby wells and is likely completed in sand and gravel deposits above the bedrock.

- The Magnuson Well is located about 1,900 feet west-northwest of the Zavoral Site Well. This 175-foot-deep well is completed in the Jordan Sandstone Aquifer and is representative of many wells located west, southwest, and northwest of the Zavoral Site and farther away from the St. Croix River.

In addition to monitoring water levels in nearby wells, the following surface water measurements were collected.[4]

- Zavoral Creek at the culvert (near the Zavoral cabin). This monitoring point was located a few feet upstream from the monitoring station installed by the WCD for long-term monitoring. The Black ash seepage subtype wetlands were identified by the MnDNR in their comment letter on the EAW for the proposed Project (Sunde 2008). Zavoral Creek is fed by the seeps. AECOM staff conducted a reconnaissance of the Zavoral Site and the seeps on September 1, 2009. The seeps emerge from the rock faces and slopes along Zavoral Creek.

- Zavoral Creek near Crystal Springs, located about 1,100 feet northwest and up-stream of the Zavoral Creek culvert (on the property of Gregory Page).

- Unnamed creek designated as Middle Creek located about 400 feet south-southeast of the Zavoral Creek culvert. This creek is the next creek south of Zavoral Creek.

[4] Two of these monitoring locations and the WCD monitoring station were added due to input from the PAC and local residents.

- Unnamed creek designated as Spring Box Creek located at the north end of a culvert below Quint Avenue North, west of railroad tracks, a short distance downgradient from spring box, and about 2,800 feet south of the Zavoral Creek culvert.

The purpose for monitoring the creeks near the Zavoral Site during the aquifer test was to document whether measurable changes in water flow occurred during the aquifer test.

Two other monitoring points were observed and measurements were taken during the aquifer test:

- St. Croix River stage was measured four times for the aquifer test at a benchmark point established near the Zavoral cabin: 1 day before the aquifer test day (June 28), two times on the day of the aquifer test (June 29), and a final time on June 30, 2010.

- The water pumped from the Zavoral Site Well during the pump test was piped to an on-site depression to prevent excessive runoff, sediment transport, and erosion. This Discharge Pond is located south of the Zavoral Site Well. A staff gauge was installed in the pond. The water level at the staff gauge was observed and recorded a total of five times: three times on the day of the aquifer test (June 29), once the next day (June 30), and a final time on July 2, 2010.[5]

There is one permitted high capacity well within the 3-mile radius around the Zavoral Site Well—Abrahamson Nurseries Well (MnDNR Permit: 2007-0195, MN Unique Well No. 00 733013). Since the permit allows pumping at a rate up to 420 gpm, pumping from that well could interfere and invalidate the pump test. Abrahamson Nurseries was contacted and they agreed to not pump during the period of the pump test or recovery.

The aquifer test started at 9:00 a.m. on June 29, 2010. After 4 hours and 20 minutes of pumping, the pump failed (1:20 p.m.) and could not be restarted. The calculated average pumping rate was 664 gpm. The total volume of water pumped was 172,600 gallons, or more than 17 times the maximum amount of water Tiller would use daily during its seasonal operations at the Zavoral Site. The pumping was planned to be conducted for a longer period of time but was stopped due to the pump failure. A review of the aquifer test measurements indicated that the duration and the volume of water pumped were sufficient to evaluate the impacts of pumping the Zavoral Site Well at the proposed maximum rate of 10,000 gpd. The pumping was also determined to be sufficient to determine if impacts to shallow wells and/or surface water would likely occur due to the planned pumping.

4.7.1.4.2 *Aquifer Test Results*

Pumping of the Zavoral Site Well created measurable drawdown only in the Zavoral Cabin Well. A drawdown of 0.25 feet (3 inches) occurred after the first 15 minutes of pumping at a rate of approximately 660 gpm (**Figure 42**). This is approximately equal to the maximum daily volume of water that would be pumped during operation. The Zavoral Cabin Well is a 240-foot-deep well completed in the Franconia Aquifer. The Zavoral Cabin Well is located approximately 1,300 feet away from the Zavoral Site Well.

No aquifer test-related drawdowns were observed in the other two monitored wells (Trails End Well and Magnuson Well) (**Figure 42**). The lack of drawdown in these wells indicates that the St. Lawrence

[5] This was added due to input from the PAC.

Formation acts as an effective aquitard. This is consistent with expectations based on the geologic conditions that exist at the Site.

Surface water monitoring conducted in late June through the beginning of July 2010 at several points documented water level fluctuations on the order of a few centimeters (**Figure 43**). Water levels were increasing throughout June 29, the day of the aquifer test. No discernible change in the increasing trend could be linked to pumping from the Zavoral Site Well. Surface water appears to be fed by groundwater from the shallow aquifer and precipitation. The St. Lawrence aquitard separates these shallow aquifers from the deep aquifers from which water was drawn for the aquifer test.

The monitoring of the water level in the on-site depression south of the Zavoral Site Well indicated that the pumped water was seeping through the bottom of a depression at a relatively constant and slow rate of approximately 15 gpm. The depression was monitored to determine if infiltration would have an impact on the observed readings. Based on the slow rate of water discharge, location of the depression, and comparative surface water readings, it was determined that infiltration of this water did not impact the test results.

The data collected near the Zavoral Cabin indicates that the St. Croix River's stage decreased about 0.2 feet during the aquifer test (**Figure 44**). However, average daily discharge rates were recorded at the USGS Gauging Station 05340500, St. Croix River at St. Croix Falls, Wisconsin, located about 14 miles upriver from the Zavoral Site. The records show a distinct decreasing trend during the time prior to the aquifer test. This decreasing trend coincides with the declining stage as captured by the very limited number of stage measurements taken on the river below the Zavoral Cabin Well during the days before and after the aquifer test.

4.7.1.5 Impact Analysis

The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers on the shallow Drift and Prairie Du Chien-Jordon Aquifers. Based on the aquifer test, it appears that area supply wells located to the west, southwest, and northwest of the Site that are screened in the shallow Drift or Prairie Du Chien-Jordan Aquifers would not be affected by pumping the Zavoral Site Well at the rates and volumes proposed for dust control purposes and allowable under law without obtaining a water appropriation permit.

Supply wells screened in the Franconia Aquifer would have some potential to be affected by pumping of the Zavoral Site Well. The Zavoral Cabin Well is the closest well to the Zavoral Site Well that is screened in the Franconia Aquifer. The aquifer test indicated a drawdown of 0.25 feet (3 inches) caused by pumping the Zavoral Site Well during the first 15-minute period of the test, which is the time required to reach the maximum daily volume of 10,000 gallons. This represents 1/800th of the total water column present in that well. A decline of water level of 3 inches or less is insignificant given the capacity of the aquifer and the limited duration over which the decline would occur. The decline would begin to rebound once the pumping is stopped. Water level mostly recovered within 24 hours after the completion of the 4-hour 20-minute aquifer test. After 4 hours and 20 minutes of pumping, the drawdown was 3.5 feet, which represents less than 1/50th of the total water column in that well. The other two Franconia wells closest to the Site are located about 2,000 and 2,500 feet away from the Zavoral Site Well, respectively. The bottoms of both wells are at similar elevations as the bottom of the Zavoral Cabin Well. The Zavoral

Cabin Well is located much closer to the Zavoral Site Well than the other two wells, while other Franconia wells in the area are located at still greater distances. Consequently, drawdowns caused in those wells by pumping the Zavoral Site Well are expected to be less than observed in the Zavoral Cabin Well. A decline of water level of 3 inches or less is insignificant given the capacity of the aquifer and the limited duration over which the decline would occur. The decline would begin to rebound once the pumping is stopped. Water level mostly recovered within 24 hours after the completion of the 4-hour 20-minute aquifer test. No aquifer test-related drawdowns were observed in the other two monitored wells:

- Trails End Well (Minnesota Unique Number 00263147), located about 1,700 feet west of the Zavoral Site Well
- Magnuson Well (owned by Mr. Roger Magnuson, Minnesota Unique Number 00154397), located about 1,900 feet west-northwest of the Zavoral Site Well

The lack of drawdown in those wells indicates that the St. Lawrence Formation, which is separating the shallow aquifers (Drift and Prairie du Chien – Jordan) and the Franconia-Ironton-Galesville Aquifer, acts as an effective aquitard.

The Southern mesic cliffs and the Black ash swamp seepage subtype wetlands are located along the eastern edge of the property boundary outside the mining and reclamation limits. At several PAC meetings, committee members voiced concern over whether the use of the Zavoral Site Well could result in groundwater impacts that would negatively impact the Southern mesic cliffs and Black ash swamp seepage subtype wetlands.

The Southern mesic cliffs and the Black ash swamp seepage subtype wetlands obtain their base flow from groundwater discharged from the shallow aquifers below the Site that consist of the Glacial Drift and the Prairie Du Chien-Jordon Aquifers. The aquifer test conducted by AECOM confirmed that the St. Lawrence Formation acts as an aquitard that limits the influence of pumping from the deeper Franconia-Ironton-Galesville and Mt. Simon Aquifers. The shallow aquifers at the Site were not influenced by pumping in the deeper aquifer, and the projected use of water from the Zavoral Site Well for dust control purposes would not be expected to impact these regionally significant features. It should be noted that if a new well were installed at the Site and water were pumped from the shallow aquifers, the potential for impacts to area supply wells and surface water features would be more likely because pumping would be from the aquifer serving these resources.

Mining would increase the amount of internal surface drainage at the Site. The Project would improve internal drainage and infiltration, resulting in improved base flow conditions to these areas. This additional water would add to the base flow and reduce the surface water runoff that currently occurs on a portion of the Site. The increase in the base flow is not expected to be significant but would provide an incremental increase in the groundwater flow into the seeps and creeks. The decrease in surface runoff should decrease sediment loading to the creeks, which should benefit the creeks.

The discharge of the St. Croix River was about 3,900 times larger than the average pumping rate during the aquifer test. Although a declining stage was measured in the river during the aquifer test, this decreasing trend coincides with the declining discharge of the river as measured by the USGS, and was not due to pumping from the Zavoral Site Well.

The volume of water proposed for mining is a very small percentage of the groundwater that flows through the Site. Groundwater balance estimations indicate that pumping the Zavoral Site Well at a daily limit of 10,000 gallons represents about 0.7% of daily groundwater flow rate across the Site.

The data and calculations presented clearly indicate that pumping from the Zavoral Site Well at a daily limit of 10,000 gallons would only minimally affect groundwater resources around the Site and that any potential impacts are likely to be insignificant. The Water Use Technical Memorandum (**Appendix B.4**) provides additional details about the data collected.

4.7.1.5.1 *Alternative 1 – Mining 5- to 10-Year Operation*

No significant impacts to area supply wells, groundwater resources, or surface water features are projected to occur based on water use for dust control purposes. The total volume of groundwater that could be pumped over the maximum period of operation would be 10 million gallons (1 mgy for 10 years). The total volume of pumping over the life of the Project may be greater than Alternative 3; however, due to the mining occurring for fewer weeks per year, the annual volume of water use could be less than for Alternative 3 (with neither Alternative 1 or 3 being allowed to use more than 10,000 gpd). Water management, operational measures, and weather conditions would influence the quantity of water used for dust control both on a daily and annual basis. Tiller has indicated that the property owner has no plans to abandon the well regardless of whether the mining would occur.

4.7.1.5.2 *Alternative 2 – No-Build Alternative*

No mining at the Site would occur, so no mining-related water use would result. Tiller has indicated that the property owner has no plans to abandon the well regardless of whether the mining would occur.

4.7.1.5.3 *Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation*

No significant impacts to area supply wells, groundwater resources, or surface water features are projected to occur based on water use for dust control purposes. The total volume of groundwater that can be pumped over the maximum period of operation would be 5 million gallons (1 mgy for 5 years). The total volume of pumping over the life of the Project may be less than Alternative 1; however, due to the mining occurring for more weeks per year, the annual volume of water use could be more than for Alternative 1 (with neither Alternative 1 nor 3 being allowed to use more than 10,000 gpd). Water management, operational measures, and weather conditions would influence the quantity of water used for dust control both on a daily and annual basis. Tiller has indicated that the property owner has no plans to abandon the well regardless of whether the mining would occur.

4.7.1.5.4 *Subalternative 3A –– Reduced Timeframe 150-Working Day Operation*

No significant impacts to area supply wells, groundwater resources, or surface water features are projected to occur based on water use for dust control purposes. The total volume of groundwater that could be pumped over the estimated 1 year of operation would be 1 million gallons; however, due to mining occurring for more weeks during this year, the annual volume of water use could be more than the other alternatives but could not exceed 10,000 gpd.

4.7.2 Potential Mitigation Measures

No mitigation measures are proposed because no anticipated significant impacts are expected to occur due to the proposed groundwater pumping. The following monitoring to be funded by Tiller is recommended.

- Tiller should keep records of when the Zavoral Site Well is pumped, and provide these to the City for groundwater monitoring activities. This should document both the daily use and total annual pumped volume from the Zavoral Site Well. The daily total should not exceed 10,000 gallons at a maximum pumping rate of 1,200 gpm. The total annual pumping should not exceed 1mgy.

- The WCD monitoring point installed for the pump test and collection of baseline data in Zavoral Creek should be monitored during the lifetime of the Project.

- The Black ash seepage subtype wetland boundary mapped by CCES (CCES January 2010) established the baseline boundary of the seep along Zavoral ravine. This should be monitored during the life of the Project.

4.7.3 Scandia Mine

The use of add-rock from the Zavoral Site rather than other sources currently used would not change the level of water appropriation at the Scandia Mine.

Water used at the Scandia Mine is obtained from an existing on-site well that is finished in the Quaternary Drift water table aquifer. Water use at the Scandia Mine is expected to remain consistent with the levels evaluated in the EAWs prepared for the Mine (1987 and 1999) and the current water appropriation permit. The 1999 EAW analysis included water use of 20 mgy and 600 gpm. The current MnDNR Water Appropriations permit identifies two water use categories and allows for 18 mgy at 500 gpm for sand and gravel washing and 2 mgy and 500 gpm for dust control.

Washing at the Scandia Mine occurs on an as-needed basis. The MnDNR website supports only one water use category; therefore, persons accessing this website for permit information would find a permit with one water use category that allows 18 mgy at 500 gpm for sand and gravel washing. A copy of the actual permit with the two water use categories described above is included as **Appendix E**.

The majority, if not all, of the Class C add-rock hauled from the Zavoral Site would not be washed. Historically, only a small portion of aggregates sold at the Scandia Mine have been washed sand and gravel products. Although the water appropriation permit allows washing and past environmental review has included washing, washed products are only produced as needed to meet market demand.

Washing last occurred at the Scandia Mine in 2002. Average water use over the last 5 years has been less than 2 mgy, even though unprocessed add-rock has been imported. Under the current water appropriation permit levels, the Scandia Mine could produce over 300,000 tons/year of washed product. These production volumes are sufficient for Tiller to meet any reasonable increase in the demand for washed product without necessitating any change to existing permitted activity or further environmental review.

Importing unprocessed Class C add-rock from the Zavoral Site would not change current Mine operations and would not impact water use at the Scandia Mine.

4.8 WATER-RELATED LAND USE MANAGEMENT DISTRICTS

Water-related land use management districts at the Site are the CMSCWD, the WCD, and the St. Croix River District.

Tiller would be required to obtain a Permit for Stormwater Management from the CMSCWD prior to operation that requires a stormwater plan to be submitted to the CMSCWD for review and approval. To meet CMSCWD permit requirements, the Project would not be allowed to increase peak flow discharge rates to off-site areas, would not be allowed to increase the runoff volume discharge off-site, and would require appropriate BMPs. The Project would need to meet all of these requirements through on-site infiltration and would not be allowed to increase the level for duration of bounce in downstream waterbodies.

Because no wetlands were identified within the mining and reclamation area (NRC 2010), it is not anticipated that any permits would be required under the programs managed by the WCD.

Tiller proposes to conduct reclamation activities on about 4 acres of the previously mined area located within the St. Croix River District Zone and scenic easement. Permits from the local authority are required for certain grading, filling, and vegetative cutting activities associated with the St. Croix Riverway ordinance in accordance with Minn. R. ch. 6105.0370 §§ 4 and 6. This work should be monitored for compliance with regulatory requirements.

The potential for impacts to area surface water bodies is described in other sections of this summary. The Project is consistent with water-related land use management district regulations.

4.9 EROSION AND SEDIMENTATION

4.9.1 Zavoral Site

4.9.1.1 Affected Environment

Soils within the Site are categorized by the Natural Resource Conservation Service (NRCS) as hydrologic soil Group A, a category composed of sandy soils (NRCS September 2011). Soils that are sandy infiltrate runoff at relatively high rates. Watershed areas that discharge off-site have well-established vegetation, which, combined with the sandy nature of the soil, enhances infiltration and decreases the risk of erosion. Surface runoff occurs when the soil is saturated or when the rate of rainfall or snow melt exceeds the infiltration rate. The majority of runoff from the Site is infiltrated and becomes groundwater because of internal drainage and sandy nature of the Site soils.

Portions of the Site that discharge to the creeks, referred to as the Middle and South Creeks in this EIS, are forested by White-pines and other trees. The area discharging to Zavoral Creek is vegetated primarily with nonnative and native grasses.

Approximately 35% of the internally drained watershed areas are forested, the remainder is nonnative and prairie grasses. Several areas with steep slopes that drain internally are attributed to mining activities from the mid 1960s to the 1980s. Existing Site topography is shown on **Figure 27** along with the depression areas that drain internally.

The topography in the area between the Site and the St. Croix River includes steep slopes and bluffs that have a high risk for erosion. Designated wetlands outside the proposed mining and reclamation area, but within the Site boundary, include reaches of the three creeks to which the Site is tributary. The creeks are characterized as "ravines with several seep areas along the hillsides." Vertical cuts in soils and soil sloughing occur in areas along Zavoral Creek and Middle Creek.

There is some evidence that a major transportation of soil occurred in the past, primarily based on discussions with area residents and the existence of a delta deposit near the mouth of Zavoral Creek that appears to be the result of a significant erosion event. The cause of this delta deposit is not known. It could be the result of a natural erosion event (major rain event) or the result of human activities.

Potential impacts on erosion and sedimentation exist after the start of construction when soils are exposed for overburden removal or other activity. The source areas of potential erosion and sedimentation project impacts are 4.6 acres on the perimeter of the Site that would discharge off-site during construction (**Figure 28**). Watershed areas discharging off-site during operation would include 1.3 acres discharging to Zavoral Creek, 1.0 acre discharging to the Middle Creek, and 2.3 acres discharging to the South Creek, a total of 4.6 acres or 7% of the Site.

The watersheds discharging off-site have slopes ranging from 2% to 25% within the mining limits. In comparison, slopes along adjacent areas of the St. Croix River escarpment range up to 100% or higher. For the remaining 93% of the Site, runoff is trapped within depressions (internally drained) and does not leave the Site. Internally drained areas would not have potential for off-site erosion and sedimentation impacts, as these impacts are the result of runoff.

4.9.1.2 Impact Analysis

4.9.1.2.1 *Alternative 1 – 5- to 10-year Operation*

Immediately after soil stripping, and prior to overburden removal, there would be several relatively short periods (a matter of days or less for each occurrence) when potential impacts to downstream water resources could occur. If significant rain were to fall during this period, erosion in externally draining perimeter areas of the Site could potentially affect downstream resources including the three small tributaries receiving Site drainage and the St. Croix River. After vegetative stabilization or after overburden removal, the potential for these impacts becomes very small, and less than potential impacts for existing conditions.

4.9.1.2.2 *Alternative 2 – No-Build Alternative*

There would be no change in potential impacts relative to erosion and sedimentation for downstream tributaries and the St. Croix River for the No-Build Alternative.

4.9.1.2.3 *Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation*

Alternative 3 may have less risk for the potential impacts compared to Alternative 1 because the shorter Project duration reduces the exposure to rain events. However, Alternative 3 would increase of the intensity of mining activity during Project operation, increasing the potential sources of pollution during the operation period.

4.9.1.2.4 *Subalternative 3A – Reduced Timeframe 150-Working Day Operation*

Subalternative 3A may have less risk for the potential impacts compared to Alternative 3 because the shorter Project duration reduces the exposure to rain events. However, Subalternative 3A would increase of the intensity of mining activity during Project operation, increasing the potential sources of pollution during the operation period.

4.9.2 Potential Mitigation Measures

The Site would require several permits for the management of erosion and sedimentation. Permits include the NPDES/SDS general permit for Stormwater Discharges Associated with Construction Activities (MN R100001), the NPDES/SDS General Permit for Construction Sand and Gravel, Rock Quarrying and Hot Mix Asphalt Production Facilities (MNG 490000), and the CMSCWD erosion and sediment control permit.

Permit requirements include a SWPPP, both for construction activities and for the ongoing mining operation. The draft SWPPP Tiller prepared for the Project calls for double row silt fences along with vegetated buffer strips to be installed along the downgradient edge of the perimeter watersheds draining off-site during operation. These BMPs would be installed before overburden removal and would both control the velocity of overland flow and trap sediment on-site. In addition to the silt fence and buffer strips, berms would be constructed on the north and south ends of the Site to divert additional areas where runoff would drain off-site to internally drained areas within the Site.

There are 4.6 acres of the Site along the north, east, and south perimeters that would drain off-site via the silt fences and buffer strips; these discharge points are potential areas of erosion where ongoing maintenance of the BMPs would be needed to prevent erosion and subsequent sedimentation in downstream water bodies. To limit exposure after overburden removal, those portions of the Site where overburden would be removed would be graded to drain internally immediately after soil exposure. Because the project would be phased, mining would only occur in one of the three perimeter areas at a time. The maximum potential area of exposed soil draining off-site during a mining phase would be the 2.3 acres discharging to the South Creek (Phase 2).

The St. Croix River is listed as an Outstanding Resource Value Water (ORVW) according to Minn. Stat. § 7050.0180. A requirement of the NPDES/SDS General Permit for Construction Sand and Gravel, Rock Quarrying and Hot Mix Asphalt Production Facilities is that all exposed soil areas with a slope of 3:1 or steeper, that have a continuous positive slope to an ORVW or trout waters, must have temporary erosion protection or permanent cover within 3 days after the area is no longer actively being worked. The Project would be managed such that all exposed soil discharging off-site would be revegetated and erosion protection established within 3 days, a management practice included in the draft project SWPPP. The NPDES/SDS General Stormwater Permit associated with construction activity states that

any drainage from the Site must be stabilized within 200 lineal feet from the property edge, or from the point of discharge into any surface water within 24 hours of connecting to surface water.

There are no diversion berms or swales proposed for the 1.3 acres draining to Zavoral Creek or for the 1.0 acre draining to the Middle Creek because it is not possible to construct effective diversion berms at these locations. Instead, alternative practices must be used at these locations, including minimizing the time when soil is exposed by implementing rapid stabilization techniques. A critical time would be between stripping of topsoil to overburden removal when the slopes would then be drained into the Site. Overburden removal followed by regrading each perimeter area to establish internal drainage would be accomplished immediately after the topsoil is disturbed. The extent of disturbed soils draining off-site at any one time is also limited by the phasing of the project. There are three project phases and only one of the three locations where off-site drainage occurs is in each phase. Since the Project would decrease the total surface runoff from the Site compared to existing conditions, the risk of erosion and sedimentation impacts from runoff originating from the Site is also reduced by the Project.

