This document was submitted by Laurie Allman following the PAC meeting as part of her comments on the Biological Assessment completed by Critical Connections Ecological Services at that meeting.

Natural Features Assessment of Property Adjacent to Proposed Tiller/Zavoral Gravel Mine, Northern Boundary

prepared by Dave Crawford, retired MN DNR Park Naturalist and resource management specialist, employed in St. Croix Valley 1975-2009

July 16, 2010

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I. Site visit

Property adjacent to the north edge of the proposed site of gravel mining on the Zavoral property was visited July 5, 2010. Observations of topography, surficial geology, plant species, plant community types, and bird species were recorded. All observations from this visit are 'first impressions' from a brief visit, rather than the result of systematic and detailed investigation of the site. For instance, a thorough catalog of species, landforms, hydrology, and plant communities based on a detailed survey would run to multiple pages rather than the brief mentions included below.

The most striking feature of this property, in terms of habitat, scenic qualities, and unusual landforms is a large