4.9.3 Scandia Mine

There would be no change in potential impacts relative to erosion and sedimentation for the Scandia Mine Site as a result of the Project.

4.10 SURFACE WATER QUALITY AND QUANTITY

4.10.1 Affected Environment

See Sections 4.6 and 4.9.

4.10.2 Impact Analysis

A SWPPP would be implemented for the Project in compliance with the NPDES/SDS and CMSCWD permits. See additional discussion in Sections 4.6 and 4.9.

The SWPPP plan would utilize BMPs to minimize or prevent discharge of stormwater runoff from becoming contaminated or, for sediment laden stormwater, from being discharged off-site. In addition to the SWPPP, erosion and sediment control methods have been developed for the individual phases, including post-reclamation, as illustrated in the Mining and Reclamation Stormwater Plans. The Stormwater Plans depict the evolution of drainage patterns as topography is altered throughout the mining and reclamation phases. As mining progresses, the interior elevation of the Site would be reduced, which directs the flow of surface water to the interior of the Site. The Stormwater Plans also illustrate the BMPs that would be implemented throughout the life of the project.

As described in the draft SWPPP, the area that would be mined and reclaimed includes 64 acres, which includes approximately 53 acres that currently drain internally due to past mining operations, which have lowered the grade below the elevation of the surrounding land. As a result, runoff generated within the internally drained area is not discharged off-site. About 11 acres within the Project limits currently drain off-site.

Three separate areas within the proposed mining limits currently drain off-site as indicated in the draft SWPPP Site Map. Stormwater from each of these three areas drains to a separate spring creek that ultimately discharges into the St. Croix River. The northernmost area encompasses approximately 3.1 acres and is located within Phase 1 Mining. The stormwater flows off-site and drains toward an unnamed creek locally known as Zavoral Creek. To prevent untreated off-site flow at this location, a number of BMPs would be applied as illustrated in Mining and Reclamation Stormwater Plan Phase 1. The southernmost drainage area consists of approximately 6.64 acres and is located within Phase 2 Mining. The area drains off-site to the southernmost creek located outside of the property boundary. To prevent untreated off-site flow at this location, a number of BMPs would be applied as illustrated in Mining and Reclamation Stormwater Plan Phase 2. The central drainage area consists of approximately 1.07 acres and is located in Phase 3 Mining. The stormwater drains off-site to a creek that is also unnamed. To prevent untreated off-site flow at this location, a number of BMPs would be applied as illustrated in Mining and Reclamation Stormwater Plan Phase 3.

After reclamation of the Project, the majority of stormwater runoff would be directed toward the six depressions located in the interior of the site as illustrated in Mining and Reclamation Stormwater Plan Post-Reclamation. The exception is the northwesternmost area of the project. This area would be reclaimed during Phase 2. The removal of the BMPs would not occur until vegetation and soil stability is well established. Until stability of the area is evident, stormwater flow would be diverted to the interior of the Site.

See Sections 4.6 and 4.9.

4.10.3 Potential Mitigation Measures

See Sections 4.6 and 4.9.

4.10.4 Scandia Mine

The 1999 EAW evaluated impacts associated with the mining limits that are consistent with the mining limits currently approved in the Scandia Mine CUP. These mining limits include 155 acres to be mined and reclaimed. Add-rock imported to the Scandia Mine is unloaded over an active face where it is stored until needed. It is not stored in individual stockpiles over the Mine floor. The practice of storing the add-rock material over the active face would continue regardless of the add-rock source. This activity does not open any areas to be mined prematurely nor does it change or disturb additional areas as storage takes place over the active mining area. Utilizing the Zavoral Site as the source of Class C add-rock would not require any change to the approved mining limits or operation, or cause any change to impacts to downstream water resources.

4.11 GEOLOGIC HAZARDS AND SOIL CONDITIONS

4.11.1 Zavoral Site

Potential geologic hazards are related to the elevation relief between the Zavoral Site and the St. Croix River and the erodible nature of the soil. The surface soils consist of highly erodible granular materials. These soils are generally stable unless water is introduced. Surface water drainage is the primary source of water that could lead to erosion and soil transport.

There is some evidence that a major transportation of soil occurred in the past, primarily based on discussions with area residents and the existence of a delta deposit near the mouth of Zavoral Creek that appears to be the result of a significant erosion event. The cause of this delta deposit is not known. It could be the result of a natural erosion event (major rain event) or the result of human activities.

AECOM reviewed the Site watershed boundaries for existing conditions, during operation, and reclamation and post-operation conditions. The following observations were made based on the review of Tiller Mining and Reclamation Plans.

- The majority of the Site currently drains internally. Where internal drainage is present the potential for a significant erosion event is small.
- Areas of off-site drainage currently exist on the north and south portions of the Site. These areas are located adjacent to ravines and some potential for erosion exists.
- Mining activity would increase the area of internal drainage and decrease the area of off-site drainage. This would reduce the amount of water available to erode Site granular soils.
- The post-conditions situation eliminates all but 1.3 acres of off-site drainage located at the north end of the Site. The rest of the Site would be internally drained. The watershed for the remaining 1.3 acres of off-site drainage would be reduced from what presently exists thereby reducing the potential for a significant erosion event.
- Tiller is not proposing to process materials at the Zavoral Site. No wash water basins or other features exist that, should a breach or overtopping event occur, would result in a major soil transportation event similar to past events.

The potential for a significant erosion event to occur would be reduced by the implementation of BMPs, as part of the Project to control sedimentation and erosion, and the increase in the area of internal drainage as part of mining-related activities. In addition to reducing the off-site drainage, reclamation activities would result in a stable vegetative cover that would further reduce the potential for soil erosion.

4.11.2 Scandia Mine

The geology, soil conditions, and operations at the Scandia Mine would remain the same as those evaluated in the 1989 EAW and the 1999 EAW. The add-rock source would not affect these conditions.

4.12 SOLID WASTE, HAZARDOUS WASTE, AND STORAGE TANKS

4.12.1 Zavoral Site

4.12.1.1 Solid Waste

Due to the seasonal nature of the Project, no permanent sanitary waste facilities would be constructed. Instead, portable sanitary waste facilities would be used and managed by a licensed contractor.

It is anticipated that very little solid waste would be produced at the Zavoral Site. It is expected that a waste container within the on-site trailer would be sufficient for waste collection. This would be collected

by a Tiller employee on a daily basis during periods when work was occurring at the Site and disposed of at Tiller's Maple Grove facility where waste is picked up by a licensed solid waste hauler for disposal at a licensed waste facility. In the event that increased waste disposal was needed, a dumpster managed by a licensed waste hauler could be brought to the Site.

4.12.1.2 Hazardous Waste

No hazardous wastes are expected to be generated at the Zavoral Site. Hazardous materials at the Site would be limited to Materials of Trade (MOTs) carried in a service truck, which would come to the Site to perform routine maintenance on operating equipment. The service truck would take all used fluids and filters from the Site where they would be properly disposed of at the operator's main shop. The service truck would carry a spill containment kit.

An MOT as defined in a fact sheet published by the Mn/DOT[6] is a hazardous material, other than a hazardous waste, that is carried on a motor vehicle:

- For the purpose of supporting the operation or maintenance of a motor vehicle, including its auxiliary equipment (e.g., engine starting fluid or spare wet batteries carried on a tow truck).
- By a private motor carrier, including a vehicle operated by a rail carrier, in direct support of a principal business that is other than transportation by motor vehicle (e.g., landscaping, plumbing, or welding services).

Other materials that are not considered hazardous but are expected to be on-site during operations include engine oil, grease, hydraulic fluid, and anti-freeze. The materials would be stored in the on-site trailer in compliance with state, county, and city requirements and regulations.

4.12.1.3 Storage Tanks

The only material that may be stored in on-site tanks during operation would be diesel fuel. However, it is expected that diesel fuel would primarily be brought on-site by a bulk delivery truck that would directly fuel the operating equipment. Therefore, storage of diesel fuel on-site is not expected. In the event that fuel storage would be necessary, storage would be in a single 1,000-gallon mobile tank in compliance with state, county, and city requirements and regulations. This tank would be located within the active mining or reclamation phase.

4.12.1.4 Impact Analysis

4.12.1.4.1 *Alternative 1 – 5- to 10-Year Operation*

The generation of solid waste, use of MOTs, and delivery and/or storage of diesel fuel would occur during the 5 to 10 years of operation. If a diesel storage tank is not used at the Site, these activities would occur only when mining and/or reclamation activities take place. If diesel is stored at the Site, the tank could remain there for up to 10 years.

[6] Mn/DOT. Minnesota Commercial Truck and Passenger Regulations Fact Sheet: Materials of Trade, St. Paul, MN. Available at: http://www.dot.state.mn.us/cvo/factsheets/hm200mot.pdf.

4.12.1.4.2 *Alternative 2 – No-Build Alternative*

The No-Build Alternative would have no impact on solid waste, hazardous waste, or storage tanks because no mining or reclamation activities would take place within the Zavoral Site.

4.12.1.4.3 *Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation*

If diesel fuel is not stored in a tank at the Site, the generation of solid waste, use of MOTs, and delivery of diesel fuel would occur during the 3.3 to 5 years of operation, but either more frequently or for longer durations or a combination of both. If diesel is stored at the Site, the tank could remain there for up to 5 years.

4.12.1.4.4 *Subalternative 3A – Reduced Timeframe 150-Working Day Operation*

If diesel fuel is not stored in a tank at the Site, the generation of solid waste, use of MOTs, and delivery of diesel fuel would occur during the 1 year of operation. If diesel is stored at the Site, the tank could remain there for approximately 1 year.

4.12.2 Potential Mitigation Measures

All on-site construction equipment would be monitored for leaks and receive regular preventive maintenance. Fueling and maintenance of vehicles would occur within the active mining phase and no "topping off" of vehicle fuel tanks would be allowed.

Minn. R. ch. 7151 requires registration of aboveground storage tanks (ASTs) over 500 gallons and has additional requirements for tanks over 1,100 gallons, facilities over 1,000,000 gallons, and tanks near surface water.

Regulated ASTs with a capacity of 500 to 1,100 gallons that are within 500 feet of a Class 2 surface water (water that can be used for recreational purposes) are required to:

- Be registered with the MPCA
- Be labeled
- Be constructed using appropriate industry standards
- Have secondary containment
- Have a facility sign posted

As a mitigation measure, the AST should be required to be more than 500 feet from surface water to reduce the potential for impacts to surface water. The MPCA must be notified about all ASTs within 30 days of installation by submitting an AST Notification Form to the MPCA.

Groundwater should be sampled and analyzed for diesel range organics. If gasoline is to be stored on the Site, gasoline range organics and benzene should be added to the analyte list.

4.12.3 Scandia Mine

Waste handling and material storage at the Scandia Mine would remain the same as those evaluated in the 1989 EAW and the 1999 EAW and allowed under the current CUP and AOP. The add-rock source would not affect these conditions.

4.13 TRAFFIC

4.13.1 Zavoral Site

4.13.1.1 Affected Environment

Raw aggregate material mined at the Zavoral Site would primarily be transported to the Scandia Mine. In some cases, it would be transported directly to construction project sites. It is not possible to predict the locations of these construction sites. The Scandia Mine currently uses or processes aggregate material that is transported to the Scandia Mine from various locations. These include Class A, B, and C aggregate material that falls into two basic categories:

- Material hauling that would not change regardless of whether the Zavoral Site is permitted
- Material hauling that would change if the Zavoral Site is permitted

These categories are described in detail below.

4.13.1.1.1 *Material hauling that would not change regardless of whether the Zavoral Site is permitted*

Class A aggregate typically consists of crushed quarry or mine trap rock (basalt, diabase, gabbro, or other related igneous rock types), quartzite, gneiss, or granite

Class A Aggregate: Tiller currently imports Class A aggregate to the Scandia Mine for use in hot mix asphalt production. Annual utilization varies. Average utilization for the past 5 years is 21,500 tons a year. These materials are stored in proximity to the asphalt plant and therefore stockpile size is limited to approximately 2,000 to 2,500 tons.

This Class A aggregate hauled to the Scandia Mine consists of basalt from the Dresser, Wisconsin, area and granite from the St. Cloud, Minnesota, area. Historically, this has typically consisted of two to three trucks per day for 1 to 3 days per week depending on utilization. Each of the trucks would haul five loads per day or 10 round trips per day, resulting in up to 30 round trips on a typical day for up to 3 days a week (90 round trips a week). The route from Wisconsin is east on TH 243, to south on State Scenic Byway TH 95, to west on TH 97, to north on CR 1 (Lofton Avenue), to the Lofton Avenue entrance of the Scandia Mine (**Figure 45**). The route from St Cloud is the regional system (TH 61 and Interstate 35E), then east on TH 97 to north on CR 15A (Manning Trail) (**Figure 45**). These routes are reversed for return trips.

Class B aggregate typically consists of all other crushed quarry or mine rock, i.e., limestone, dolomite, rhyolite, schist, etc.

Class B Aggregate: Tiller currently imports Class B aggregate to the Scandia Mine for use in hot mix asphalt production. Annual utilization varies. Average utilization for the past 5 years is 30,000 tons per year. These materials are stored in

proximity to the asphalt plant and therefore stockpile size is limited to approximately 2,000 to 2,500 tons.

The number of trucks hauling limestone is two to three trucks per day for 1 to 3 days per week depending on utilization. Each of the trucks would haul five loads per day or 10 round trips per day, resulting in up to 30 round trips on a typical day for up to 3 days a week (90 round trips a week). There are two haul routes. One route is from the Bayport, Minnesota, area; trucks hauling limestone travel north on CR-15 and CR 15A (Manning Trail) to the Scandia Mine. The other route is from the west from the Burnsville, Minnesota, area; trucks hauling limestone travel the regional system (TH 61 and Interstate 35E), then east on TH 97 to north on CR 15A (Manning Trail). These routes are reversed for the return trips (**Figure 45**).

4.13.1.1.2 *Material hauling that would change if the Zavoral Site is permitted*

Class C Aggregate: Tiller currently imports Class C aggregate from Franconia Township, Minnesota, and the Osceola, Wisconsin, area. The existing Class C aggregate haul routes (**Figure 45**) are concentrated on both State Scenic Byway TH 95 (north), CR 1 (from the south), and TH 97. Other sources of Class C aggregate, including those currently used, would not be used if the Zavoral Site were permitted until the material from the Zavoral Site was used up. This is because the Zavoral Site is closer to the Scandia Mine than the Franconia or Osceola sources and, as a result, is less costly to haul.

> Class C aggregate typically consists of natural or partly crushed natural gravel obtained from a natural gravel deposit. Material from the Zavoral Site would consist of uncrushed natural gravel.

The Class C aggregate haul routes currently used (**Figure 45**) are:

- Franconia Township, Minnesota – from the intersection of Sugar Bush Trail N. and State Scenic Byway TH 95 in Franconia Township, to south on TH 95, to west on TH 97, to north on CR 1 (Lofton Avenue), to the Lofton Avenue entrance of the Scandia Mine, with return trips reversing this route.

- Osceola, Wisconsin, area – trucks typically cross the river at TH 243 from Polk County, which is the closest river crossing to south on State Scenic Byway TH 95, to west on TH 97, to north on CR 1 (Lofton Avenue), to the Lofton Avenue entrance of the Scandia Mine, with return trips reversing this route.

These hauling activities have generated a maximum of 265 loads (530 trips) a day with an average of 190 loads (380 trips) a day. The most recent Class C aggregate haul event from Franconia Township to the Scandia Mine occurred in July 2010. This was pit run, of unprocessed material that was blended and processed with material present at the Scandia Mine. The haul started the week of July 5 and lasted through July 22. The average number of loads per day was 140 or 280 trips. During this event there were 3 days with 170 loads or 340 trips.

4.13.1.2 Proposed Haul Route

The proposed haul route from the Zavoral Site to the Scandia Mine, shown in **Figure 4**, is approximately 6.5 miles long. The proposed haul route would haul material directly from the Zavoral Site to the Scandia Mine on TH 97. The two “build alternatives” include the same study area, haul facilities, and roadway network. The main difference is the duration of the haul events (total years and number of weeks for the

add-rock haul). The impacts of the build alternatives on traffic operations and safety were evaluated on the following roadways:

- TH 97 from Manning Trail to State Scenic Byway TH 95
- State Scenic Byway TH 95 from 220th Street to 209th Street
- Manning Trail and Lofton Avenue from TH 97 to the Scandia Mine entrance
- Intersections within the study limits

Under the two "build alternatives," truck traffic currently traveling to and from the Scandia Mine along TH 97, State Scenic Byway TH 95, TH 243 would be replaced by the direct routes between the Zavoral Site and Scandia Mine (**Figures 4 and 45**). While the Zavoral Site is in operation, Tiller would not haul Class C add-rock to the Scandia Mine from Franconia or Osceola, As a result, in Minnesota, TH 243 and State Scenic Byway TH 95 north of TH 97 would no longer carry this traffic, a distance of approximately 7 miles. Trucks with other regional and local destinations would continue to operate on these roadways; however, the overall daily volumes would not include Tiller Class C add-rock haul traffic during the life of the Zavoral Site.

Employee and maintenance transportation at the Zavoral Site would be minimal. One equipment operator, one foreman, and one fuel truck per day, and a maintenance truck every 2 to 4 days are expected to access the Site. In addition, mining and restoration would occur at the Site as described in Section 2.0 of this document.

4.13.1.3 Current Traffic Levels in Study Area

Annual average daily traffic (AADT) – the estimate of daily traffic on a road segment that represents the total traffic on a segment that occurs in a 1-year period divided by365 days.

Annual average daily traffic (AADT) volumes (**Figure 46**) have remained fairly constant in the past several years on the main roadways that would be affected by the Project. State Scenic Byway TH 95 and TH 97 are two-lane state highways designed for higher speed traffic (55 mph speed limit) and regional travel. They include bypass lanes in some areas and turn lanes at some intersections. The Traffic Technical Memorandum is included as **Appendix B.5**.

The intersections at TH 97 at Manning Trail and Olinda Trail are four-way stop intersections. TH 97 has stop sign control at State Scenic Byway TH 95. None of the intersections in the study area carry sufficient traffic volume to warrant a traffic signal.

Mn/DOT completed roadway construction improvement projects on sections of TH 97 in 2007 and State Scenic Byway TH 95 in 2009, which are important for mobility and safety on the Trunk Highways. These projects were primarily pavement rehabilitation, drainage, and associated improvements for safety and maintenance. Washington County does not have improvements planned in their 5-Year Capital Improvement Plan.

The haul traffic related to the three alternatives under consideration in this EIS is described below.

4.13.1.3.1 *Alternative 1 – 5- to 10-Year Operation*

The projected daily truck volumes (**Figure 47**) were calculated using the following data:

- Alternative 1 is based on 5- to 10-year operation at the Zavoral Site.
- Mining operations would take place for 6 to 12 weeks a year.
- Total projected Class C aggregate mined each year for transport from the Zavoral Site, primarily to the Scandia Mine, is120,000 to 240,000 tons.

Alternative 1 – 5 to 10 years of Mining –
6 to 12 weeks of mining a year
334 to 400 trips per working day
560 round trips peak day
40 round trips a day peak reclamation topsoil
Total peak is 600 round trips a day

- The number of loads per year is calculated based on the haul weight and typical weight transferred in one truckload (20 to 24 tons per truckload). The number of loads per year is then converted to "projected loads per day" based on the typical range of truckloads that would be loaded and transported during a working day. This calculates to 167 to 200 truckloads on a typical working day (334 to 400 round trips).

Tiller has noted that production can vary and be lower than the 167 truckloads. This EIS analyzes the higher level of traffic volume to evaluate the potential impacts to the roadway system.

The maximum number of trucks in a working day has been defined at 280 trucks (560 round trips). This is based both on historic peaks for the Scandia Mine (530 trips) and on field timing of similar add-rock truck loading conducted at other Tiller sites (**Figure 47**). It takes approximately 2.15 minutes to load a truck. This includes time to periodically reposition excavating equipment and allow trucks to move to the excavator to be loaded. As a result, no more than 28 trucks (60 minutes/2.15 minutes per truck) could be loaded and leave the Zavoral Site. This scenario is unlikely because trucks would need to run at full hourly capacity (28 loads per hour) for 10 consecutive hours to reach this level. However, this EIS analyzes this as the maximum traffic level because a major demand for gravel could generate this peak traffic level.

Reclamation of the Zavoral Site would proceed in increments as areas of mining are completed. Topsoil or other organic material would be applied to these areas and vegetation established to reduce erosion. Reclamation at maximum levels would result in 40 round trips a day for topsoil. This level would only occur during Phase 1 reclamation but was used throughout the project life as a worst-case peak (**Appendix B.5**). This reclamation hauling in combination with the add-rock hauling peak would result in a total worst-case peak of 600 round trips per day.

4.13.1.3.2 *Alternative 2 – No-Build Alternative*

The projected daily truck volumes (**Figure 48**) were calculated using the following data:

- This is the No-Build Alternative. Tiller would continue to import Class C aggregate from the Franconia Township, Minnesota, and the Osceola, Wisconsin, area.
- Alternative 2 is based on 20 to more than 30 years of mining at these sites.

Alternative 2
6 to 20 weeks of mining a year
210 to 528 round trips per working day
560 round trips peak day
No reclamation
Total peak haul is 560 round trips a day

- Mining operations would take place for 6 to 20 weeks a year.
- Total projected Class C aggregate mined each year for transport, primarily to the Scandia Mine, is 120,000 to 240,000 tons.
- The range of projected loads is shown based on Tiller's records over the past 7 years of operation for the Scandia Mine. This calculates to 105 to 279 truckloads on a typical working day (210 to 528 round trips).

Tiller has noted that production can vary and be lower than the 105 truckloads. This EIS analyzes the higher level of traffic volume to evaluate the potential impacts to the roadway system. The maximum number of trucks in a working day has been defined at 280 trucks (560 round trips). No reclamation would be occurring at the Zavoral Site, so no reclamation topsoil trips are included in this peak number.

4.13.1.3.3 *Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation*

The projected daily truck volumes **(Figure 49)** were calculated using the following data:

- Alternative 3 is based on 3 to 5 years of mining at the Zavoral Site.
- Mining operations would take place for 12 to 18 weeks a year.
- Total projected aggregate mined each year for transport from the Zavoral Site to the Scandia Mine is 240,000 to 360,000 tons.

Alternative 3
12 to 18 weeks of mining a year
334 to 400 round trips per working day
560 round trips peak day
40 round trips peak reclamation topsoil
Total peak haul is 600 round trips a day

The number of loads per year is calculated based on the haul weight and typical weight transferred in one truckload (20 to 24 tons per truckload). The number of loads per year is then converted to "projected loads per day" based on the typical range of truckloads that would be loaded and transported during a working day. This calculates to 167 to 200 truckloads on a typical working day (334 to 400 round trips).

Tiller has noted that production can vary and be lower than the 167 truckloads. This EIS analyzes the higher level of traffic volume to evaluate the potential impacts to the roadway system.

The maximum number of trucks in a working day has been defined at 280 trucks (560 round trips).

Reclamation of the Zavoral Site would proceed in increments as areas of mining are completed. Topsoil or other organic material would be applied to these areas and vegetation established to reduce erosion. Reclamation at maximum levels would result in 40 round trips a day for topsoil. This level would only occur during Phase 1 reclamation but was used throughout the project life as a worst-case peak (**Appendix B.5**). This reclamation hauling in combination with the add-rock hauling peak would result in a total worst-case peak of 600 round trips per day.

4.13.1.3.4 *Subalternative 3A – Reduced Timeframe 150-Working Day Operation*

The projected daily truck volumes were calculated using the following data:

- Subalternative 3A is based on approximately 1 year of mining at the Zavoral Site.
- Mining operations would take place for 30 weeks over approximately 1 year.
- Total projected aggregate mined over 1 year for transport from the Zavoral Site to the Scandia Mine is 1.2 million tons.

Subalternative 3A
30 weeks of mining in 1 year
696 round trips per working day
736 round trips peak day
40 round trips peak reclamation topsoil
Total peak haul is 736 round trips a day

The number of loads per year is calculated based on the haul weight and typical weight transferred in one truckload (23 tons per truckload). The number of loads per year is then converted to “projected loads per day” based on the typical range of truckloads that would be loaded and transported during a working day. This calculates to 348 truckloads on a typical working day (696 round trips).

The maximum number of trucks in a working day has been defined at 368 trucks (726 round trips).

Reclamation of the Zavoral Site would proceed in increments as areas of mining are completed. Topsoil or other organic material would be applied to these areas and vegetation established to reduce erosion. Reclamation at maximum levels would result in 40 round trips a day for topsoil. This level would only occur during Phase 1 reclamation but was used throughout the project life as a worst-case peak (**Appendix B.5**). This reclamation hauling in combination with the add-rock hauling peak would result in a total worst-case peak of 736 round trips per day.

4.13.1.4 Haul Traffic Summary

Table 19 summarizes the haul traffic for the alternatives.

Table 19: Haul Traffic Summary

Task	Alternative			
	Alternative 1 (5 to 10 Years)	Alternative 2 No-Build (hauling from current add-rock sources)	Alternative 3 (5 Years or Less)	Subalternative 3 150-Working Days
Mining activity	5 to10 years	20 to 30+ Years	3.3 to 5 years	1
Tons per year mined	120,000–240,000	120,000–400,000	240,000–360,000	1.2 million
Projected weeks operating per year	6–12	6–20	12–18	30
Projected loads per year	5,000–12,000	5,000–20,000	10,000–18,000	50,000 - 60,000
Typical tons per truckload	20–24	20–24	20–24	23
Projected loads per day (range)	167–200 trucks 334–400 trips	105–279trucks 210–558 trips	167–200 trucks 334–400 trips	348 truck 696 trips
Reclamation topsoil loads per day	0–20 trucks 0–40 trips	Not Applicable	0–20 trucks 0–40 trips	0-20 trucks 0-40 trips
Projected loads per day (range) Add-rock + reclamation	167–220 trucks 334–440 trips	105–279trucks 210–558 trips	167–220 trucks 334–440 trips	368 trucks 736 trips
Maximum capacity loads per day	280 trucks 560 trips	280 trucks 560 trips	280 trucks 560 trips	368 trucks 736 trips
Maximum capacity loads per hour	28 trucks 56 trips	28 trucks 56 trips	28 trucks 56 trips	31 trucks 62 trips
Maximum reclamation topsoil loads per day	20 trucks 40 trips	0	20 trucks 40 trips	20 trucks 40 trips
Total peak (add-rock + reclamation topsoil)	300 trucks 600 trips	280 trucks 560 trips	300 trucks 600 trips	368 trucks 736 trips

4.13.1.5 Area Roadway Weight Restrictions

The weight restrictions for Minnesota highways vary depending upon the number of axles on a vehicle, the distance between the axles, and the classification of the road. A three-axle dump truck can have a gross weight of 18.5 to 27 tons, depending on the length, and can go up to a gross weight of 30 tons on trunk highways. A six-axle truck can have a gross weight from 33 to 40 tons, depending on the length. Additional weight is not allowed for trucks with more than six axles. Unless a lower weight restriction applies, the maximum gross weight on any Minnesota trunk highway is 40 tons and 36.6 tons on other roads. However, the relatively new Minnesota Regulation 169.824(2)(3) states that the higher 40-ton gross weight limit also applies to roads that provide access to dumping or loading facilities up to 3 miles from trunk highways.

Minnesota also has seasonal weight restrictions for roads during the spring thaw to limit road damage during this time of higher damage susceptibility. These restrictions last for a duration of 8 weeks and vary each year, but they typically are in place from February to about the middle of May. These restrictions are 9 tons per axle on county roads and 10 tons per axle for trunk highways.

The trucks currently hauling to/from the Scandia Mine and plans for hauling from the Zavoral Site would meet the weight limit requirements for the trunk highways and county roads adjacent to Scandia.

4.13.1.6 Impact Analysis

4.13.1.6.1 *Level of Service Analysis*

The truck volume analyzed was the Maximum Daily Capacity (and Maximum Hourly Capacity). This maximum is the same volume for all Alternatives 1 through 3, including the No Build.

- Maximum hourly volume for Alternatives 1 through 3 (28 trucks, 56 round trips) is the maximum number of trips that could be made between the Scandia Mine and Zavoral Site in 1 hour. This includes loading and trip time, with no delays in any activity. This level may be reached on occasion, but is unlikely to be maintained.

- The maximum daily volume assumes the maximum hour would be maintained for an entire day's haul (10 hours hauling with 280 trucks, 560 round trips). This is not considered to be attainable in practice, but was used to evaluate maximum potential truck impacts.

- For Subalternative 3A, the maximum daily volume of 368 trucks (736 round trips) was assumed to occur over 12 hours giving a maximum hourly rate of 31 trucks (62 trips) per hour.

The maximum rate was used for Alternatives 1, 2, 3, and 3A and considered to be used for the duration of the haul. This established a maximum number of trucks that could potentially run between the Zavoral Site and Scandia Mine.

The only physical road modification associated with the Project is the conversion of the TH 95 and TH 97 intersection from a 3-way to a 4-way intersection (with the addition of a northbound right turn lane required by MnDOT). The sight distance was reviewed as part of the MnDOT evaluation of the proposed intersection plans submitted by Tiller. MnDOT determined the sight distance met their design criteria. A review of the topography on TH 97 and TH 95 verified these conclusions.

AECOM completed a level of service (LOS) analysis for the intersection at TH 95 and TH 97. Also known as "Traffic Service," LOS is a qualitative measure describing operational conditions within a traffic stream. Level of service assesses conditions in terms of speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. Six levels of service are defined by letter designations from A to F, with LOS A representing the best operating conditions, and LOS F the worst. Roadway LOS descriptions are summarized below:

Level of Service A: This is a condition of free flow, accompanied by low volumes and high speeds. Traffic density will be low, with uninterrupted flow speeds controlled by driver desires, speed limits, and physical roadway conditions. There is little or no restriction in maneuverability due to the presence of other vehicles, and drivers can maintain their desired speed with little or no delay.

Level of Service B: This occurs in the zone of stable flow, with operating speeds beginning to be restricted somewhat by traffic conditions. Drivers still have reasonable freedom to select their speed and lane of operation. Reductions in speed are not unreasonable, with a low probability of traffic flow being

restricted. The lower limit (lowest speed, highest volume) of this level of service has been used in the design of rural highways.

Level of Service C: This is still in the zone of stable flow, but speeds and maneuverability are more closely controlled by the higher volumes. Most of the drivers are restricted in their freedom to select their own speed, change lanes, or pass. A relatively satisfactory operating speed is still obtained, with service volumes suitable for urban design practice.

Level of Service D: This level of service approaches unstable flow, with tolerable operating speeds being maintained, through considerably affected by changes in operating conditions. Fluctuations in volume and temporary restrictions to flow may cause substantial drops in operating speeds. Drivers have little freedom to maneuver, and comfort and convenience are low. These conditions can be tolerated, however, for short periods of time.

Level of Service E: This cannot be described by speed alone, but represents operations at lower operating speeds, typically, but not always, in the neighborhood of 30 miles per hour, with volumes at or near the capacity of the highway. Flow is unstable, and there may stoppages of momentary duration. This level of service is associated with operation of a facility at capacity flows.

Level of Service F: This describes a forced-flow operation at low speeds, where volumes are below capacity. In the extreme, both speed and volume can drop to zero. These conditions usually result from queues of vehicles backing up for a restriction downstream. The section under study will be serving as a storage area during parts or all of the peak hour. Speeds are reduced substantially and stoppages may occur for short or long periods of time because of the downstream congestion.

The LOS of an intersection is a qualitative measure of capacity and operating conditions and is directly related to vehicle delay. Level of service is given a letter designation from A to F, with LOS A representing very short delays and LOS F representing very long delays. LOS conditions for unsignalized intersections, the levels of service are shown in **Table 19A**.

Table 19A: Level of Service Criteria for Unsignalized Intersections

Level-of-Service (LOS)	Average Control Delay (seconds/vehicle)	Description
A	≤ 10.0	No delays at intersections with continuous flow of traffic. Uncongested operations: high frequency of long gaps available for all left and right turning traffic. No observable queues.
B	10.1 to 15.0	Same as LOS A
C	15.1 to 25.0	Moderate delays at intersections with satisfactory to good traffic flow. Light congestion; infrequent backups on critical approaches.
D	25.1 to 35.0	Increased probability of delays along every approach. Significant congestion on critical approaches, but intersection functional. No standing long lines formed.
E	35.1 to 50.0	Heavy traffic flow condition. Heavy delays probable. No available gaps for cross-street traffic or main street turning traffic. Limit of stable flow.
F	> 50.0	Unstable traffic flow. Heavy congestion. Traffic moves in forced flow condition. Average delays greater than one minute highly probable. Total breakdown.

SOURCE: Highway Capacity Manual, HCM2000, Transportation Research Board, 2000.

The morning and evening peak hour traffic volumes were analyzed (based on ATR data from MnDOT) for the roadway segment on TH 97 from Lofton to TH 95 using Highway Capacity Analysis software. For both the morning and evening conditions, the segment existing LOS is Level C. Use of peak hourly traffic data plus maximum truck traffic negates the need to run multiple analyses for lower traffic volumes.

Traffic counts were collected during the morning and evening rush hour on Tuesday June 12th. These times were selected to reflect maximum traffic conditions. Tiller was not conducting a Class C haul event from Franconia, Minnesota or Osceola, Wisconsin during the June traffic counts.

The LOS analysis was completed for three scenarios at the TH 97 and TH 95 intersection:

1. Existing rush hour traffic
2. The No-build alternative with a haul event from Wisconsin occurring at maximum hourly haul rates.
3. The Zavoral Site in operation at maximum hourly haul rates.

During the morning rush hour the LOS remained at Level C or better for all turning movements for all three scenarios.

During the evening rush hour the LOS remained unchanged at Level C or better for all turning movements with the following exceptions. For approximately 1 to 2 hours during the evening rush hour or other periods of similar traffic patterns:

- The LOS for the turning movement from eastbound TH 97 left onto northbound TH 95 would decrease from Level C to Level D for all build alternatives.

- The LOS for the eastbound approach on TH 97 crossing TH 95 to the Zavoral Site would be Level D for all build alternatives.

According to Section 5.3, Figure 5.2 of the MnDOT Traffic Impact Study Guidance this LOS is considered to be acceptable for this type of intersection.

Modification of the intersection of TH 97 and TH 95 from a 3- way to a 4- way intersection would increase the number of potential conflict points. MnDOT took this into account as part of their evaluation of the proposed intersection plans submitted by Tiller. MnDOT would require the construction of a right turn lane on northbound TH 95 at the proposed Project Site entrance to reduce potential conflicts to traffic on TH 95. MnDOT evaluated but rejected addition of an acceleration lane on TH 97 as unnecessary. Also, as noted above, per MnDOT guidance, the LOS following this modification is considered to be acceptable for this type of intersection.

As shown on **Tables 19B through 19D**, the LOS analysis showed that the intersection has sufficient gaps under all scenarios and all traffic patterns.

Table 19B: Existing Conditions – TH 97 and TH 95 (Unsignalized Intersection LOS)

Intersection	Delay & Level of Service (LOS/Delay in seconds per vehicle)			
	Northbound (left turn)	Eastbound (left turn)	Eastbound (right turn)	Eastbound Approach
TH 97 and TH 95 AM Peak	A / 8.4	B / 12.0	A / 9.6	B / 11.6
TH 97 and TH 95 PM Peak	A / 8.0	C / 16.5	A / 9.0	C / 15.9

Table 19C: Alternative 2- No Build Haul Conditions TH 97 and TH 95 (Unsignalized Intersection Level of Service)

Intersection	Delay & Level of Service (LOS/Delay in seconds per vehicle)			
	Northbound (left turn)	Eastbound (left turn)	Eastbound (right turn)	Eastbound Approach
TH 97 and TH 95 AM Peak	A / 8.6	B / 13.5	A / 9.6	B / 13.1
TH 97 and TH 95 PM Peak	A / 8.1	C / 21.8	A / 9.0	C / 20.8

Table 19D: Alternatives 1 and 3 TH 97 and TH 95 (Unsignalized Intersection LOS)

Intersection	Delay & Level of Service (LOS/Delay in seconds per vehicle)				
	Northbound (left turn)	Westbound (thru)	Eastbound (left turn)	Eastbound (right turn)	Eastbound Approach
TH 97 and TH 95 AM Peak	A / 8.5	C / 16.9	C / 15.5	A / 9.6	B / 14.7
TH 97 and TH 95 PM Peak	A / 8.0	C/ 18.6	D / 32.0	A / 9.0	D / 30.2

Note: See Table 19H for Subalternative 3A LOS.

During the morning rush hour the LOS remained unchanged at level C or better for all turning movements for all three scenarios.

During the evening rush hour the LOS remained unchanged at Level C or better for all turning movements for all three scenarios with the following exception. The LOS for the turning movement from eastbound TH 97 left onto northbound TH 95 and the eastbound approach to TH 95 decreased to Level D

for Scenario 3 only. According to Section 5.3, Figure 5.2 of the Mn/DOT Traffic Impact Study Guidance these levels are considered to be acceptable for this type of intersection.

4.13.1.6.2 *Safety Evaluation*

~~The safety of the roadway system was evaluated by obtaining and reviewing the most current 3 years of crash reports, geometrics and operations, and site reviews.~~

~~The study area roadway system includes trunk highways, county roads, and local roads that provide access to all vehicles for local and regional travel. The trunk highway system has sufficient capacity for the traffic volumes in the area and meets Mn/DOT requirements for sight distance (including the State Scenic Byway TH 95 and TH 97 intersection). The county and local roads also meet the county design criteria for rural traffic. The details of the crash analysis are described below. No significant crash problems were identified in the study area during the 3-year period (2008–2010).~~

~~Crash data for the key roadways in the study area was collected for the years 2008, 2009, and 2010. Mn/DOT provided updated crash data for the Scandia area for roadway segments and intersections. The data is mapped and details included in the technical memorandum in **Appendix B.5.**~~

~~The roadway segments in the study area for crash data included:~~

- ~~TH 97 from Manning Trail to Lofton Avenue~~
- ~~TH 97 from Lofton Avenue to Olinda Trail~~
- ~~TH 97 from Olinda Trail to State Scenic Byway TH 95~~
- ~~Lofton Avenue from TH 97 to 228th Street~~

~~The intersections in the study area for crash data included:~~

- ~~TH 97 and Manning Trail~~
- ~~TH 97 and Lofton Avenue~~
- ~~TH 97 and Meadowbrook Avenue~~
- ~~TH 97 and Oakhill Road~~
- ~~TH 97 and Olinda Trail~~
- ~~TH 97 and State Scenic Byway TH 95~~

~~The segment crashes are relatively small in number and include run-off road and deer collision crashes. Segment crashes are defined as crashes that occur on a section of roadway between intersections (but not including the intersection). These are typical for rural areas. There appears to be no major contributing factors in terms of roadway geometry and operations. Mn/DOT has reviewed the sight distance at the TH 97 and State Scenic Byway TH 95 intersection and found no deficiencies. TH 97 was rehabilitated in 2007 and the sight distances met Mn/DOT standard requirements at the 55 mph speed~~

~~limit. State Scenic Byway TH 95 was rehabilitated in 2009 and the sight distances met Mn/DOT standard requirements at the 55 mph speed limit.~~

~~The intersection crash data was collected for the typical 3-year period when evaluating such data is generally low at most intersections. The TH 97 and CR 1 (Lofton Avenue) intersection had the highest number of crashes during the 3-year period (12 crashes), including five right angle crashes. The TH 97 and Lofton Avenue intersection was part of Mn/DOT's resurfacing project. The crashes were likely caused by drivers erroneously turning in front of vehicles on TH 97.~~

A total of six years of data was obtained from MnDOT for four intersections and four road segments in the Scandia area. In accordance with standard procedures, three years (2009 – 2011) of data was used in the traffic safety analysis.

The crash data for each location was reviewed for the intersections and road segments. The analysis of the crash data shows that all of the road segments on TH 97 and TH 95 and intersections are well below the statewide average for similar roads.

The calculated crash rates are included in the **Tables 19E and 19F** for intersections and segments.

Table 19E: Segment Crash Rates

Segment	Number of Crashes (2009-2011)	Crash Rate (per Million Vehicle Miles)	MnDOT Statewide Average Crash Rate for 2 lane Rural Trunk Highway
TH 97 Manning to Lofton	3	0.22	0.8
TH 97 Lofton to Olinda	9	0.45	0.8
TH 97 Olinda to TH 95	3	0.38	0.8
TH 95 220th to Oakhill[1]	1	0.06	0.8

[1] Crash data for the TH 95 220th to Oakhill was not available for 2011. 2008 to 2011 crash data were used.

Table 19F: Intersection Crash Rates

Intersection	Number of Crashes (2009-2011)	Crash Rate (per Million Entering Vehicles)	MnDOT Statewide Average Crash Rate for Rural, Unsignalized Intersection
TH 97 and Lofton	5	0.49	0.6
TH 97 and Oakhill	3	0.34	0.6
TH 97 and Olinda	5	0.54	0.6
TH 97 and TH 95	3	0.35	0.6

Additional review of the above crash data for the TH 97 and Lofton intersection (**Table 19G**) showed the following:

1. There were 16 crashes in a 6 year period, 2006 – 2011
2. Eight of those crashes occurred in 2008

3. No pattern was observed in the 16 crashes that indicated a problem with the road or intersection design

4. No gravel trucks or semi-trucks were involved in any of the crashes at TH 97 and Lofton

Table 19G: Crash Numbers at TH 97 and Lofton

Year	Number of Crashes
2006	0
2007	3
2008	8
2009	1
2010	3
2011	1

Based on data from 2006 to 2011, the high crash rate in 2008 appears to be an anomaly not directly associated with current traffic patterns.

Concerns about speeding on TH 97 are an enforcement issue that requires the attention of the State Patrol. A review of the data does not show involvement of semi-trucks in the area crashes. The data captures actual crashes and does not record near-miss or other close call data.

One fatal crash occurred just north of the TH 97 and State Scenic Byway TH 95 intersection in 2006 that involved a pedestrian. This data was not provided in the initial crash reports obtained from Mn/DOT and was found after additional research extended past the typical 3-year crash data collection window. At a PAC meeting, a concerned resident provided information that a pedestrian was struck by a semi-truck. The State Patrol investigated the crash and found that it was caused by the pedestrian walking in front of the truck and the driver was unable to stop in time.

A single-vehicle crash involving an overturning gravel truck occurred in 2012 at the intersection of TH 95 and TH 97. This crash fell outside of the 2006-2011 data used in the above analysis.

4.13.1.6.3 *Scandia Elementary School*

Scandia Elementary School is located on the south side of TH 97 near Oakhill Road. School representatives were contacted and provided information on school bus operations, parent drop-off/pickup, and bike/walk patterns. The school does not cite any major concerns with traffic and safety on TH 97. They recognize it is a busy highway and do not have activities near the area. The following is a summary of the key findings:

- Buses drop off students at 9:05 a.m. (for a 9:15 start of school) and leave at 3:40 p.m. (school is dismissed at 3:30). There are 14 buses for about 390 students. All buses enter on TH 97 in the morning. Half the buses exit on TH 97 and the other half on Oakhill Road.

- During the year, 35 to 40 students are picked up and dropped off at various times. The north lot is used for pick-up/drop-off to personal vehicle traffic separate from the bus traffic.

- Six students ride bicycles to school (2 to 4 miles) and are required to have a bike/walk pass for safety. No students currently walk to school.

~~The traffic operation, capacity, and safety were evaluated for the school driveways (at TH 97 and Oakhill Road). No problems were found with capacity or safety based on traffic volumes and turning movements out of the driveway. TH 97 includes a right-turn lane into the school and a bypass lane westbound around turning vehicles.~~

As described in Section 4.13.1.2, crash data shows that the road segment near Scandia Elementary School and the intersection of TH 97 and Oakhill Road are well below the MnDOT statewide average crash rate for similar roads.

An intersection turning movement analysis was completed for buses and cars at the Scandia Elementary School driveway. The traffic counts were based on peak hour ATR data provided by MnDOT, bus data, and maximum truck traffic rates. The specific ATR data used represented the time when school peak traffic hours occurred in the morning and afternoon. The LOS analysis showed the morning peak had LOS A and the afternoon peak had LOS B. This indicates that sufficient gaps are present in traffic to allow buses and cars to access TH 97.

With regard to safety at the Scandia Elementary School, the Scandia Elementary Parent Survey on Walking/Biking to School dated March 2011 was reviewed and Ms. Julie Greiman, Principal of Scandia Elementary School provided this data based on the Safe Routes to School program evaluation.

Traffic speed and volume on TH 97 were identified as a concern for children walking or biking to the school by parents in the survey. The lack of sidewalks or trails and distance to the school were identified as barriers to walking and biking. However, in 54 separate comments provided by parents, the presence, absence, or safety of gravel trucks on TH 97 was not mentioned.

Ms. Greiman was asked if her staff had concerns about access to the school. Ms. Greiman stated that she was not aware of any major concerns. Ms. Greiman also stated that they were aware that TH 97 is a busy road and they do not hold any activities near the road.

4.13.1.6.4 *Impacts Bicycle and Pedestrian Facilities*

The City of Scandia Trail Plan presents near- and long-term improvement plans for trails in the area and connections to regional trails. The following measures should be considered in relation to the Project:

- Tiller should provide funds to improve the existing pedestrian/bicycle trail along State Scenic Byway TH 95 in the mine area, and establish connecting to existing trails.

- A proposed trail on TH 97 is planned as an off-road trail to be constructed in the long-term plan. The proposed trail on State Scenic Byway TH 95 is also an off-road trail. The trail crossing at TH 97 and TH 95 is in the long-term plan. If a crossing is placed at this location while the Zavoral Site is operational, advanced signing for the trail crossing should be added.

- A trailhead is shown at TH 97 and State Scenic Byway TH 95. If the Zavoral Site is operational, the location of the trailhead should be relocated due to the proximity of the intersection to hauling vehicles.

- New crossings on TH 97 at Oakhill Road and Ozark Avenue are called out for design with traffic controls. This would most likely be some type of warning flashers, not traffic signals. The City may want to delay installing crossings at these locations until the mining is complete

4.13.1.6.5 *Impacts Related to Recreation Area Traffic*

The area along the St. Croix River is scenic and provides a range of recreational and scenic driving opportunities. William O'Brien State Park is located approximately 2.5 miles south of the Zavoral Site on State Scenic Byway TH 95. Recreation traffic is a component in increasing average daily traffic on TH 97 and TH 95 during the spring to fall timeframe. Mn/DOT data recorded on TH 97 (at Automated Traffic Recorder station east of Lofton Avenue) is included in **Appendix B.5**. The trunk highways have sufficient reserve capacity to handle the change in traffic volume for seasonal traffic. Periods of congestion may be experienced during peak weekend travel times or on a holiday weekend, with or without the proposed Project. Removing the current hauling traffic from the river crossing at TH 243 and the portion of State Scenic Byway TH 95 north of the Zavoral Site should be beneficial to vehicles using these roadways to get to the state park or enjoy other recreational opportunities in the area.

4.13.2 Impact Analysis

4.13.2.1 Alternative 1 – 5- to 10-Year Operation

The existing roadway network is sufficient to handle the daily traffic volumes in the area. TH 97 and State Scenic Byway TH 95 are state highways designed to accommodate regional traffic. The peak hour truck volumes are also within the capacity of the roadways.

Alternatives 1 and 3 have the same range of loads per day (334–440 projected trips with a maximum of 600 trips). The difference would be the length and duration of mining activity. Alternative 1 spreads the mining out over 5 to 10 years but would only operate hauls for a projected 6 to 12 weeks a year.

Current hauling patterns to the Scandia Mine require trucks to travel longer distances. Tiller has agreed not to haul Class C add-rock to the Scandia Mine from Franconia, Minnesota or the Osceola, Wisconsin, area during the period that the Zavoral Site is active. As a result, in Minnesota, TH 243 (including the bridge to Wisconsin), and State Scenic Byway TH 95 north of TH 97 would no longer carry this traffic, a distance of approximately 7 miles.

Mn/DOT reviewed the proposed driveway location for the Zavoral Site and determined the intersection sight distance to meet their requirements. A northbound right-turn lane would be required to allow vehicles to reduce speed and move out of mainline traffic to turn. An acceleration lane on TH 97 was not recommended by Mn/DOT, as the trucks are not pulling into high speed traffic and the acceleration lane would be a high cost and high property impact.

4.13.2.2 Alternative 2 – No-Build Alternative

Alternative 2 (No-Build) is expected to maintain the current level of truck traffic. Alternative 2 is projected to have 210–558 trips with a maximum of 560 trips). The reduction in maximum trips per day is related to no reclamation of the Zavoral Site, resulting in a possible reduction of up to 40 trips a day for topsoil hauling.

4.13.2.3 Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation

Alternative 3 condenses the mining to 3.3 to 5 years, and the hauls would be projected to occur for 12 to 18 weeks a year. The add-rock haul impacts per day are limited by the maximum number of loads per day, which could be the same for all alternatives, but may be more likely to occur under Alternative 3 than Alternative 1 given the compressed Project timeframe. Under any scenario, the truck volumes are within the capacity of the study area roadway system and can be handled safely.

4.13.2.4 Subalternative 3A – Reduced Timeframe 150-Working Day Operation

As a result of the compression of mining and reclamation to approximately 1 year, the traffic volumes and the typical hours of operation would need to increase in order to mine and transport the material from the Site within the reduced time period.

Estimated daily traffic volumes would increase under this subalternative. The maximum traffic levels estimated for Alternatives 1 and 3 are not likely to occur on a daily basis. However, limiting mining operations to 150 working days would require a consistently higher volume of truck traffic on each working day, and may require longer typical working days than Alternatives 1 and 3.

Based on 1.2 million tons of material and 23-ton haul trucks that would be required to move the amount of material within 150 working days, approximately 348 trucks or 696 trips could be expected each day. This is an increase from Alternatives 1 and 3 in which a maximum of 280 trucks or 560 trips are expected. Reclamation traffic is expected at a maximum of 20 trucks or 40 trips per day. This would result in an estimated peak traffic level of 736 trips per day as compared with 600 trips per day under Alternatives 1 and 3.

The LOS analysis for Subalternative 3A shows that for both the AM and PM conditions, the segment level of service remains at Level C. Also, the LOS for the intersection at Scandia Elementary School did not change.

The LOS analysis for the intersection of TH 97 and TH 95 did not change as shown in **Table 19H**.

Table 19H: Subalternative 3A TH 97 and TH 95 (Unsignalized Intersection LOS)

Intersection	Delay and Level of Service (LOS/Delay in seconds per vehicle)				
	Northbound (left turn)	Westbound (thru)	Eastbound (left turn)	Eastbound (right turn)	Eastbound Approach
TH 97 and TH 95 AM Peak	A / 8.5	C / 17.0	C / 15.8	A / 9.6	C / 15.1
TH 97 and TH 95 PM Peak	A / 8.0	C / 18.8	D / 34.1	A / 9.0	D / 32.2

Based on City regulations, the Project would be allowed to operate Monday through Friday 7:00 a.m. to 7:00 p.m. In the past, hauling operations have occurred from 7:00 a.m. to 7:00 p.m., but the average workday has been 10 hours. Therefore an expected 10-hour workday was used for analysis in both Alternatives 1 and 3. The 150 working days would result in 12-hour workdays for Subalternative 3A in order to remove the aggregate within the reduced timeframe.

The Scandia Mine operates under a CUP issued by the City. Condition 14 of this permit requires Tiller to restrict truck traffic that imports add-rock to the Mine from using the CR 1 (Lofton Avenue) access during

non-daylight hours. Tiller would not be able to comply with this current requirement to restrict the use of CR 1 (Lofton Avenue) access during non-daylight hours under Subalternative 3A.

4.13.3 Potential Mitigation Measures

The following is a list of potential mitigation measures.

- Construct the new driveway access directly across from TH 97 as required item by Mn/DOT for safe access. In a review conducted by Mn/DOT in 2009, the agency required that the Zavoral Site access onto State Scenic Byway TH 95 be moved south to line up with TH 97 and that a northbound right-turn lane be constructed (Mn/DOT letter to City of Scandia, January 22, 2009). The right-turn lane would be consistent with the design of the existing left-turn lane. This would also match the design on the southbound approach. The sight distance requirements were met based on Mn/DOT reviews of the existing TH 97 and State Scenic Byway TH 95 intersection, and the 2007 and 2009 rehabilitation projects (June 29, 2011, letter to Anne Hurlburt, City of Scandia). In a recent review of the development this year, Mn/DOT reaffirmed that the improvements outlined in the 2009 letter would be required.

- To ensure that additional truck traffic would not result from hauling from the Zavoral Site at peak demand concurrently with other sites, the number of trucks hauling Class C add-rock to the Scandia Mine should be recorded and reported by Tiller. Trips should be limited to the projected maximum level of working day haul traffic, and documentation could be required.

- Truck warning signs that are Minnesota Manual on Uniform Traffic Control Devices (MMUTCD) compliant are recommended on State Scenic Byway TH 95 to advise drivers of trucks crossing TH 97 in and out of the Zavoral Site. The installation of warning flashers is another option but should be discussed with Mn/DOT to evaluate the safety impacts.

Area citizens expressed concern regarding the need for an acceleration lane on TH 97. Mn/DOT responded as follows:

- “This situation is significantly different than the site at Hwy 95 and 243. At that site, slow moving vehicles are pulling out into high speed southbound traffic and the acceleration lane that was provided allows for trucks to increase speed and then merge into southbound traffic. At the Hwy 95/97 intersection, the trucks from the mining site are not pulling into high speed traffic. Once they cross the intersection, all traffic on Hwy 97 is low speed and accelerating as they continue west up to the 55 MPH speed limit. The grade is fairly gradual in this area and trucks are able to accelerate as they go up this relatively gradual grade on Hwy 97. Mn/DOT does not support requiring the developer to install an acceleration lane due to limited benefits, high costs, and impacts to abutting properties along Hwy 97.”

4.13.4 Scandia Mine

Washington County was the RGU for the 1999 EAW and is the road authority for CR 15 (Manning Trail) and CR 1 (Lofton Avenue). Traffic and safety issues were reviewed by the County during the 1999 EAW and again during the 2007 City of Scandia and 2008 processes. Maximum daily haul truck traffic of 750 trips was used in both reviews. This number of daily trips would allow for 8,000 to 9,000 tons of

material to be transported to and from the Scandia Mine in a given day. This level of hauling would not be expected to occur frequently but has occurred in the past and has the potential to occur in the future. Tiller has scheduling control for the Scandia Mine hauling traffic. To avoid equipment and trucking conflicts, and to keep trucks moving efficiently, Tiller would control traffic so that add-rock hauling would not occur when there are large projects hauling outgoing material.

The CUP for the Scandia Mine requires Tiller to post "trucks hauling" signs for the northbound lane on Manning Avenue and both north and southbound lanes on Lofton Avenue. Supplemental distance signs must also be provided below these signs and the existing sign to inform drivers of the approximate location of the access. Signs must be approved by Washington County and shall meet the County's requirement. Tiller must also restrict truck traffic that imports add-rock to the Mine from using the CR 1 (Lofton Avenue) access during non-daylight hours. Non-daylight hours shall be defined as one-half hour after sunset to one-half hour before sunrise. Tiller is required to post a sign at the Manning Avenue access that is similar to the existing sign at the access to Lofton Avenue that restricts trucks using 228th Street, to keep the truck traffic off the local roadway near the Mine.

4.14 STATIONARY SOURCE AIR EMISSIONS AND DUST

4.14.1 Zavoral Site

4.14.1.1 Affected Environment

The Clean Air Act required the U.S. Environmental Protection Agency (USEPA) to set NAAQS for pollutants considered harmful to public health and the environment if present in sufficient concentrations. The NAAQS include two types of air quality standards.

- Primary standards protect the public, including the health of sensitive populations such as asthmatics, children, and the elderly.
- Secondary standards protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

The USEPA has established and Minnesota has adopted NAAQS for seven principal pollutants, which are called "criteria pollutants," as defined in **Table 20**.

Table 20: National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour [1]	None	
	35 ppm (40 mg/m^3)	1-hour [1]		
Lead	0.15 µg/m^3 [2]	Rolling 3-Month Average	Same as Primary	
Nitrogen Dioxide	53 ppb [3]	Annual (Arithmetic Average)	Same as Primary	
	100 ppb	1-hour [4]	None	
Particulate Matter (PM_{10})	150 µg/m^3	24-hour [5]	Same as Primary	
Particulate Matter ($PM_{2.5}$)	15.0 µg/m^3	Annual[6] (Arithmetic Average)	Same as Primary	
	35 µg/m^3	24-hour [7]	Same as Primary	
Ozone	0.075 ppm (2008 std)	8-hour [8]	Same as Primary	
	0.08 ppm (1997 std)	8-hour [9]	Same as Primary	
	0.12 ppm	1-hour [10]	Same as Primary	
Sulfur Dioxide	0.03 ppm [11] (1971 std)	Annual (Arithmetic Average)	0.5 ppm	3-hour [1]
	0.14 ppm [11] (1971 std)	24-hour [1]		
	75 ppb [12]	1-hour	None	

Source: USEPA 2011 (http://www.epa.gov/air/criteria.html)

[1] Not to be exceeded more than once per year.

[2] Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m^3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

[3] The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard

[4] To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective January 22, 2010).

[5] Not to be exceeded more than once per year on average over 3 years.

[6] To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.

[7] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3 (effective December 17, 2006).

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm. (effective May 27, 2008)

(9) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.

(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.

(c) EPA is in the process of reconsidering these standards (set in March 2008).

(10) (a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.

(11) The 1971 sulfur dioxide standards remain in effect until one year after an area is designated for the 2010 standard, except that in areas designated nonattainment for the 1971 standards, the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standards are approved.

(12) Final rule signed June 2, 2010. To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb.

In addition to the NAAQS, Minnesota has adopted State Ambient Air Quality Standards (MAAQS). **Table 21** provides a summary of the MAAQS.

Table 21: Minnesota Ambient Air Quality Standards

Pollutant/Air Contaminant	Primary Standard	Secondary Standard	Remarks
Hydrogen Sulfide	0.05 ppm by volume (70.0 micrograms per cubic meter)		½-hour average not to be exceeded over 2 times per year
	0.03 ppm by volume (42.0 micrograms per cubic meter)		½-hour average not to be exceeded over 2 times in any 5 consecutive days
Ozone	0.08 ppm by volume (235 micrograms per cubic meter)	Same as primary standard	Daily maximum 8-hour average; the standard is attained when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to the standard
Carbon Monoxide	9 ppm by volume (10 milligrams per cubic meter)	Same as primary standard	Maximum 8-hour concentration not to be exceeded more than once per year
	30 ppm by volume (35 milligrams per cubic meter)	Same as primary standard	Maximum 1-hour concentration not to be exceeded more than once per year
Sulfur Dioxide	80 micrograms per cubic meter (0.03 ppm by volume)	60 micrograms per cubic meter (0.02 ppm by volume)	Maximum annual arithmetic mean
	365 micrograms per cubic meter (0.14 ppm by volume)	Same as primary standard	Maximum 24-hour concentration not to be exceeded more than once per year
		915 micrograms per cubic meter (0.35 ppm by volume)	Maximum 3-hour concentration not to be exceeded more than once per year in Air Quality Control Regions 127, 129, 130, and 132
		1300 micrograms per cubic meter (0.5 ppm by volume)	Maximum 3-hour concentration not to be exceeded more than once per year in Air Quality Control Regions 128, 131, and 133
Sulfur Dioxide, con't.	1300 micrograms per cubic meter (0.5 ppm by volume)		Maximum 3-hour concentration not to be exceeded more than once per year
	1300 micrograms per cubic meter (0.5 ppm by volume)		Maximum 1-hour concentration not to be exceeded more than once per year
PM	75 micrograms per cubic meter	60 micrograms per cubic meter	Maximum annual geometric mean
	260 micrograms per cubic meter	150 micrograms per cubic meter	Maximum 24-hour concentration not to be exceeded more than once per year
Nitrogen Dioxide	0.05 ppm by volume (100 micrograms per cubic meter)	Same as primary standard	Maximum annual arithmetic mean

Pollutant/Air Contaminant	Primary Standard	Secondary Standard	Remarks
Lead	1.5 micrograms per cubic meter	Same as primary standard	Maximum arithmetic mean averaged over a calendar quarter
PM_{10}	150 micrograms per cubic meter	Same as primary standard	maximum 24-hour average concentration; the standard is attained when the expected number of days per calendar year exceeding the value of the standard is equal to or less than one
	50 micrograms per cubic meter	Same as primary standard	Annual arithmetic mean; the standard is attained when the expected annual arithmetic mean concentration is less than or equal to the value of the standard
$PM_{2.5}$	65 micrograms per cubic meter	Same as primary standard	24-hour average concentration; the standard is attained when the 98th percentile 24-hour concentration is less than or equal to the standard
	15.0 micrograms per cubic meter	Same as primary standard	Annual arithmetic mean; the standard is attained when the annual arithmetic mean concentration is less than or equal to the standard

Source: Minn. R. ch. 7007.0080, State Ambient Air Quality Standards, 2011 (https://www.revisor.mn.gov/rules/?id=7009.0080)

Areas that meet the ambient air quality standards (AAQS) for the criteria pollutants are designated as being in attainment. Areas that do not meet the AAQS for one or more of the criteria pollutants may be subject to the formal rule-making process and designated as being in nonattainment for that standard. The determination regarding whether an area is in attainment is made by the MPCA using a combination of monitoring for pollutants at multiple locations and computer-based modeling. The results of the AAQS designation is reported to and reviewed by the USEPA regularly. The MPCA also prepares and submits a report on ambient air quality to the Minnesota Legislature each year.

The State of Minnesota and Washington County are in attainment for the NAAQS and MAAQS. The MPCA has determined the ambient background concentration of criteria pollutants for the purposes of permitting. The background concentration is the average of the third highest reading observed over a 3-year period. Thus, the actual concentration of pollutants is lower than the background concentration at least 98% of the time. **Table 22** shows the background concentration for Scandia.

Table 22: Ambient Air Quality Background Concentrations

Pollutant	Avg. Period	Ambient Background µg/m^3
$PM_{2.5}$	24-Hr	24
	Annual	8.0
PM_{10}	24-Hr	43

Source: MPCA Standardized Air Modeling (SAM) Spreadsheet [Version 09293], 2011 (http://www.pca.state.mn.us/index.php/air/air-monitoring-and-reporting/air-emissions-and-monitoring/air-dispersion-modeling)

Small concentrations of silica are present in the ambient air as a result of natural causes such as windblown dust, volcanic activity, etc. Silica is also present in the ambient air as a result of anthropogenic activities such as vehicle traffic on roads, farming, and mining.

No data was identified for the existing background concentration of silica in the ambient air in Minnesota.

4.14.1.2 Air Emissions and Dust Analysis

The following sections discuss the existing Site conditions, proposed activities at the Zavoral Site, and the potential impacts of the Project.

4.14.1.2.1 *Proposed Zavoral Site Activities*

Proposed activities at the Site would be divided into four phases as described below.

Phase 1 would involve reclamation activities on an area approximately 4 acres in size, which is located within the St. Croix River District and scenic easement. Gravel mining is not planned for this area but would instead be the first phase of Site reclamation. Reclamation of this area would involve the removal of existing stockpiles and final grading of the area.

Phases 2 and 3 would involve both mining operations and reclamation activities. Phase 2 and Phase 3 would involve the same activities but would be completed in different locations on the property. Mining operations would include:

- Development of haul roads to the mining area
- Stripping of vegetation and overburden and stockpiling the material on-site for reuse during reclamation activities
- Excavating the aggregate using front-end loaders
- Loading the aggregate into trucks
- Transporting the aggregate to the Scandia Mine Site
- Reclamation activities, including grading, placing topsoil, and seeding

Phase 4 would involve final reclamation activities and grading. Stockpiles of overburden would be redistributed and additional topsoil may be transported to the Site for use. The reclaimed areas would be reseeded in accordance with the reclamation plan.

These activities would generate fugitive dust and, to a much lesser degree, particulate from combustion that could be transported off-site and deposited onto nearby land, vegetation, rivers, and lakes.

4.14.1.2.2 *Impact Analysis*

As discussed in detail in the Air Quality Technical Memorandum in **Appendix B.6**, the impacts analysis included:

- Preparation of potential to emit (PTE) calculations for fugitive emission sources for particulate matter (PM), inhalable particulate matter (PM_{10}), and fine particulate matter ($PM_{2.5}$).
- Simulation of the atmospheric transport processes (dispersion and deposition) using the USEPA Guideline model AERMOD to calculate ambient concentrations of PM, inhalable particulate (PM_{10}), and fine particulate ($PM_{2.5}$).

Simulation of deposition of PM to the earth's surfaces using the model AERMOD. The analysis included dry deposition due to gravitational settling and surface impaction due to turbulent air flow near surface elements as well as wet deposition due to wash-out by precipitation. To ensure defensibility of model predicted results, all modeling was conducted according to approved USEPA methodologies presented in the Guideline on Air Quality Models (40 CFR Part 51 Appendix W), and in accordance with MPCA Modeling Guidance posted at http://www.pca.state.mn.us/air/modeling.html#guidance.

4.14.1.2.2.1 Evaluation of potential ambient concentrations of crystalline silica from Site operations.

PTE calculations were prepared for the following fugitive emission sources:

- Haul truck traffic on paved entry roads using the equation and emission factors published by the USEPA in the AP 42, Fifth Edition, Volume I, Chapter 13: Miscellaneous Sources, Section 13.2.1 Paved Roads. January 2011.

- Haul truck traffic on unpaved haul roads on the Site for three phases of operation using the equation and emission factors from AP-42 Section 13.2.2, Unpaved Roads. November 2006.

- Mining and loading aggregate into haul trucks using the equation and emission factor for the Source Classification Code 30502503 for Mineral Products Manufacturing and Processing, Sand and Gravel – Construction, Material Transfer and Conveying.

Although both build alternatives include four phases, only Phases 1, 2, and 3 include mining activities. Mining activities, due to their higher intensity, would have the greatest emission rate for fugitive dust. Therefore, the analysis focused on the Phase 1, 2, and 3 mining activities because they represented the worst-case conditions for generation of fugitive dust.

Data provided by Tiller included the number of haul trucks, quantity of aggregate mined, and proposed location of haul roads for the Phase 1, Phase 2, and Phase 3 mining and reclamation activities. As discussed further below, the data represents the maximum activity levels at the Site regardless of the alternative. The data used in the PTE calculations included:

- Maximum number of haul trucks per day (including reclamation topsoil) = 300

- Maximum hourly aggregate excavation and loading = 670 tons

- Maximum daily aggregate excavation and loading = 6,720 tons

- Maximum annual aggregate excavation and loading = 500,000 tons

Haul road distances were calculated for each mining phase using figures for each phase of the mining plan (**Figures 5 through 9**) provided by Tiller showing the haul road locations. Where the maps show more than one loop, the longest loop was used for all truck traffic to provide a maximum estimate of emissions.

The following tables summarize the uncontrolled PTE for the Project. No mitigation techniques were considered as part of the uncontrolled PTE calculations.

The excavation and loading calculations (**Table 23**) do not change based on the mining phase. The maximum mining quantities were used for this calculation.

Table 23: Potential to Emit from Excavation and Loading Operations

Excavation Rate	Hourly		Daily		Annual	
	670 tons/hour		6,720 tons/day		500,000 tons/year	
	Emission Rate	lb/hr	Emission Rate	lb/day	Emission Rate	lb/year
PM	19.4	lb/hr	195	lb/day	14,500	lb/year
PM_{10}	4.3	lb/hr	43	lb/day	3,200	lb/year
$PM_{2.5}$ (17% of PM_{10})	0.7	lb/hr	7	lb/day	544	lb/year

The paved and unpaved road calculations were completed for each mining phase (**Table 24**). Again, all PTE calculations are for uncontrolled emissions. No mitigation techniques were considered.

Table 24: Summary of Potential Emissions from Haul Roads

Phase 1 Mining	Paved Entry Road		Unpaved Mine Roads	
	lb/day	lb/year	lb/day	lb/year
PM	677	46,590	1,467	76,299
PM_{10}	135	9,318	521	27,093
$PM_{2.5}$	33.2	2,287	52.1	2,709
Phase 2 Mining	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	841	57,875	3,204	166,568
PM_{10}	168	11,575	1,137	59,146
$PM_{2.5}$	41.3	2,841	114	5,915
Phase 3 Mining	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	841	57,875	2,188	113,729
PM_{10}	168	11,575	777	40,384
$PM_{2.5}$	41.3	2,841	78	4,038

Tiller has prepared a fugitive dust control plan (Zavoral Mine Dust Control Plan, September 2011) to define the mitigation methods that would be used to reduce emissions of fugitive dust from the Site. A copy of the Zavoral Mine Dust Control Plan is in **Appendix A.7**. The mitigation methods selected include:

- Paved Roads – Sweeping and washing to remove dirt
- Unpaved Roads – Placing asphalt fines on the roads, watering, and chemical dust suppression
- Excavation Areas – Watering
- Reclamation material stockpiles - Watering during construction, seeding for long-term mitigation

Based on published information from the USEPA, these mitigation techniques can effectively reduce fugitive dust emissions. The effect of the proposed mitigation techniques would be:

- Paved Roads – 90% for sweeping and washing

- Unpaved Roads – 90% for watering, silt load reduced from 25.5 grams per square meter (g/m^2) to 6 g/m^2 for application of asphalt fines
- Excavation Areas – 90% for water application
- Reclamation material stockpiles – 90% for watering, 100% for seeding

Emission calculations for the mitigated PTE were completed using the same assumptions on mining activity as were used for the uncontrolled PTE calculations. **Table 25** summarizes the mitigated excavation and loading calculations.

Table 25: Mitigated Potential to Emit from Excavation and Loading Operations

Excavation Rate	Hourly		Daily		Annual	
	670 tons/hour		6,720 tons/day		500,000 tons/year	
	Emission Rate	lb/hr	Emission Rate	lb/day	Emission Rate	lb/year
PM	1.9	lb/hr	19.5	lb/day	1,450	lb/year
PM_{10}	0.4	lb/hr	4.3	lb/day	320	lb/year
$PM_{2.5}$ (17% of PM_{10})	0.1	lb/hr	0.7	lb/day	544	lb/year

The mitigated paved and unpaved road calculations are summarized in **Table 26** for each mining phase.

Table 26: Summary of Mitigated Potential Emissions from Haul Roads

Phase 1 Mining	Paved Entry Road		Unpaved Mine Roads	
	lb/day	lb/year	lb/day	lb/year
PM	87.3	6005	53.8	2794
PM_{10}	17.5	1201	14.3	745
$PM_{2.5}$	4.3	295	1.43	74.5
Phase 2 Mining	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	108.4	7460	117	6100
PM_{10}	21.7	1492	31.3	1626
$PM_{2.5}$	5.3	366	3.1	163
Phase 3 Mining	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	108.4	7460	80	4165
PM_{10}	21.7	1492	21.4	1110
$PM_{2.5}$	5.3	366	2.1	111

4.14.1.2.3 *Modeling Analysis*

As described in detail in the Air Quality Technical Memorandum (**Appendix B.6**), an ambient air quality modeling analysis was used to predict the ambient air concentrations of PM, PM_{10}, and $PM_{2.5}$. The TSP modeling results were used to predict deposition of dust onto land and into the St. Croix River. The PM_{10} and $PM_{2.5}$ results were compared to the primary and secondary NAAQS to determine if the emissions would cause or contribute to an exceedance of the NAAQS.

The model predicted that the uncontrolled impacts from facility sources plus the addition of appropriate background concentrations would result in exceedances of the NAAQS for PM_{10} and $PM_{2.5}$. The NAAQS results for uncontrolled emissions are summarized in **Table 27**.

Table 27: Summary of Ambient Air Quality Modeling Analysis for Uncontrolled Emissions

Mining Phase	Pollutant	Avg. Period	Maximum Concentration µg/m³	Ambient Background µg/m³	Worst-case + Ambient Background µg/m³	NAAQS µg/m³	% of NAAQS
Phase 1	$PM_{2.5}$	24-Hr	108.4	24	132.4	35	378%
		Annual	11.2	8.0	19.2	15	128%
	PM_{10}	24-Hr	755.9	43	798.9	150	533%
Phase 2	$PM_{2.5}$	24-Hr	101.2	24	125.2	35	358%
		Annual	14.3	8.0	22.3	15	149%
	PM_{10}	24-Hr	829.4	43	872.4	150	582%
Phase 3	$PM_{2.5}$	24-Hr	137.4	24	161.4	35	461%
		Annual	15.1	8.0	23.1	15	154%
	PM_{10}	24-Hr	1013.4	43	1056.4	150	704%

Notes:
$PM_{2.5}$ 24-hour result is the multiyear average of the H1H values. The average H1H value and the monitored ambient background value are summed and compared to the standard.
$PM_{2.5}$ annual result is multiyear annual average concentration over all analysis years. The multiyear average value and the monitored background value are summed and compared to the standard.
PM_{10} 24-hour result is H6H concentration over all analysis years. The H6H value and the monitored ambient background value are summed and compared to the standard.
Ambient Background Concentrations provided MPCA Standardized Air Modeling (SAM) Spreadsheet [Version 09293].
No external sources of emissions were included in this analysis.

The area where the model predicts that the impacts, due to uncontrolled emissions, would be above the NAAQS for PM_{10} and $PM_{2.5}$ is shown in **Figures 50 through 55**.

The model predicted that the mitigated impacts from facility sources plus the addition of appropriate background concentrations would not result in exceedances of the NAAQS for PM, PM_{10}, and $PM_{2.5}$ at off-site locations. The NAAQS results for mitigated emissions are summarized in **Table 28**.

Table 28: Summary of Ambient Air Quality Modeling Analysis for Mitigated Emissions

Mining Phase	Pollutant	Avg. Period	Source Contribution µg/m³	Ambient Background[4] µg/m³	Worst-case (or Average) + Ambient Background µg/m3	NAAQS µg/m3	% of NAAQS
Phase 1	$PM_{2.5}$[1, 2]	24-Hr	6.38	24	30.4	35	87%
		Annual	1.00	8.0	9.0	15	60%
	PM_{10}[3]	24-Hr	6.34	43	49.3	150	33%
Phase 2	$PM_{2.5}$[1, 2]	24-Hr	5.00	24	29.0	35	83%
		Annual	0.97	8.0	9.0	15	60%
	PM_{10}[3]	24-Hr	8.92	43	51.9	150	35%
Phase 3	$PM_{2.5}$[1, 2]	24-Hr	6.44	24	30.4	35	87%
		Annual	0.95	8.0	9.0	15	60%
	PM_{10}[3]	24-Hr	6.77	43	49.8	150	33%

Table Notes:

1. $PM_{2.5}$ 24-hour result is the multiyear average of the H1H values. The average H1H value and the monitored ambient background value are summed and compared to the standard.
2. $PM_{2.5}$ annual result is multiyear annual average concentration over all analysis years. The multiyear average value and the monitored background value are summed and compared to the standard.
3. PM_{10} 24-hour result is H6H concentration over all analysis years. The H6H value and the monitored ambient background value are summed and compared to the standard.
4. Ambient Background Concentrations provided MPCA Standardized Air Modeling (SAM) Spreadsheet [Version 09293].

4.14.1.2.4 *Deposition Analysis*

Deposition modeling was conducted for PM emissions to assess the impact of particulate deposition from the Project. The concentration of particulate decreases with distance, and since the modeling analysis uses historic actual meteorological data, these values represent the highest concentration likely to occur during any single day.

The deposition analysis results showing the highest concentration of PM resulting from uncontrolled emissions at the Site are summarized in **Table 29**.

Table 29: Deposition Analysis Results for the Site and the St. Croix River for Uncontrolled Emissions

Deposition to:	Mining Phase	Avg. Period	2004 g/m^2	2005 g/m^2	2006 g/m^2	2007 g/m^2	2008 g/m^2	Multiyear Worst-Case g/m^2
St. Croix River	Phase 1	24-Hr	0.26	0.25	0.22	0.20	0.23	0.26
		Annual	6.74	7.02	7.59	8.46	8.44	8.46
	Phase 2	24-Hr	0.26	0.27	0.28	0.29	0.31	0.31
		Annual	12.44	13.62	13.82	15.07	15.32	15.32
	Phase 3	24-Hr	0.50	0.50	0.46	0.31	0.32	0.50
		Annual	12.76	14.64	14.23	15.37	15.52	15.52
Land	Phase 1	24-Hr	3.40	3.53	3.40	3.05	3.45	3.53
		Annual	270.7	287.7	263.1	248.9	269.0	287.7
	Phase 2	24-Hr	3.26	3.52	3.55	3.13	3.54	3.55
		Annual	236.5	255.1	232.1	218.8	236.2	255.1
	Phase 3	24-Hr	3.10	3.27	3.34	3.04	3.38	3.38
		Annual	236.3	253.9	232.1	219.1	235.6	253.9

Table Notes:
24-hour results are H1H deposition rate of PM for each year.
Annual results are the highest annual average deposition for each year.

The deposition analysis results showing the highest concentration of PM resulting from mitigated emissions at the Site are summarized in **Table 30**.

Table 30: Deposition Analysis Results for the Site and the St. Croix River for ~~Uncontrolled~~ Mitigated Emissions

Deposition to:	Mining Phase	Avg. Period	2004 g/m^2	2005 g/m^2	2006 g/m^2	2007 g/m^2	2008 g/m^2	Multiyear Worst-Case
St. Croix River	Phase 1	24-Hr	0.03	0.03	0.03	0.02	0.03	0.03
		Annual	0.74	0.78	0.83	0.94	0.93	0.94
	Phase 2	24-Hr	0.04	0.04	0.04	0.04	0.05	0.05
		Annual	1.7	1.9	2.0	2.2	2.2	2.2
	Phase 3	24-Hr	0.06	0.06	0.06	0.04	0.04	0.06
		Annual	1.65	1.86	1.83	1.99	2.00	2.00
Land	Phase 1	24-Hr	3.80	3.40	3.40	3.50	3.70	3.80
		Annual	20.5	21.7	21.5	18.7	20.3	21.7
	Phase 2	24-Hr	0.23	0.25	0.24	0.21	0.22	0.25
		Annual	26.6	26.4	31.0	24.3	25.5	31.0
	Phase 3	24-Hr	0.34	0.30	0.34	0.25	0.22	0.34
		Annual	15.6	16.7	25.6	14.4	15.5	25.6

Table Notes:

24-hour results are H1H deposition rate of PM for each year.

Annual results are the highest annual average deposition for each year.

4.14.1.2.4.1 Deposition to Land

The deposition analysis was completed for potential impacts to local vegetation. Dust deposits can have significant effects on plant life, though mainly at high dust loadings. This can include:

- Reduced photosynthesis due to reduced light penetration through the leaves. This can cause reduced growth rates and plant vigor. It can be especially important for horticultural crops, through reductions in fruit setting, fruit size, and sugar levels.

- Increased incidence of plant pests and diseases. Dust deposits can act as a medium for the growth of fungal diseases. In addition, it appears that sucking and chewing insects are not affected by dust deposits to any great extent, whereas their natural predators are affected.

Under normal conditions, only PM_{10} remains in the atmosphere long enough to be considered atmospheric particulates. This is reflected in the actions of the USEPA, which eliminated the NAAQS for PM. The PM NAAQS was superseded by the PM_{10} NAAQS on July 1, 1987. Therefore, use of PM_{10} for deposition analysis is appropriate for impacts to land and plants.

Since the uncontrolled predicted concentrations of PM_{10} are above the NAAQS primary and secondary standards, in the absence of mitigation techniques, the concentrations may be high enough to adversely impact local vegetation within the areas shown in **Figures 53 through 55**.

As noted above, the largest area would occur during mining Phase 2 due to longer haul road lengths.

Following implementation of mitigation techniques, the concentrations of PM_{10} are below the primary and secondary standards. As noted above, the secondary NAAQS were established to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings. Since the deposition analysis shows the highest predicted concentration on any day, all other days would be predicted to have lower impacts. Therefore, it is unlikely that deposition would have an adverse impact on the surrounding land.

Neither the USEPA nor the MPCA has a standard for nuisance dust. Several countries have established nuisance dust standards that can be used for reference in evaluating PM concentrations related to the Project. **Table 31** summarizes nuisance dust standards for several countries.

Table 31: Summary of Nuisance Dust Standards

Nuisance: mass deposition measurements				
UK "unofficial" nuisance dust deposition rate[75]	All particulates	200 mg/m^2/day	Annual mean	Serious nuisance
West Australia Nuisance Standard	All particulates	133 mg/m^2/day	Monthly mean	First loss of amenity
		333 mg/m^2/day		Unacceptable reduction in air quality
West Germany Nuisance Standard	All particulates	350 mg/m^2/day	Monthly mean	Possible nuisance
	All particulates	650 mg/m^2/day		Very likely nuisance
Malaysia Air Quality Standard	All particulates	133 mg/m^2/day		Nuisance dust deposition
Israel Air Quality Standard	All particulates	2 * 10^5 kg/km^2/month		Nuisance dust deposition

Source: http://www.goodquarry.com/article.aspx?id=58&navid=2

The results of the modeling analysis indicate that the uncontrolled PM emissions from the Zavoral Site would be above the nuisance dust levels. The mitigated dust levels would be less than the above standards.

4.14.1.2.4.2 Deposition to Water

The deposition analysis was completed for potential impacts to the St. Croix River. The primary concern would be a significant increase in the amount of sediment in the river. To determine if a significant impact occurred, the current amount of sediment (sediment loading) in the St. Croix River near Scandia was obtained from the USGS and compared to the amount that would be added under the worst-case and mitigated conditions from the operations at the Site.

The USGS has been collecting water flow data from the St. Croix River at St. Croix Falls since 1902. Additionally, the USGS collected sediment data in 1981 and 1982 from the same location at St. Croix Falls.

The water flow data shows that flow rates vary substantially over time. Based on the published data, the highest monthly average flow rate in the St. Croix River at St. Croix Falls was 29,600 cfs which occurred in April 2001. The lowest monthly average flow rate in the St. Croix River at St. Croix Falls was 839 cfs, which occurred in August 1934.

The sediment loading data collected by the USGS in 1981 and 1982 showed that the sediment loading in the river ranged from 12.5 tons/day in January to 1,293 tons/day in April.

Extrapolating the sediment data to estimate the minimum and maximum sediment loading at the historic high and low flow rates shows that the minimum sediment loading in the St. Croix River would be approximately 4.8 tons/day and the maximum sediment loading would be 2,225 tons/day without any contribution from operation at the Zavoral Site.

The maximum deposition of PM into the St. Croix River from the Project was determined by modeling the amount of PM that would be deposited into the river for a distance of 2,200 meters upstream and downstream from the Site under the maximum emission and deposition conditions. The worst-case uncontrolled 24-hour average deposition rate based on an average from the receptors in the above area is 0.231 grams per square meter per day (g/m^2/day). The worst-case annual average deposition rate based on an average from the receptors in the basin is 10.03 g/m^2/year.

Since the amount of PM that would deposited in the river is a function of the width of the river, the width of the river was estimated at low and high flow rates. The river would be at its widest when the flow rate is highest and at its narrowest when the river is at its lowest flow conditions. **Table 32** shows the results of the deposition analysis.

Table 32: Summary of Sediment Loading in the St. Croix with Uncontrolled Emissions from the Site

Flow Rate Cfs	Current Sediment Loading tons/day	Contribution from Zavoral tons/day	% Increase in Sediment Loading
839	4.8	0.2	3.7
29,600	2,225	1.3	0.1

The worst-case mitigated 24-hour average deposition rate based on an average from the receptors in the above area is 0.016 g/m^2/day. The worst-case annual average deposition rate based on an average from the receptors in the basin is 0.7 g/m^2/year.

Table 33 shows the results of the deposition analysis with the mitigated emissions from the Zavoral Site.

Table 33: Summary of Sediment Loading in the St. Croix with Mitigated Emissions from the Site

Flow Rate Cfs	Current Sediment Loading tons/day	Contribution from Zavoral tons/day	% Increase in Sediment Loading
839	4.8	0.2	0.2%
29,600	2,225	0.09	0.01%

It is unlikely that fugitive dust would adversely affect the water quality in the St. Croix River under either uncontrolled or mitigated conditions given:

- The existing high degree of variability in the sediment loading in the St. Croix River.
- Maximum deposition conditions projected to occur on 1 day per year.
- The mining activities are at the maximum rate.
- Mining activities are taking place on the northern boundary of the Site.

- Weather conditions are consistent with those that yielded the predicted maximum impact. Such weather conditions only occurred for 1 day out of the 5 years of actual meteorological data used in the modeling analysis.

A deposition analysis was completed for Zavoral Creek, Middle Creek, and South Creek. The length and approximate width of each creek was determined from aerial photographs and on-site visual observations to derive the approximate area of each creek from the headwaters to the St. Croix River. The locations and lengths of the creeks are shown in **Figure 56**. For the purposes of this analysis, it was assumed that dust would be deposited along the entire creek at the maximum rate for land deposition shown in **Table 30** for each mining phase. This assumption results in a substantial overestimate of the actual deposition of dust into the creek because:

- The maximum deposition rate occurs at the north property line for the Site.
- The three creeks are located away from the point of maximum deposition.
- Deposition rates decrease with distance from the source. For example, as shown in **Table 30**, the maximum 24-hour deposition to land is 0.36 g/m^2 where the maximum deposition rate at the St. Croix River is 0.05 g/m^2.

Table 34 shows the results of the deposition analysis to Zavoral Creek, Middle Creek, and South Creek.

Table 34: Maximum Deposition of Particulate Matter to Zavoral Creek, Middle Creek, and South Creek

Phase 1	Total Length	Assumed Average Width	Area	Maximum Daily Deposition Rate	Maximum Daily Deposition	Maximum Daily Deposition	Maximum Annual Deposition Rate	Maximum Annual Deposition	Maximum Annual Deposition
	meters	meters	m^2	g/m^2	g/day	lb/day	g/m^2	g/year	lb/year
Zavoral Creek	2098	1	2098	0.36	755	1.7	28.8	60429	133.2
Middle Creek	752	1	752	0.36	271	0.6	28.8	21656	47.7
South Creek	1468	1	1468	0.36	528	1.2	28.8	42276	93.2
Phase 2									
Zavoral Creek	2098.2	1	2098	0.36	755	1.7	25.5	53505	118.0
Middle Creek	751.9	1	752	0.36	271	0.6	25.5	19175	42.3
South Creek	1467.9	1	1468	0.36	528	1.2	25.5	37432	82.5
Phase 3									
Zavoral Creek	2098	1	2098	0.34	755	1.7	25.4	53295	117.5
Middle Creek	752	1	752	0.34	271	0.6	25.4	19099	42.1
South Creek	1468	1	1468	0.34	528	1.2	25.4	37285	82.2

As shown in **Table 34**, the maximum daily deposition rate would be:

- 1.7 lbs particulate matter/day over the entire length of Zavoral Creek. For perspective, this is the equivalent of approximately one handful of dust distributed across over approximately 1.3 miles of creek length.
- 0.6 lbs particulate matter/day over the entire length (~0.5 miles) of Middle Creek.
- 1.2 lbs particulate matter/day over the entire length (~0.9 miles) of South Creek.

4.14.1.2.5 *Silica Impacts*

Silica is the main component in sand and in rocks like sandstone and granite. Silica is present in the aggregate that would be extracted from the Site. Prolonged inhalation exposure to fine silica dust, which is known to occur in some workplace environments involving mining and construction trades, can result in a specific adverse health effect known as silicosis. The types of work places for which the risk of silicosis is most prevalent include tunneling and excavation, road building, demolition work, and explosive blasting work. Other industries also present a risk such as slate, granite cutting, and glass manufacturing industries; brick making; and some manufacturing processes involving crystalline silica. Silica exposure to residents or workers in the area around the Project could potentially occur as a result of breathing fugitive dust from the mining and aggregate hauling operations.

~~The Occupational Health and Safety Administration (OSHA) has assigned a maximum exposure limit (MEL) of 300 micrograms per cubic meter (µg/m3) to silica expressed as an 8-hour time-weighted average (TWA) for workers. The American Conference of Industrial Hygienists (ACGIH) has~~

~~recommended a Threshold Limit Value - Time-Weighted Average Limit (TLV -TWA) of between 50 µg/m3 and 100 µg/m3 for the respirable fraction of the dust depending on the type of silica that is present. The ACGIH standard is also intended for workplace applications.~~

The Occupational Safety and Health Administration permissible exposure limit (PEL) (8-hour time weighted average (TWA)) for crystalline silica (as respirable quartz) is either 250 millions of particles per cubic foot of air (mppcf) divided by the value "%SiO_2 + 5" or 10,000 µg/m^3 divided by the value "%SiO_2 + 2." The OSHA PEL (8-hour TWA) for crystalline silica (as total quartz) is 30,000 µg/m^3 divided by the value "%SiO_2 + 2." The OSHA PELs (8-hour TWAs) for cristobalite and tridymite are ½ the values calculated above using the count or mass formulae for quartz.. The American Conference of Industrial Hygienists (ACGIH) has recommended a Threshold Limit Value - Time-Weighted Average Limit (TLV - TWA) of 25 µg/m^3 and the National Institute for Occupational Safety and Health .Recommended Exposure Limits for crystalline silica is.50 µg/m^3. The OSHA, ACGIH and NIOSH standards are intended for workplace applications.

The above exposure limits are for daily exposure to workers to silica over a typical 8-hour workday. Since the highest 24-hour ambient air quality concentration for $PM_{2.5}$ shown in **Table 30** represents total respirable dust and not just silica, a direct comparison cannot be made. However, the data indicates that the maximum uncontrolled concentration would be below the OSHA but above ACGIH worker standards. Tiller has conducted workplace monitoring of employees for respirable dust at similar aggregate facilities. The data collected from those tests indicates that the total respirable dust was below the OSHA TWA. Therefore, the silica content was also below the OSHA TWA (Tiller 2011).

The State of California has developed ambient guidelines for annual average concentrations to protect against chronic noncancer health effects for the general public, including those in the general population that are most sensitive. These are referred to as Reference Exposure Levels (RELs). California has developed an REL for respirable (i.e., $PM_{2.5}$) silica of 3 µg/m3. The California standard was used for the comparison to the projected ambient air concentration that the public would potentially exposed from the proposed Project Site.

- Tiller has collected a sample of fine aggregate, particles that will pass through a 200 mesh screen, and analyzed this sample for crystalline silica. The fine aggregate was used because it represents the material that has the potential to become airborne during mining or haul truck operation. The analysis showed that the fine aggregate at the Site is 25% crystalline silica.

- Since the California REL is an annual standard, this limit can be compared to the annual ambient air quality concentrations from the Site emissions for $PM_{2.5}$ shown in **Tables 27** and **28** after they have been adjusted for the percentage of crystalline silica contained in the Zavoral aggregate. AECOM assumed that the existing ambient concentration of silica is zero.

- Based on the results of the NAAQS modeling analysis, the uncontrolled emissions of dust would result in a maximum annual ambient air concentration of silica of 3.8 µg/m^3. The mitigated emissions would result in a maximum annual ambient air concentration of silica of 0.26 µg/m^3, which is well below the California silica guideline.

4.14.1.2.6 *Alternative 1 – 5- to 10-Year Operation*

The model predicted that the mitigated impacts (after implementation of the Tiller Fugitive Dust Control Plan) from Project sources plus the addition of appropriate background concentrations would not result in exceedances of the NAAQS for PM, PM_{10} ,or $PM_{2.5}$. The results of the modeling analysis indicate that the mitigated dust levels would be below these levels. It is unlikely that fugitive dust would adversely affect the water quality in the St. Croix River or nearby creeks. Mitigated emissions of dust would result in a maximum annual ambient air concentration of silica of 0.26 $\mu g/m^3$, which is well below the California silica guideline.

The impacts described could occur on any day when mining activities were being conducted at the maximum rates described. A reduction in the daily mining rate would result in lower impacts to the environment.

4.14.1.2.7 *Alternative 2 – No Build*

The No-Build Alternative is based on the existing use continuing at the Site. The Site would remain as an unreclaimed open space and would not be a source of increased air pollutant emissions.

4.14.1.2.8 *Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation*

The proposed mining rates do not vary between Alternatives 1 and 3. Since the ambient air quality analyses are based on annual and daily emissions, and the potential to emit (PTE) calculations for each mining phase represent the worst-case emissions while the facility is operating at maximum capacity, there would be no difference between the maximum or mitigated impacts between Alternatives 1 and 3.

The only differences between Alternatives 1 and 3 are that air emissions would occur for fewer years under Alternative 3 but may occur more frequently each year.

4.14.1.2.9 *Subalternative 3A – Reduced Timeframe 150-Working Day Operation*

The proposed mining rates would increase from a maximum of 6,720 tons per day under Alternatives 1 and 3 to an estimated 8,000 tons per day. ~~The increase in mining rate would result in higher daily and annual air emissions and deposition than Alternatives 1 and 3, but rough calculations indicate that the maximum mitigated concentrations would likely remain below the NAAQS. Air emissions would occur over 150 working days rather than fewer days per year over a longer period.~~

An ambient air quality analysis was completed for Subalternative 3A. The emission calculations for the Subalternative 3A air quality analysis were based on the following assumptions:

- Haul Trucks = 348/day (736 round trips)
- Reclamation Trucks = 40/peak day
- Days of operation = 150
- Hours per day = 12

Haul road distances, silt content and fugitive dust control were assumed to be the same as the other alternatives. The diesel exhaust emissions based on the following assumptions:

- Haul Trucks = 348/day
- Reclamation Trucks = 40/day
- 2 front end loaders operating continuously
- 2 excavators operating continuously
- 4 trucks idling continuously
- Days of operation = 150
- Hours per day = 12

Diesel exhaust was added to the fugitive dust generated by the truck traffic, which is a very conservative method for the NAAQS analysis. Using the above assumptions, the mitigated potential to emit for excavation and loading is shown in **Table 34A** below.

Table 34A: Subalternative 3A- Mitigated Potential to Emit from Excavation and Loading Operations

Excavation Rate	Hourly		Daily		Annual	
	670 tons/hour		8000 tons/day		1,200,000 tons/year	
	Emission Rate	lb/hr	Emission Rate	lb/day	Emission Rate	lb/year
PM	1.94	lb/hr	23.2	lb/day	3480	lb/year
PM_{10}	0.43	lb/hr	5.1	lb/day	768	lb/year
$PM_{2.5}$ (17% of PM_{10})	0.07	lb/hr	0.9	lb/day	131	lb/year

Using the above assumptions, the mitigated potential to emit for haul and reclamation trucks plus diesel exhaust emissions is shown in **Table 34B** below.

Table 34B: Subalternative 3A Mitigated Summary of Potential Emissions from Haul Roads Including Diesel Exhaust

Phase 1 Mining	Paved Entry Road		Unpaved Mine Roads	
	lb/day	lb/year	lb/day	lb/year
PM	114.8	6024	71.0	2850
PM_{10}	23	1220	19.2	800
$PM_{2.5}$	5.7	313.3	2.3	130
Phase 2 Mining	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	142.6	7479	145.6	6155
PM_{10}	28.6	1511	41.5	1681
$PM_{2.5}$	7.1	384.7	4.5	218
Phase 3 Mining	**Paved Entry Road**		**Unpaved Mine Roads**	
	lb/day	lb/year	lb/day	lb/year
PM	142.6	7479	105.7	4220
PM_{10}	28.6	1511	28.4	1165
$PM_{2.5}$	7.1	384.7	3.2	166

As shown on **Table 34C**, mitigated emissions from Subalternative 3A will not cause or contribute to an exceedance of the NAAQS.

Table 34C: Subalternative 3A- Summary of Ambient Air Quality Modeling Analysis for Mitigated Emissions

Mining Phase	Pollutant	Avg. Period	Source Contribution µg/m³	Ambient Background[4] µg/m³	Worst-case (or Average) + Ambient Background µg/m3	NAAQS µg/m3	% of NAAQS
Phase 1	$PM_{2.5}$[1, 2]	24-Hr	6.38	24	30.4	35	87%
		Annual	1.00	8.0	9.0	15	60%
	PM_{10}[3]	24-Hr	6.34	43	49.3	150	33%
Phase 2	$PM_{2.5}$[1, 2]	24-Hr	5.00	24	29.0	35	83%
		Annual	0.97	8.0	9.0	15	60%
	PM_{10}[3]	24-Hr	8.92	43	51.9	150	35%
Phase 3	$PM_{2.5}$[1, 2]	24-Hr	6.44	24	30.4	35	87%
		Annual	0.95	8.0	9.0	15	60%
	PM_{10}[3]	24-Hr	6.77	43	49.8	150	33%

A deposition analysis was completed for Subalternative 3A. The analysis showed that deposition to the land, St. Croix River, Zavoral Creek, Middle Creek, and South Creek would be approximately 30% higher than Scenarios 1 and 3.

For Subalternative 3A, the maximum annual ambient air concentration of silica of 0.37 µg/m^3, which is also well below the California silica guideline.

4.14.2 Potential Mitigation Measures

As discussed, Tiller has prepared a fugitive dust control plan (Zavoral Mine Dust Control Plan, September 2011) to define the mitigation methods that would be used to reduce emissions of fugitive dust from the Site. A copy of the Zavoral Mine Dust Control Plan is in **Appendix A.7**. The specific mitigation methods proposed include:

A. Haul Roads

1. Paving the main haul road with asphalt for the first 300 feet into the Site.

2. Appling asphalt millings to the main haul road, starting from the end of the paved portion of the main haul road down to the base of the mine or approximately 660 feet. Once asphalt millings are applied and graded, truck traffic would compact the material so that after approximately 2 to 5 days the millings surface may be swept and washed.

3. Non-chloride products available on the market that are either agriculturally derived organic polymers or naturally occurring polymers ~~Calcium chloride~~ would be applied to the internal haul roads from the edge of the milled portion of the haul road throughout the unpaved haul roads within any given active phase.

4. Watering the unpaved haul roads as needed between applications of the agriculturally derived organic polymers or naturally occurring polymers to control dust ~~calcium chloride~~. Any secondary haul roads in use would be watered on a daily basis (unless there has been precipitation in the last 24 hours). Water trucks would be available on-site whenever there is a hauling event or reclamation activity.

5. Washing the paved and milled portion of the main haul road with a high-pressure low-volume wash twice a day during haul events. This reduces the accumulation of silts on the road surface, significantly reducing fugitive dust emissions.

6. Sweeping the Site entrance and the paved portion of the haul road, including that portion surfaced with asphalt millings one to two times per week to remove accumulated sediments. (Washing the paved sections of the haul road twice a day during haul events would reduce the frequency of sweeping needed.)

B. Excavation Area:

The sand and gravel deposit naturally contains some moisture, which helps control fugitive dust emissions associated with the excavation and loading activities. However, during extended dry periods, this may not be sufficient to adequately control fugitive dust. In the event of an extended dry period, water would be applied to the area in the immediate vicinity of the excavation area.

C. Hauling Operations:

Haul trucks traveling from the Site during haul events would be covered with tarps to reduce wind-blown dust. In addition, haul trucks traveling throughout the Site would be required to limit their speed to 15 mph or less, which would contribute to the reduction of fugitive dust emissions.

D. Reclamation Material Stockpiles

1. Watering stockpiles during construction.

2. Sloping perimeter areas and backfilling and grading the interior areas to reclamation grades. Topsoil application, seeding, and mulching of the graded area would be performed in accordance with the approved Reclamation Plan.

3. Records of the sweeping and water application would be maintained to document the fugitive dust control measures.

4. Based on published information from the USEPA, these mitigation techniques can effectively reduce fugitive dust emissions. The effect of the proposed mitigation techniques would be:

   - Paved Roads – 90% for sweeping and washing;

- Unpaved Roads – 90% for watering, silt load reduced from 25.5 g/m^2 to 6 g/m^2 for application of asphalt fines
- Excavation Areas – 90% for water application
- Reclamation material stockpiles – 90% for watering, 100% for seeding

5. The City could require Tiller to pay for monitoring.

4.14.3 Scandia Mine

The 1999 EAW identified that the Scandia Mine operates under two air permits—an Option D Air Permit associated with operation of the asphalt plant and a General Non Metallic Air Emission Permit for operation of the processing and hauling activities. Under the Option D permit, the plant can produce 720 tons per hour. The General Air Emission Permit allows processing of up to 2,750,000 tons of aggregate per year. Average production at the Scandia Mine ranges from about 450,000 to 600,000 tons per year (2007 permit application). Utilizing the Zavoral Site as the source of Class C add-rock would not change production or operation and, as a result, would not require any modification to air permits.

4.15 NOISE ANALYSIS

4.15.1 Sound Basics

Sound is produced by vibrating objects and reaches the listener's ears as waves. When an object vibrates, it causes slight changes in air pressure. These air pressure changes travel as waves through the air and produce sound. To illustrate, imagine striking a drum surface with a stick. The drum surface vibrates back and forth. As it moves forward, it pushes the air in contact with the surface. This creates a positive (higher) pressure by compressing the air. When the surface moves in the opposite direction, it creates a negative (lower) pressure by decompressing the air. Thus, as the drum surface vibrates, it creates alternating regions of higher and lower air pressure. These pressure variations travel through the air as sound waves (Source:http://www.ccohs.ca/oshanswers/phys_agents/noise_basic.html).

Sound is dependent on many factors. Two factors that can readily be measured are sound pressure and frequency. Sound pressure is the amount of air pressure fluctuation a noise source creates. We "hear" or perceive sound pressure as loudness. If the drum in our example is hit very lightly, the surface moves only a very short distance and produces weak pressure fluctuations and a faint sound. If the drum is hit harder, its surface moves farther from its rest position. As a result, the pressure increase is greater. To the listener, the sound is louder.

Noise is unwanted sound. The difference between sound and noise depends upon the listener and the circumstances. For example, rock music can be pleasurable sound to one person and an annoying noise to another. Noise level or loudness is commonly measured and reported in terms of decibels (dB), which are a measure of the sound pressure.

Frequency is the rate at which the source produces sound waves, i.e., complete cycles of high and low pressure regions. In other words, frequency is the number of times per second that a vibrating body completes one cycle of motion. The unit for frequency is the hertz (Hz = 1 cycle per second). Low-pitched

or bass sounds have low frequencies. High-pitched or treble sounds have high frequencies. A healthy, young person can hear sounds with frequencies from roughly 20 to 20,000 Hz. The sound of human speech is mainly in the range 300 to 3,000 Hz. The sensitivity of the human ear to sound depends on the frequency or pitch of the sound. People hear some frequencies better than others. If a person hears two sounds of the same sound pressure but different frequencies, one sound may seem louder than the other. This occurs because people hear high frequency noise much better than low frequency noise.

Sound pressure measurements can be adjusted to correspond to this peculiarity of human hearing. An A-weighting filter that is built into a noise monitoring instrument deemphasizes low frequencies or pitches. Decibels measured using this filter are A-weighted and are called dB(A). Minnesota's noise regulations have limits expressed in dB(A). A-weighting serves two important purposes:

- It gives a single number measure of noise level by integrating sound levels at all frequencies.
- It gives a scale for noise level as experienced or perceived by the human ear.

The Minnesota noise standards, discussed further in Section 4.15.4.2, are based on two time periods, L_{10} and L_{50}. Mn/DOT uses the following definitions:

- L_{10} - The sound level that is exceeded 10 percent of the time (the 90th percentile) for the period under consideration.
- L_{50} - The sound level that is exceeded 50 percent of the time (the 50th percentile) for the period under consideration

4.15.2 Sound Perception

The following paragraphs present two concepts to assist in evaluating the noise analysis contained in Section 4.15.4.

Sound levels are not directly additive. The sound level from a piece of equipment, such as a front-end loader, cannot be directly added to the ambient sound levels to predict noise levels. The following example illustrates this concept. Two people are at a loud music concert. The people try to talk in a normal tone of voice to each other. Because the music is louder (higher sound levels) and at a similar frequency to the talking, the people cannot hear each other. They must shout (louder than the music) at each other to be heard.

Similarly, if the sound level of equipment operating on a site is less than the ambient level and the sound frequencies are approximately the same, it would be difficult if not impossible to hear the equipment.

Sounds at the same loudness but different frequencies can both be heard. The following example illustrates this concept. A high frequency note is played on a piano. Then two notes, one high frequency and one low frequency, are played together. The sound level (loudness) can be the same, but both notes are clearly heard.

Finally, one noise must be sufficiently louder than another to be perceived as different by the human ear. **Table 35** shows how much difference there must be between sound levels for a noise to be perceived by

humans as louder or quieter. The levels in **Table 35** are approximate as humans have highly variable abilities to perceive noise levels.

Table 35: Perceptions of Increases in Decibel Level

Imperceptible Change	1 dB
Barely Perceptible Change	3 dB
Clearly Noticeable Change	5 dB
About Twice as Loud	10 dB
About Four Times as Loud	20 dB

Source: http://www.gcaudio.com/resources/howtos/loudness.html

4.15.3 Common Noise Sources

Noise is generated by human activities and other sources, such as wind, water movement, animals~~.~~, etc. **Table 36** provides a list of typical noise levels for a variety of human activities and locations; however, actual noise levels may vary depending on the particular item.

Table 36: Common Noise Levels in dBa

Home	Work	Recreation
50–refrigerator	40 quiet office, library	40 quiet residential area
55–conversation	50 large office	70 freeway traffic
50–60 electric toothbrush	55 conversation	85 heavy traffic,
50–75 washing machine	65–95 power lawn mower	85 noisy restaurant
50–75 air conditioner	80 manual machine, tools	90 truck, shouted conversation
50–80 electric shaver	85 handsaw	95–110 motorcycle
55 coffee percolator	90 tractor	100 snowmobile
55–70 dishwasher	90–115 subway	100 school dance, boom box
60 sewing machine	95 electric drill	110 disco
60–85 vacuum cleaner	100 factory machinery	110 busy video arcade
60–95 hair dryer	100 woodworking class	110 symphony concert
65–80 alarm clock	105 snow blower	110 car horn
70 TV audio	110 power saw	110–120 rock concert
70–80 coffee grinder	110 leafblower	112 personal cassette player on high
70–95 garbage disposal	120 chain saw, hammer on nail	117 football game (stadium)
75–85 flush toilet	120 pneumatic drills, heavy machine	120 band concert
80 pop-up toaster	120 jet plane (at ramp)	125 auto stereo (factory installed)
80 doorbell	120 ambulance siren	130 stock car races
80 ringing telephone	125 chain saw	143 bicycle horn
80 whistling kettle	130 jackhammer, power drill	150 firecracker
80–90 food mixer or processor	130 air raid	156 capgun
80–90 blender	130 percussion section at symphony	157 balloon pop
80–95 garbage disposal	140 airplane taking off	162 fireworks (at 3 feet)
110 baby crying	150 jet engine taking off	163 rifle
110 squeaky toy held close to the ear	150 artillery fire at 500 feet	166 handgun
135 noisy squeeze toys	180 rocket launching from pad	170 shotgun

Source: http://www.chchearing.org/noise-center-home/facts-noise/common-environmental-noise-levels

4.15.4 Zavoral Site

4.15.4.1 Affected Environment

Currently, the Zavoral Site does not have any man-made noise sources. Tiller's consultant, David Braslau Associates, Inc., prepared a noise report for the Project (**Appendix A.8**). AECOM Consultant Team member SBP Associates, Inc. (SBP) conducted additional analysis, which is included as **Appendix B.7**.

Noise in the area near the Site is generated primarily by traffic on State Scenic Byway TH 95 and TH 97. Existing traffic includes automobiles for local and commuter traffic and truck traffic, including trucks for hauling aggregate to the existing Scandia Mine. Man-made noise on the St. Croix River is generated by boats (motorized and human powered) in the summer, snowmobiles in the winter, campers and trail users, and other recreational activities throughout the year. The St. Croix River near the Site is

designated as a no wake zone thus limiting the speed of the boats and the associated noise from boat motors.

Potential noise receptors near the Site include residential properties, commercial properties, schools and churches, and the Lower St. Croix National Scenic Riverway. Residential properties are located within ¼ mile of the Site. The Rutstrum State WMA is located east of the Site, within the boundaries of the St. Croix River. The Farmington Bottoms SNA is located east of the St. Croix River in Wisconsin.

Sound level monitoring was performed December 2009 at two locations at the Zavoral Site boundary just east of State Scenic Byway TH 95. The north monitoring site was north of the intersection of State Scenic Byway TH 95 and TH 97. The south monitoring site was south of the intersection of TH 95 and TH 97. Data was collected over 5-minute intervals and provided overall sound level distribution curves from approximately 11:30 a.m. until 3:30 p.m. In addition, more detailed octave band data was collected at the southerly site using 10-second intervals during the period 2:30 p.m. to 3:30 p.m. **Table 37** summarizes the results of the December 2009 noise monitoring.

Table 37: Summary Sound Level Statistics (dBA), December 2009

Sound Level	North Site	South Site
L01	67.0	67.5
L10	58.5	58.0
L50	46.5	41.5
L90	35.5	35.0
L99	33.5	33.5

The Mn/DOT 2006 highway volumes for the area show about 65% more traffic on State Scenic Byway TH 95 north of its intersection with TH 97 than south, reflecting a flow of commuter traffic to and from the Twin Cities. This difference in flow is reflected in the summary of sound level statistics of the data from the two sites in **Table 37**. The 5 dBA difference in the L_{50} or median level reflects the higher traffic level at the northerly monitoring location.

In June and July 2011, the NPS completed noise monitoring at four locations on the St. Croix River. According to the NPS report, the 30-day ambient measurements resulted in a median L_{50} noise level of 39.4 dBA (12.5-20,000 Hz) between the hours of 7a.m. and 7p.m.

In October 2011, a traffic noise impact assessment was conducted by SBP for the travel route between the proposed Zavoral Mine and the existing Scandia Mine. Noise was measured at two locations along TH 97. The first monitoring location, M1, was near the four-way stop at the intersection of TH 97 and Olinda Trail. The second location, M2, was near the intersection of TH 97 and Newberry Avenue, representing a roadway section with free-flowing traffic. The number and type of vehicles were also monitored.

The monitoring locations are shown in **Figure 57**. The results of the measurements and the number of vehicles are provided in **Table 38**.

Table 38: TH 97 Noise Monitoring Results – 10/20/11

Monitoring Location	Time	Distance from the Monitor to TH 97 Centerline	L_{10} dBa	L_{50} dBa	Number of Cars	Number of Medium Trucks	Number of Heavy Trucks
M1	7:05 a.m. to 8:05 a.m.	80 feet	65	57	276	6	20
M2	8:24 a.m. to 9:24 a.m.	225 feet	63	55	242	6	24

The monitoring was completed during the morning hours after rush hour and represent low traffic noise levels. The monitoring showed that noise levels along TH 97, during low traffic levels, are at or near the Minnesota Noise L_{10} daytime standard of 65 dBa.

4.15.4.1.1 *State of Minnesota Noise Regulations*

Minnesota State noise standards have been established specifically for daytime and nighttime periods. The MPCA defines daytime as 7:00 a.m. to 10:00 p.m. and nighttime from 10:00 p.m. to 7:00 a.m. For residential land uses including apartments, churches, and schools, as well as designated campgrounds and picnicking areas (Noise Area Classification 1 or NAC-1), the Minnesota State standards for L_{10} are 65 dBA for daytime and 55 dBA for nighttime; the standards for L_{50} are 60 dBA for daytime and 50 dBA for nighttime. For recreational land uses other than designated camping and picnicking areas (NAC-2), the Minnesota State standards for L_{10} are 70 dBA for daytime and nighttime; the standards for L_{50} are 65 dBA for daytime and nighttime. Minnesota State noise standards are shown in **Table 39**.

Table 39: Minnesota State Noise Standards

Land Use	Code	Day (7 a.m. – 10 p.m.) dBA		Night (10 p.m. – 7 a.m.) dBA	
"Residential" Includes designated camping and picnicking areas	NAC-1	L_{10} of 65	L_{50} of 60	L_{10} of 55	L_{50} of 50
"Commercial" (Includes recreational areas (such as the St. Croix Riverway) other than designated camping and picnicking areas.)	NAC-2	L_{10} of 70	L_{50} of 65	L_{10} of 70	L_{50} of 65
"Industrial"	NAC-3	L_{10} of 80	L_{50} of 75	L_{10} of 80	L_{50} of 75

Source: Minn. R. ch. 7030.0040, 2011 (https://www.revisor.leg.state.mn.us/rules)

Impacts to Minnesota residences in the Project vicinity would be compared to daytime NAC-1 standards. The St. Croix Riverway is subject to two standards; NAC-1 for the designated campgrounds and NAC-2 for the remainder of the Riverway. However, since campgrounds are distributed along the Riverway in the area of potential noise impacts near the Site, it is appropriate to compare potential noise levels to the NAC-1 standards for the Riverway and campgrounds near the Site.

4.15.4.1.2 *National Park Service Noise Policy*

The NPS has adopted policies related to maintenance of natural soundscapes in parks. The Final Cooperative Management Plan EIS for the Lower St. Croix National Scenic Riverway (Minnesota and Wisconsin) was reviewed to identify potential concerns regarding noise levels and to identify any information on existing sound levels. Areas are classified with respect to the potential for noise level expectations of waterway uses. The area by the Site is classified in the management plan as "Rural

Residential" on the Minnesota side and "Conservation" on the Wisconsin side. The Riverway is classified as "Quiet Waters" in the main channel and "Natural Waters" in back water areas. The same goals apply to natural waters and quiet waters in this area. These management objectives from the Final Cooperative Management Plan are discussed below.

Rural Residential (p.49 - Final Cooperative Management Plan Environmental Impact Statement for the Lower St. Croix National Scenic Riverway)

This area would provide a feeling of being on a river in a sparsely developed landscape. As in the small town management areas, the river, natural features, and man-made features would shape the Riverway experience. Users would encounter no large concentrations of development or people—small numbers of people would be the rule in this area, with little or no commercial development. Residential settings would be limited to large lot development scattered along the shore and/or bluffs at a lower density than the small town or river town management areas. Natural vegetation would cover significant portions of the shoreline, with some stretches being largely undisturbed. Riverway users could anticipate moderate noise levels. The area would offer abundant opportunities to fish and view wildlife. There might be a few small public recreational support facilities (e.g., docks and launches) and some private docks.

Conservation (p.53 - Final Cooperative Management Plan Environmental Impact Statement for the Lower St. Croix National Scenic Riverway)

This management area would provide users with a sense of being in a natural setting. Very few signs of development, such as homes, bridges, or agricultural fields, would intrude on this largely natural scene. The river and surrounding biological communities would dominate the user experience. The shoreline would not be disturbed by the few visible signs of development. Forest management would emphasize the undisturbed appearance. This area would provide many opportunities to view wildlife, and there would be abundant opportunities for angling. Access to the river would be limited to a few public carry-in and small craft access points and a very few riparian landowner private docks. Recreational support facilities (e.g., primitive campsites, trails) would be small, limited in number, and largely screened by natural vegetation. With few access points, small numbers of people and infrequent encounters, there would be ample opportunity for quiet and solitude.

With motorized boats permitted on this portion of the river, and with homes and docks along the Minnesota side of the river, the Management Plan objectives indicate that river users can anticipate moderate noise levels.

Quiet Waters (p.59 - Final Cooperative Management Plan Environmental Impact Statement for the Lower St. Croix National Scenic Riverway)

Users in this area usually would encounter a small number of other people engaged in "low impact" activities during nonpeak times, but during peak use periods (i.e., summer weekends) large numbers of other users and boats could be encountered. Opportunities for solitude consequently would vary from low opportunities during peak times to moderate opportunities during nonpeak times. Management would be directed toward recreational uses that leave the surface of the river largely undisturbed. Both motorized and nonmotorized watercraft would be able to use these areas. Watercraft speeds would be kept low to preserve the river's tranquil quality. Noise levels would be consistently low. Abundant opportunities for fishing would be available.

4.15.4.1.3 *Zavoral Site Noise-Related Activities*

Proposed activities at the Site would be divided into four phases.

Phase 1 would involve reclamation activities on an area approximately 4 acres in size, which is located within the St. Croix River District and scenic easement. Gravel mining is not planned for this area but would instead be the first phase of Site reclamation. Reclamation of this area would involve the removal of existing stockpiles and final grading of the area.

Phases 2 and 3 would involve both mining operations and reclamation activities. Phase 2 and Phase 3 would involve the same activities but would be completed in different locations on the property. Mining operations would include:

- Development of haul roads to the mining area
- Stripping of vegetation, and overburden and stockpiling the material on-site for reuse during reclamation activities
- Excavating the aggregate using front-end loaders
- Loading the aggregate into trucks
- Transporting the aggregate to the Scandia Mine
- Reclamation activities, including grading, placing topsoil, and seeding

Phase 4 would involve final reclamation activities and grading. Stockpiles of overburden would be redistributed and additional topsoil may be transported to the Site for use. The reclaimed areas would be reseeded in accordance with the reclamation plan.

Noise would be generated by the use of front-end loaders and graders to prepare haul roads and to excavate the aggregate. Noise would also be generated during loading trucks with aggregate and by truck traffic on the Site and on adjacent roads between the Zavoral Site and the Scandia Mine.

As described in Section 4.13, raw aggregate material mined at the Zavoral Site would primarily be transported to the Scandia Mine. In some cases, it would be transported directly to construction project sites. The haul trucks would be a source of noise as they travel on State Scenic Byway TH 95 and TH 97.

4.15.4.2 Impact Analysis

The noise analysis is broken into three subsections. The first subsection addresses noise generated on the Zavoral Site and the impacts to residences and other receptors adjacent to the Site (**Figure 57).** The second subsection provides additional analysis of potential impacts to the St. Croix Riverway and compared predicted noise levels from the Site to NPS 2011 ambient noise data. The third subsection addresses haul truck traffic on public roads and the receptors along State Scenic Byway TH 95 and TH 97 (**Figures 58a and 58b**).

A total of 15 locations representing noise-sensitive receptors were identified in the vicinity of the Zavoral Site. These receptor locations are shown in **Figure 57**.

- Receptors 1 through 6 represent residences adjacent to the Site.
- Receptors 7 through 9 represent some of the homes along the river nearest to the Zavoral Site. Receptor 10 represents a home in Wisconsin.
- Receptors 11 through 13 represent users on the river within the Scenic Riverway. Receptor 11 was placed between the Zavoral Site and the Rutstrum State WMA and Farmington Bottoms SNA.
- Receptors 14 and 15 represent trail users along State Scenic Byway TH 95.

AECOM consultant team member SBP reviewed the noise model that was developed for the above receptors and the activities at the Site. Noise sources included in the model were a front-end loader/excavator and haul trucks. The noise level data for the front-end loader/excavator was from similar operations during operation. This spectral data in dB for noise level at 50 feet for the excavator and front-end loader is provided in **Figure 59**. The Braslau study used Minnesota noise limits for older trucks for the Haul Truck Noise L_{10}. The ~~haul truck~~ noise spectrum in dB ~~used in the modeling~~ (**Figure 60**) was used in the modeling for the haul trucks. The model completed by Braslau converted the spectral data (in dB) to dBA for comparison to the Minnesota noise standards, which are listed in ~~is based on this L_{10} of 82~~ dBA ~~at 50 feet~~. Each proposed phase of mining operations was modeled to evaluate the maximum noise levels at the above receptors.

Shielding from topography was evaluated for the three mining phases and was a critical part of the impact analysis. Whenever the line of sight between an assumed source and a receptor site is blocked by topography (barrier), even by 1 foot, the noise reduction benefit is about 5 dBA and increases with increase in effective barrier height.

Shielding currently exists throughout much of the Site due to past mining operations, which have lowered the interior grades below the elevation of the surrounding land. Existing berms and the construction of proposed berms during initial Site preparation would provide additional shielding. A 10-foot berm was assumed along the west side of the Site for all phases. Sound levels were analyzed with these berms since they are proposed as part of initial Site preparations.

For a relatively short period of time, Site operations would occur at the already reduced existing grades within the proposed mining area until an active mine face is established within the initial stages of project development. Once the active face has been established, mining activities would follow the active face throughout the phase, operating in the lowest elevations of the phase or the mine floor. Lower elevations would have the effect of reducing noise levels at all receptors surrounding the Site. The mine floor elevations used for the noise assessment are equivalent to the reclamation grades, which represents a conservative approach to the analysis since the reclamation grades are not representative of the lowest mine floor elevations.

Table 40 presents the maximum modeled L_{10} impacts at each receptor location, which are determined by adding the maximum excavator noise level for each mine phase to the average on-site haul truck impact. **Table 40** also compares the maximum modeled L_{10} impacts to the Minnesota noise standards and the

predicted summer ambient noise levels without mining activities. Finally, **Table 40** presents an analysis of whether the maximum modeled impact would be perceptible over the ambient summer noise levels.

Table 40: Zavoral Mine Maximum L_{10} Noise Impact Summary (dBA)

	MN Standard	Maximum L_{10} Noise from Mining Activities			Above Standard	Predicted Summer Ambient Noise	Predicted Ambient plus Project Noise Level[1]	Change from Ambient	Perceptible Increase
		Phase 1	Phase 2	Phase 3					
Receptor	L_{10}	L_{10}	L_{10}	L_{10}	L_{10}	L_{10}	L_{10}	L_{10}	L_{10}
R1	65	52.3	47.3	48.8	No	62.7	63.1	0[1]	No
R2	65	54	50.9	51.4	No	71	71.1	0[1]	No
R3	65	55.2	50.2	49.9	No	60.4	61.5	1.1	May Be Perceptible
R4	65	53	52.5	50.2	No	60.6	61.3	0.7	No
R5	65	44.4	44.5	50	No	48.3	52.2	3.9	Barely Perceptible
R6	65	44.7	53.5	45.8	No	48.3	54.6	6.3	Yes
R7	65	42.5	46.7	45.9	No	42.2	48.0	5.8	Yes
R8	65	41.9	46.7	44.3	No	42.2	48.0	5.8	Yes
R9	65	41.3	46.6	42.8	No	41.7	47.8	6.1	Yes
R10	65	35.2	37.4	37.5	No	38.2	40.9	2.7	May Be Perceptible
R11	65	38.6	38.5	40.6	No	39.7	43.2	3.5	Barely Perceptible
R12	65	43.9	41	42	No	41.3	45.8	4.5	Yes
R13	65	35.9	38.9	38.4	No	38.3	41.6	3.3	Barely Perceptible
R14	70	56.5	48.7	51	No	75.9	75.9	0.0	No
R15	70	56.9	54.2	54.2	No	66.8	67.2	0.4	No

[1] When noise levels are more than 10 dBA apart, there is no additive effect on the total noise level.

Table 41 presents the maximum modeled L_{50} impacts at each receptor location, which are determined by adding the maximum excavator noise level for each mine phase to the average on-site haul truck impact. **Table 41** also compares the maximum modeled L_{50} impacts to the Minnesota noise standards and the predicted summer ambient noise levels without mining activities. Finally, **Table 41** presents an analysis of whether the maximum modeled impact would be perceptible over the ambient summer noise levels.

Table 41: Zavoral Mine Maximum L_{50} Noise Impact Summary (dBA)

	MN Standard	Maximum L_{50} Noise from Mining Activities			Above Standard	Predicted Summer Ambient Noise	Predicted Ambient plus Project Noise Level[1]	Change from Ambient	Perceptible Increase
		Phase 1	Phase 2	Phase 3					
Receptor	L_{50}	L_{50}	L_{50}	L_{50}	L_{50}	L_{50}	L_{50}	L_{50}	L_{50}
R1	60	48.7	41.9	44.3	No	55.8	56.6	0.8	No
R2	60	49.7	44.8	45.7	No	61.3	61.6	0[1]	No
R3	60	51.7	45.8	45.2	No	53.2	55.5	2.3	May Be Perceptible
R4	60	49.5	48.9	46.2	No	53	54.6	1.6	May Be Perceptible
R5	60	40.5	40.7	46.7	No	43.3	48.3	5.0	Yes
R6	60	41.3	49.9	42.2	No	43.7	50.8	7.1	Yes
R7	60	39	43.2	42.5	No	38.2	44.4	6.2	Yes
R8	60	38.4	43.2	40.8	No	38.2	44.4	6.2	Yes
R9	60	37.8	43.2	39.2	No	38	44.3	6.3	Yes
R10	60	31.4	33.7	33.9	No	34.3	37.1	2.8	May Be Perceptible
R11	65	35	34.8	37.2	No	34.3	39.0	4.7	Yes
R12	65	40.7	37.4	38.6	No	36.6	42.1	5.5	Yes
R13	65	32.3	35.2	34.8	No	34.5	37.9	3.4	Barely Perceptible
R14	65	53.1	43.3	46.7	No	65.6	65.8	0[1]	No
R15	65	52.1	46.9	46.9	No	57.9	58.9	1.0	No

[1] When noise levels are more than 10 dBA apart, there is no additive effect on the total noise level.

SBP used the Federal Highway Administration Highway Construction Noise Model (HCNM) to predict the maximum noise levels determined by adding the maximum excavator noise level for each mine phase to the maximum on-site haul truck impact at the nearest residential location for each of the three mining phases. The HCNM model uses a database of noise levels for construction equipment to calculate the L_{10} noise level at the desired receptor locations. The results showed that maximum impacts would occur at receptor R3 and would be 58.8 dBA for any of the three mine phases. All projected impacts are well within the Minnesota Daytime Standards but some receptors would experience a perceptible increase in noise under worst-case conditions for both L_{10} and L_{50} averaging periods.

At noise levels under average noise rates, the noise levels would be lower, but there would still be perceptible increases at some receptors.

4.15.4.2.1 *Additional St. Croix Riverway Noise Analysis*

As noted in Section 4.15.4.1, the NPS collected ambient noise data at a location on the St. Croix Riverway during the summer of 2011. The NPS monitoring yielded data from which the NPS calculated a median L_{50} noise level of 39.dBA. As part of David Braslau Associates, Inc. noise modeling analysis, three receptors, 11, 12, and 13, were placed on the Riverway.

As shown in **Table 42**, the highest noise impacts from mining activities on the Site at Receptor 11 is predicted to occur during Phase 3 of mining activities. **Table 42** shows a comparison of the predicted

impacts for receptors 11, 12, and 13 against the NPS monitored data. **Figure 61** presents this information graphically.

Table 42: Comparison of Maximum Predicted Noise Levels vs. Monitored NPS Data (dBA)

Receptor	Predicted Maximum Phase 3 L_{50}	NPS Median L_{50}	Predicted Project plus NPS Median	Change from Ambient	Perceptible Increase in Sound Levels?
R11	37.2	39.4	41.4	2.0	May be Perceptible
R12	38.6	39.4	42.0	2.6	May be Perceptible
R13	34.8	39.4	40.7	1.3	May be Perceptible

As shown in **Table 42**, the noise levels in the St. Croix Riverway would not increase over current ambient levels even at maximum mining rates. However, as noted in Sections 4.15.1 and 4.15.2, noise levels only address part of the potential noise impacts. The frequency of the noise also plays a role in whether noise impacts may occur.

In the case of the Riverway, noise is not only governed by road traffic, which would have a frequency pattern very similar to the mining activities at the Site. The summertime man-made sounds include motorized boats traveling slowly through the no-wake zone and other recreational activities. Natural sounds include wind, waves, bird song, and other animal noises.

As part of the 2011 noise monitoring on the St. Croix River, the NPS prepared an analysis of the ambient noise levels at various frequency ranges. David Braslau Associates, Inc. completed a comparison of the NPS median L_{50} monitored daytime noise levels with:

- Modeled ambient noise
- The maximum predicted noise from mining activities
- The average predicted noise from mining activities
- A motorboat traveling at slow speeds 1,000 feet from the receptor

The results of the comparison are presented in **Figure 62**. As shown, at frequencies from approximately 32 Hz to approximately 250 Hz, mine noise would be greater than the NPS median L_{50} ambient and motorboat noise. At frequencies from 250 Hz to 3000 Hz, motorboat noise would be greater than mine noise and the NPS median L_{50} ambient noise. Above approximately 3000 Hz, the NPS median L_{50} ambient noise would become dominant. This means that, at its maximum levels, mine noise would likely be audible on the St. Croix River, even though the noise level measured in dBA would not increase above current ambient levels.

At noise levels under average noise rates, the noise levels would be lower and would be unlikely to result in a perceptible increase. However, due to frequency differential between mining noise and ambient river noise, the noise from mining operations may still be audible.

4.15.4.2.2 *Traffic Noise*

Using the October 2011 monitoring results and the traffic volume information collected during the monitoring, SBP estimated noise levels at 21 sensitive receptor locations along TH 97 under baseline conditions and under maximum capacity conditions. The sensitive receptors are 20 modeled residential locations (some representing more than 1 residence) and a school. The low traffic noise levels used as the baseline condition in the model were based on traffic counts collected at monitoring location M2. For maximum noise levels, 60 additional hourly heavy truck trips were added to the baseline to reflect maximum haul truck activity during a hauling campaign from the Zavoral Site to the Scandia Mine. The MINNOISE traffic noise model, developed by the Mn/DOT, was used to estimate these noise levels. **Table 43** presents the results of this analysis.

Table 43: Zavoral Modeled Traffic Noise Impacts[1]

	Low Traffic Noise Level (dBA)[2]		Maximum Traffic Noise Level (dBA)[3]		Difference	
Receptor	L_{10}	L_{50}	L_{10}	L_{50}	L_{10}	L_{50}
R0	53.6	43.2	62.5	54.5	8.9	11.3
R2	54.9	46.5	61.8	55.1	6.9	8.6
R4	57.5	50.2	61.3	55.2	3.8	5.0
R6	61.0	52.8	64.9	57.7	3.9	4.9
R8	55.0	48.3	58.6	53.0	3.6	4.7
R10	55.7	48.8	59.3	53.5	3.6	4.7
R12	61.2	52.9	65.1	57.9	3.9	5.0
R14	56.5	49.4	60.2	54.2	3.7	4.8
R16	60.3	52.3	64.2	57.2	3.9	4.9
R18	63.9	54.9	67.9	59.9	4.0	5.0
R20	62.8	53.7	67.0	59.1	4.2	5.4
R22	61.7	52.9	65.9	58.2	4.2	5.3
R24	61.3	52.6	65.8	58.4	4.5	5.8
R26	67.9	57.4	72.4	63.0	4.5	5.6
R28	60.3	51.7	64.6	57.2	4.3	5.5
R30	60.7	52.0	65.0	57.5	4.3	5.5
R32	58.2	50.1	62.3	55.6	4.1	5.5
R34	61.0	52.3	65.3	57.8	4.3	5.5
R36	57.1	50.1	60.9	55.0	3.8	4.9
R38	57.5	50.6	61.2	55.3	3.7	4.7
School	59.6	51.4	63.7	56.6	4.1	5.2

Table Notes:

[1] Numbers in bold are above State NAC-1 standards.

[2] Low traffic noise levels are during non-rush hour periods with heavy truck traffic at approximately 25% of maximum.

[3] Maximum traffic noise levels are for periods when haul truck activity is at peak levels

The modeling analysis showed that the Minnesota L_{10} noise standard is currently exceeded at one modeled residential location under low traffic noise conditions (**Figure 62**). The modeling analysis showed that, under maximum haul truck traffic conditions, the L_{10} noise standard would be exceeded at

six modeled residential locations and the L_{50} noise standard would be exceeded at one modeled residential location.

4.15.4.2.3 *Alternative 1 – 5 to 10 Years of Operation*

Operations at the Site would not cause a net increase in L_{50} sound levels on the Riverway, but the noise from mining operations may be audible in the Riverway at maximum mining rates due to the frequency of the noise compared to ambient noise on the Riverway; however, sound levels do not exceed applicable standards.

Noise standards would be exceeded at a limited number of residences along TH 97 during maximum hauling conditions. However, the low and maximum traffic conditions (with the exception of Subalternative 3A) would not change as a result of the Project, and the noise impacts to residences and Scandia Elementary School are not predicted to change from current conditions. Noise levels when gravel hauling is occurring would be noticeably higher than during low noise traffic conditions.

4.15.4.2.4 *Alternative 2 – No Build*

Noise levels would not increase at the Zavoral Site. The No-Build Alternative would not result in lower noise impacts along the existing haul route because the aggregate hauling would still occur from other locations.

4.15.4.2.5 *Alternative 3 – 3.3 to 5 Years of Operation*

Because the noise analyses are based on 6-minute averages, and the noise estimates for each mining phase represent the worst case while the facility is operating at maximum capacity, there would be no difference between the maximum impact between Alternatives 1 and 3. The only difference between Alternatives 1 and 3 is that noise would be generated for fewer years at the Zavoral Site under Alternative 3, but may occur more frequently each year.

4.15.4.2.6 *Subalternative 3A – Reduced Timeframe 150-Working Day Operation*

Noise levels are expected to be somewhat higher than Alternatives 1 & 3 due to the additional trucks on-site necessary to achieve the higher mining rate. Noise would occur for a longer period over the days worked at the Site and could be higher due to the higher tonnage required to be mined over the 150 working days. During hauling periods, noise levels along the haul route would be higher than for Alternatives 1 and 3; levels would be expected to be higher than those experienced during peak hauling in the past, but would occur over an estimated 1-year period.

4.15.5 Potential Mitigation Measures

Noise mitigation techniques, such as developing berms and screens for the Zavoral Site, are included in Tiller's Mining and Reclamation Plan.

4.15.6 Scandia Mine

The 1999 EAW discussed noise associated with the Scandia Mine and associated controls. Using the Zavoral Site as the source of Class C add-rock add would not change or increase the types of processing activities occurring on the Scandia Mine or the range of noise levels that currently occur.

4.16 VISUAL IMPACTS

4.16.1 Zavoral Site

4.16.1.1 Affected Environment

The 114-acre Site is located within the jurisdiction of the City of Scandia and partially within the Riverway (**Figures 2 and 3**). The visual resource area for this analysis includes the Zavoral Site and all areas outside of the Site that could provide views of Project activities. Tiller's Visual Assessment is included in **Appendix A.9**. AECOM's Visual Assessment Technical Memorandum is included in **Appendix B.8**.

Landscape character creates a "sense of place" and describes the image of an area that is valued by residents and visitors to the area. The regional landscape of east-central Minnesota, west of the St. Croix River, is characterized by rolling hills interspersed with depressions of small lakes and wetlands, and extensively covered by urban and suburban development, as well as pasture and some crops and woodland (USEPA 2007). The St. Croix River flows through a broad floodplain covered with forests and braided channels, bordered by heavily wooded bluffs. The Minnesota side of the river includes low-density residential areas. The Wisconsin side is natural in character with few signs of development. The overall landscape setting of the Site possesses considerable scenic qualities based on the diversity of landforms, vegetation pattern, and surface water. Characteristic rural residential uses in a scenic setting of dense tree stands interspersed with agricultural uses adjacent to the St. Croix River are shown in the aerial view in **Figure 2**.

The Zavoral Site is an unreclaimed gravel mine characterized by irregular landforms and several stockpiles remaining from past mining activities. Neighboring properties include agricultural and residential land uses. Past mining at the Site has modified the interior terrain to an elevation that is lower than adjacent properties, which limits visibility into the Site. The scenic integrity, which indicates the degree of intactness and wholeness of the natural character of the landscape, is relatively low because of the presence of past mining disturbance and developed residential land uses on adjacent private land parcels. The scenic integrity of the adjacent St. Croix River corridor is high, as there is little evidence of discordant human activities along the river.

4.16.1.2 Proposed Activities

Tiller's Mining and Reclamation Plan includes screening elements such as berms and plantings, as well as reclamation strategies that help mitigate impacts to key viewing areas. Proposed and existing screening berms located along State Scenic Byway TH 95 and along the southwest perimeter of the Site occur within the 50-foot and 100-foot mining setbacks. The purpose of the berms is to screen the mining and reclamation activities from nearby vehicle, bike, and pedestrian traffic in the area. Construction of the berms would occur as the Site is being developed and may include transplanting of native White pine trees from within the Site to provide additional screening. Transplanting activities for the screening areas would occur simultaneously with the transplanting activities proposed in Phase 1 Reclamation prior to mining activities. Reclamation activities would take place as described in Section 3.1.1.3 of this document.

Mine facilities would be lit at night or under low light conditions (early morning, evening, and during adverse weather conditions) for maintenance activities and safety. No night-time shifts are proposed for the Project. Non-daylight lighting is generally visible for long distances, and would potentially be visible

through gaps in screening vegetation as viewed from roads and residences to the north, west, and south of the Site, and from bluffs on the Wisconsin side of the St. Croix River. However, the amount of light projected outside the Site would be minimized with the installation of downward directed lighting to illuminate only the area within the Site. The downward directed lighting would be visible to viewers within the Minnesota and Wisconsin sensitive viewing areas as well as the key viewpoints, but would likely not attract attention as the downward lighting would be screened to some extent by topography, vegetation, and the existing and proposed berms. Visual contrasts from non-daylight lighting would be weak.

4.16.1.3 Scenic Resource Management (or Special Designations)

The CMP and EIS for the Riverway were adopted by the NPS in 2002. The CMP provides direction to:

- Preserve and protect the Riverway's ecological integrity, unimpounded condition, natural and scenic resources, and significant historic resources.
- Accommodate a diverse range of recreational opportunities that do not detract from the exceptional natural, historic, scenic, and aesthetic resources.
- Provide an environment that allows the opportunity for peace and solitude.
- Provide an opportunity for the education and study of the geologic, historic, ecological, and aesthetic values to further enhance stewardship of the river.

As described in the Washington County Comprehensive Plan, the MnDNR and NPS acquired scenic easements along the St. Croix River. Scenic easements are agreements between a landowner and a government agency to protect and preserve views of scenic river districts or byways. These easements typically consist of a thin corridor along the St. Croix River shore or adjacent bluff tops. A small area of wooded bluff within the Site is within a scenic easement, shown in **Figure 2**. The scenic easement is also within the St. Croix River District and the designated Scenic River corridor.

The Washington County Comprehensive Plan provides policies and associated implementation strategies to protect scenic values in the county (Washington County 2010). Policies and strategies that apply to the Site and proposed activities within the Site are summarized below:

> Policy 6-4: Protect shoreland areas to maintain natural habitat and water quality
>
> Implementation Strategies
>
> Manage and regulate land uses in the Lower St. Croix Wild and Scenic River corridor to protect their scenic, natural, historic, cultural, and recreational aspects in accordance with the Lower St. Croix CMP.

The Lower St. Croix River Bluffland and Shoreland Management Ordinance provides protection strategies that include measures to protect scenic resources (Washington County Planning Commission 1976). These include guidelines for minimum area, setbacks, and other requirements of each district within the Riverway; standards; and criteria for allowable uses within the Riverway:

> Section 5. Uses within the Riverway

501. Purpose. The purpose of establishing standards and criteria for uses in the St Croix Riverway shall be to protect and preserve existing natural, scenic, and recreational values, to maintain proper relationships between various land use types, and to prohibit new residential, commercial, or industrial uses that are inconsistent with the National Wild and Scenic Rivers Act, and the Federal and State Lower St Croix River Acts.

807. Factors to Be Considered.
807.01. When considering a proposal or zoning amendment within the St. Croix River District, the governing body shall address the following items in making its decisions:
(1) Preserving the scenic and recreational resources of' the St. Croix Riverway, especially in regard to the view from and use of the river.

The City of Scandia Comprehensive Plan vision narrative describes the desired long-range outcome of Scandia's future development, investment, and protection efforts; and provides goals, policies, and implementation strategies that connect to the vision (City of Scandia 2009). Land use goals, policies, and strategies that address visual resources and are applicable to the Project include:

- Land Use Goal 1: Maintain the City's unique rural and small-town character and its natural landscape while accommodating a reasonable amount of new development that contributes to, rather than detracts from, that character.

  Land Use Policy 1.3: Establish standards that protect Scandia's scenic views by minimizing the visual impact of new development.

  Land Use Implementation Strategy 1.3.2: Require landscaping along major collector roads to minimize visual impact of new development.

  Land Use Policy 1.4: Emphasize sensitivity to community character in new development and redevelopment, whether that character is expressed by historic buildings, agricultural views and activities, natural resource, scenic views, dark skies, a quiet setting, or other elements that are important to the City's residents.

Scandia Ordinance No. 103 provides regulations for the protection of scenic resources during mining operations.

There are no other state, federal, or local guidelines or regulatory authority for the protection of visual resources on private lands outside of the St. Croix River District and scenic easement. The Scenic Management Objectives described above were included in this visual analysis.

4.16.1.4 Sensitive Viewing Areas

The Site has the potential to be viewed from or near sensitive viewpoints on State Scenic Byway TH 95 along the west side of the Site, TH 97, a bike path along State Scenic Byway TH 95, residences accessed from the highway, and from within the St. Croix Scenic Riverway, including high bluffs along the Wisconsin side of the Riverway.

Very little of the Site is visible from sensitive viewpoints at any location because past mining activities have lowered the Site terrain to elevations lower than the river bluff to the west and the rolling terrain to

the east. Visibility of the Site is also strongly influenced by screening of the Site from tree stands during both seasonal leaf-on and leaf-off conditions. The Tiller visual impact information available in Appendix A.9 includes photographs of the existing Site landscape as seen from surrounding sensitive viewpoints.

The upper portions of some existing stockpiles, with an estimated maximum height of 907 feet msl, are either not visible or only partially visible during leaf-off conditions as viewed from sensitive receptors within an approximate ¼-mile distance.

The Project would not be visible from the St. Croix Riverway or from the Wisconsin bluffs on the east side of the river. No part of the Project Site is visible from the river, which is located at a lower elevation than the Site. Bluffs vegetated with stands of trees (with an estimated height of 60 feet) along the east side of the Site block all views of the Site from any location on the river. The vegetated bluffs also block views from the bluffs on the Wisconsin side of the river. Any potentially visible portions of the Site unimpeded by tree stands (view corridors across open spaces) are indistinct due to distance from any location along the Wisconsin bluff line. In general, views of the Site interior from Wisconsin are either not present or very difficult to discern through the filtering of distance and vegetation. There are few sensitive viewing areas that provide unimpeded views of the Site during either seasonal leaf-on or leaf-off conditions.

The Site is visible to a limited extent from sensitive viewpoints along roadways and the bike path in Minnesota. As seen from State Scenic Byway TH 95, south of the highway junction with Quinnell Avenue and north of 220th Street, the Site is screened by stands of trees during both leaf-on and leaf-off conditions. Partially open viewshed corridors and relatively sparse tree stands do occur on TH 97 and a relatively short segment of State Scenic Byway TH 95 north of the Site.

Three key viewpoints are identified on a computer-generated model of Phase 2 mining and reclamation activities (**Figure 63**) and were selected to represent sensitive viewing areas that provide the most potential for unimpeded views of the Site interior, as well as locations that represent areas where viewers would have a concern for the scenic quality of the landscape.

4.16.1.5 Impact Analysis

Short-term visual impacts associated with Site preparation activities and long-term impacts from mining and reclamation were assessed by analyzing the contrast between the Project and the existing landscape, as seen from the three sensitive viewing areas. The contrast evaluation assesses changes to the visual quality of a landscape from the introduction of the Project into the existing landscape. Contrasts were evaluated using photographic simulations of the Project prepared for key viewpoints.

Three key viewpoints are identified on a computer-generated model of Phase 2 mining and reclamation activities (**Figure 63**) and were selected to represent sensitive viewing areas that provide the most potential for unimpeded views of the Site interior, as well as locations that represent areas where viewers would have a concern for the scenic quality of the landscape.

Key Viewpoint 1: This viewpoint is located on the bike path along the east side of State Scenic Byway TH 95 within ¼ mile of the southwest boundary of the Site, as shown in **Figure 63**. The photograph in **Figure 64** represents existing conditions at the Site. It shows that most of the Site is screened by trees even during the seasonal leaf-off condition, with the exception of the top of a stockpile.

This photographic simulation (**Figure 65**) provides a view of Phase 2 mining and reclamation activities that would be visible to the public using the bike path for about 6 to 12 weeks. Phase 2 was selected because it represents the most area disturbed by Project activities that could be visible, especially when occurring on the western portions of the Site. Visible activities would include excavation, loading, hauling, grading, and removal of stockpiles. The potential for impacts to the viewshed would decrease as mining reduces the elevation internally within the Site. Most of the activities would be screened by proposed and existing berms, and would be only partially visible over limited periods of time; therefore, the overall contrast of the operational phases with the surrounding landscape would be weak.

Key Viewpoint 2: This viewpoint is located on TH 97 about ¼ mile west of the Site, as shown in **Figure 63**. The photograph in **Figure 66** was taken during leaf-off conditions on TH 97, approximately ¼ mile west of the Site. Trees screen most of the Site. White pine trees along the east side of the Site are visible; however, the ground surface is not visible because of an elevation difference of about 70 feet. The interior of the Project is at a lower elevation due to past mining activity. The screening berm that remains from previous mining activity is also visible along the right side of the photograph across from State Scenic Byway TH 95.

This photographic simulation (**Figure 67**) provides a view of Phase 2 mining and reclamation activities. A short segment of the access road (junction with the highway shown) would be visible over the life of the Project but would repeat the lines, colors, and textures of existing roadways visible from the viewpoint resulting in a weak contrast to the existing landscape. The overall contrast of mining and reclamation equipment associated with operational phases would be weak because most of the activities would be screened by proposed and existing berms, and would be partially and intermittently visible over limited periods of time.

Key Viewpoint 3: This viewpoint is located on State Scenic Byway TH 95 approximately ¼ mile north-northwest of the Site as shown in **Figure 63**. The photograph in **Figure 68** shows the Site during leaf-off conditions. The interior of the Site is not visible. The northern portion of the Site, including a small area of disturbance from past mining activities, is within the viewshed of the viewpoint; however, any disturbed areas are difficult to discern from the surrounding undisturbed landscape because of the partial screening of trees and other vegetation.

This photographic simulation (**Figure 69**) provides a view of Phase 1 Mining and Phase 2 Reclamation. The existing stockpiles would be removed as part of Phase 3 Mining. The Project would not be visible during leaf-on conditions. The northern portion of the Site is within the viewshed of this viewpoint. Northern areas of the Site and several existing stockpiles may be visible during leaf-off conditions.

As shown in the photographic simulations for the three key viewpoints, effects on existing scenic integrity and scenic attractiveness would be negligible. There would be no change in the scenic integrity of the Site as viewed from the key viewpoints, as portions of the existing Site have already been modified by past mining activities.

A goal of the impact analysis is to evaluate the significance of changes introduced by a project and assessed through the contrast evaluation by comparing these changes to existing conditions and management objectives of pertinent land management or government agencies. Significance criteria were based on the issues from public and agency scoping, and from a literature review of issues associated with similar projects.

A significant impact on visual resources could result if the following occurred:

- Effects on existing scenic integrity and scenic attractiveness resulted from the Project.
- High level of Project visibility from sensitive viewing areas, such as the St. Croix National Scenic River, State Scenic Byway TH 95 and TH 97 on the Minnesota side of the St. Croix River, and the bluff line on the Wisconsin side of the St. Croix River.
- Inability to comply with the Scenic Management Objectives of the Lower St Croix CMP; the City of Scandia Comprehensive Management Plan and Ordinance No. 103; and the regulation of scenic resources identified in other state, federal, and local regulations and planning documents.

4.16.1.5.1 *Alternative 1 – 5- to 10-Year Operation*

Short-term direct effects to the visual character of the analysis area would result from Site preparation activities and early reclamation activities. Site preparation activities include realignment of the Site access and construction of a turning lane, internal main haul road construction, construction of screening berms, and tree removal. The majority of the visual impact of the Project would result from short-term Site preparation activities.

In general, long-term effects of mining and reclamation activities would not be visible or would be partially visible from sensitive viewpoints. This is because the interior Site terrain would be further excavated to a lower elevation than adjacent properties, which would limit visibility into the Site. In addition, views of the Site are blocked by tree stands in both leaf-on and leaf-off conditions as viewed from State Scenic Byway TH 95, TH 97, the bike path, and nearby residences.

In summary, little change would occur in the scenic attractiveness of the overall landscape viewed from any sensitive viewpoint or area during mining activities due to complete or partial screening of proposed activities by existing landforms and vegetation or by proposed berms. When mining and reclamation phases are complete, the Site would be reclaimed to a natural landscape appearance, which could enhance the scenic attractiveness of the Site.

The overall contrasts from the alternative would be none (facilities not visible) to weak (facilities are visible, but do not attract attention).

4.16.1.5.2 *Alternative 2 – No-Build Alternative*

Under the No-Build Alternative, no impacts would occur to visual resources as the Project would not be developed. The area would remain unreclaimed. Future agricultural or rural residential land use would need to comply with the City comprehensive plan and zoning.

4.16.1.5.3 *Alternative 3 – Reduced Timeframe 3.3- to 5-year Operation*

The visual impacts under Alternative 3 would be identical to those described for Alternative 1 but would occur over a shorter period of time. This would result in more mining occurring for more weeks each year and more material being mined per year. These activities would be completely or partially screened by existing landforms and vegetation, or by proposed berms. As described for Alternative 1, no significant impacts, as determined by the significance criteria, were identified from any phase of the Project.

4.16.1.5.4 *Subalternative 3A – Reduced Timeframe 150-Working Day Operation*

The visual impacts under Subalternative 3A would be identical to those described for Alternative 3 but would occur over a shorter period of time. This would result in more mining occurring for 30 weeks over approximately 1 year. These activities would be completely or partially screened by existing landforms or vegetation. As described for Alternative 3, no significant impacts were identified.

4.16.2 Scandia Mine

Currently, unprocessed add-rock is imported to the Scandia Mine and unloaded over an active face where it is stored until needed. It is not stored in individual stockpiles over the Mine floor. The practice of storing add-rock material over the active face would continue regardless of the add-rock source. Stockpiling of aggregates, importing add-rock, and placement of portable equipment are activities that were included in the 1999 EAW and are allowed in the Scandia Mine Site CUP. Regardless of the add-rock source, these activities do not change. Scandia's Mining Ordinance regulates placement of processing equipment and there are no ordinance or permit limits on the volume of materials that can be stockpiled at the Scandia Mine. There would be no change in visual impacts. The characteristic industrial landscape of Scandia Mine would not be changed by the use of Class C add-rock from the Zavoral Site; therefore, no discernible visual impact would occur from the transport and storage of Zavoral Site aggregates at the Scandia Mine.

4.16.3 Potential Mitigation Measures

The visual impacts from Site preparation, operating phases, and reclamation are anticipated to be negligible because proposed screening and reclamation measures included in the Zavoral Mine Plan (**Figures 5 through 9**) provide screening elements such as berms and plantings, as well as ongoing reclamation strategies that mitigate impacts to sensitive viewing areas to the degree practicable. Additional mitigation would ensure that the proposed screening and reclamation strategies are successfully implemented.

- Establish a maximum stockpile height limit of approximately 880 feet msl. Stockpiles limited to this elevation would be effectively screened by proposed and existing berms. Locating stockpiles on the west side of the Site should be minimized, as the upper slopes of stockpiles would have a greater potential to be within the viewsheds of sensitive viewpoints.

- Limit non-daylight lighting to what is required for safety and security. All such lighting should consist of shielded, downward directed lighting.

- Fully implement and monitor reclamation and activities to verify that reclamation is occurring as planned and to meet predetermined criteria established by the City to confirm the success of reclamation.

- Monitor the proposed transplanting of native White pine trees to verify maintenance and watering and to assess survival rates. If survival rates do not fall within a predetermined range established by the City, replacement trees should be provided by Tiller.

4.17 CUMULATIVE IMPACTS

Cumulative impacts are defined as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

- No new gravel mining operations or other development in the vicinity that would affect water use, traffic levels, noise, vegetation removal, or air quality are planned.
- Discussions with the City have indicated that no future development is planned that could affect area traffic levels.
- The City is not aware of any actions occurring within the St. Croix River District or vicinity or in the Project vicinity, particularly actions that would affect natural resources, groundwater, or surface water resources.
- Adding this supply to the regional market has the potential to extend the life of other mines that may be supplying the same material to the same customer base.

5.0 SUMMARY OF POTENTIAL MITIGATION MEASURES

This section summarizes potential mitigation measures that were identified to reduce the impact of the Project.

5.1 RECLAMATION

Tiller would need to include a reclamation plan in its CUP application. The City would use ~~the~~this EIS and recommended mitigation measures to review the plan. The reclamation must meet City ordinance requirements and must result in successful reclamation. The City may need to update the definition of "topsoil" in its Development Code to address current reclamation science. In addition to the topsoil issues addressed under Section 3.1.1.3, the City of Scandia would require that Tiller address the following general list of items in the reclamation plan included in the CUP application:.

- Establish Minimum Topsoil/Manufactured Topsoil Thickness: Proposed topsoil thickness must be reviewed and approved by the City. Tiller proposes 4 inches, which is the minimum allowed by the City ordinance; a common industry standard is 6 inches. Six inches of topsoil/manufactured topsoil is preferred and it should not be tilled, to reduce the potential for compaction.

- Test Site Soils: Once soils are tested, recommendations can then be made as to whether on-site soils could be modified to provide an acceptable topsoil. A qualified agronomist should evaluate sand/silt/clay structure, fertility, and pH of on-site soils and make recommendations regarding its use as topsoil.

- There is limited topsoil available on the Zavoral Site due to past mining activities. As a result, the material at the Site would need to be modified to produce an engineered or manufactured topsoil as described in Tillers reclamation plan, or topsoil would need to be brought to the Site from other locations.

- To provide a suitable planting medium for the establishment of vegetation at the Site, the City would need to develop a topsoil and/or manufactured topsoil specification that meets the needs for this and other mining proposals. Criteria need to be established for what materials are suitable and the City needs to have approval authority. A single source supplier of organic material (e.g., municipal leaf compost, yard waste recycling company) should be used to maintain consistency of imported material and to ensure uniformity in resulting manufactured soil. Standards also need to be established for the use of on-site or other topsoil to avoid the use of topsoil containing invasive or weed species.

- Describe Subgrade Preparation: The subgrade should be disked and amended with compost or other amendments as necessary. Placed topsoil/manufactured topsoil should not be disked. It would be preferable to disk the subgrade soils to eliminate a barrier/impedance between soil layers/horizons (i.e., create positive drainage and ensure groundwater recharge).

- Modify Seed Mix and Methods: The proposed seed mixes should require 100+ seeds per square foot of permanent native seed for successful establishment of natural areas. An inoculant should be used during seeding to improve growth. Native seed mixes should be installed using broadcast sowing on

the soil surface given loamy-sandy soil types, followed by the installation of straw erosion control blanket (straw blanket North American Green [NAG S-75 type) rather than straw crimping.

- Modify Cover Crop Specification: The temporary cover crop and how the Site would be prepared for permanent seeding after the cover crop is established should be clearly specified. The steps that would be taken for the temporary to permanent seeding process if optimal timing is not achieved should be described. A higher frequency of mowing and herbicide treatment during the establishment period should be considered, three times during the growing season is recommended. Tiller's reclamation plan should include a list of acceptable herbicides. An adaptive management plan should be developed.

- Describe Tree Transplanting/Planting: Describe how many trees, their size, transplanting/planting method, and the location, and arrangement of plantings. Consider savannah habitat as transition from native grassland to forest.

- Refine Invasive and Aggressive Native Species Control: Weedy species should be better defined (a list of such species has since been provided by the WCD through the PAC. In addition:

    - Add spotted knapweed (extremely invasive) control

    - Add management methods for common buckthorn control, which is one of the most critical tasks in forest management.

    - Add Reed canary grass control methods.

    - Identify methods to keep Boxelder, Quaking aspen, and Eastern red cedar that are prone to being weedy in check.

    - Remove Honeysuckle from the Site.

    - Add to overall forest management including the use of a rotational burn (5- to 10- year interval once the Site is established with follow-up Reed canary grass management) to suppress the growth of nonnative woody species and encourage species diversity.

- Establish Funding Mechanism: Tiller should provide a funding mechanism for the City to conduct any and all required monitoring at the Site to assess the success of proposed reclamation. Specific criteria for measuring and defining success acceptable to the City need to be established (percent cover requirements for seeded native species, limits on aggressive native species, invasive and exotic species, and so on). Actions that would be taken by Tiller if reclamation were determined not to be successful need to be specified. Conditions under which reseeding, overseeding, and/or spot seeding are required should be identified.

- Extend Monitoring Period: The City should consider extending the establishment and monitoring period to 5 years from 3 years as proposed by Tiller. An adaptive management plan should be developed.

- Address Long-Term Management: The City should address long-term management and identify related responsible party and funding source for active long-term stewardship of the Site.

5.2 BICYCLE AND PEDESTRIAN FACILITIES

The City of Scandia Trail Plan presents near- and long-term improvement plans for trails in the area and connections to regional trails. The following measures should be considered in relation to the Project.

- Tiller should provide funds to improve the existing pedestrian/bicycle trail along TH 95 in the mine area, and establish connecting to existing trails.
- The proposed trail on TH 97 is planned as an off-road trail to be constructed in the long-term plan. The proposed trail on State Scenic Byway TH 95 is also an off-road trail. The trail crossing at TH 97 and TH 95 is in the long-term plan. If a crossing is placed at this location while the Zavoral Site is operational, advanced signing for the trail crossing should be added.
- A trailhead is shown at TH 97 and State Scenic Byway TH 95. If the Zavoral Site is operational, the location of the trailhead should be relocated due to the proximity of the intersection to hauling vehicles.
- New crossings on TH 97 at Oakhill Road and Ozark Avenue are called out for design with traffic controls. This would most likely be some type of warning flashers, not traffic signals. The City may want to delay installing crossings at these locations until the mining is complete.

5.3 OTHER MITIGATION

The following potential mitigation measures have been identified and would be considered as possible conditions of any future CUP for the Project should it be approved:

- Require Tiller to provide a funding mechanism for the City of Scandia or their designee to conduct any and all required monitoring at the Site.
- Construct the berm on the south end of the Site as close to the mining and reclamation limits as possible. This would result in lower off-site peak flow rates and increased on-site infiltration.
- Require Tiller to keep records of when the Zavoral Site Well is pumped, and provide these to the City, Washington County Department of Public Health and Environment, and the MnDNR for groundwater monitoring activities. This should document both the daily use and total annual pumped volume from the Zavoral Site Well. The daily total should not exceed 10,000 gallons at a maximum pumping rate of 1,200 gpm. The total annual pumping should not exceed 1,000,000 mgy.
- Require that the WCD monitoring point installed for the pump test and collection of baseline data in Zavoral Creek be monitored during the lifetime of the Project. This monitoring should be funded by Tiller.
- Monitor the Black Ash seepage subtype wetland boundary mapped by CCES (CCES January 2010) that established the baseline boundary of the seep along Zavoral ravine. This monitoring should be funded by Tiller.

- Although no Blanding's turtles were identified at the Site, the MnDNR has requested that Blanding's turtle mitigation measures be applied to the Project. These measures are included in **Appendix C**.

- Require Tiller to monitor all on-site construction equipment for leaks and receive regular preventive maintenance. Fueling and maintenance of vehicles would occur within the active mining phase and no "topping off" of vehicle fuel tanks should be allowed.

- Require that any AST at the Site be located more than 500 feet from surface water to reduce the potential for impacts to surface water.

- Notify the MPCA about all ASTs within 30 days of installation by submitting an AST Notification Form.

- Require Tiller to sample and analyze groundwater for diesel range organics. If it is ever determined that gasoline is to be stored on the Site, gasoline range organics and benzene should be added to the analyte list.

- Construct the new driveway access directly across from TH 97 as required by Mn/DOT for safe access.

- Require Tiller to record and report the number and source location of trucks hauling add-rock to the Scandia Mine to ensure that additional truck traffic would not result from hauling from the Zavoral Site at peak demand concurrently with other sites.

- Install MMUTCD-compliant truck warning signs on State Scenic Byway TH 95 to advise drivers of trucks crossing TH 97 in and out of the Zavoral Site. The installation of warning flashers is another option but should be discussed with Mn/DOT to evaluate the safety impacts.

- Monitor the mitigation methods used at the Site to reduce emissions of fugitive dust for the life of the Project. Records of the sweeping and water application would be maintained to document the fugitive dust control measures. The City should require Tiller to provide a funding mechanism to conduct any and all City-required monitoring at the Site to confirm that sufficient dust control measures are implemented.

- Require Tiller to identify methods to control tracking on public roadways as part of their Dust Control Plan.

- Require noise mitigation techniques, such as developing berms and screens, for the Zavoral Site are implemented. Tiller should provide a funding mechanism for monitoring.

- Require the use of broadband alarms for Tiller equipment and an on-site circular traffic pattern for haul trucks.

- Monitor to ensure that the proposed screening and reclamation strategies are successfully implemented.

- Establish a maximum stockpile height limit of approximately 880 feet msl. Stockpiles limited to this elevation would be effectively screened by proposed and existing berms. Locating stockpiles on the

west side of the Site should be minimized, as the upper slopes of stockpiles would have a greater potential to be within the viewsheds of sensitive viewpoints.

- Limit non-daylight lighting to what is required for safety and security. All such lighting should consist of shielded, downward directed lighting.
- Require that all trees be inspected for raptor nests prior to any tree clearing.
- Require Tiller to coordinate with the City regarding which berms would be removed after the mining is completed.

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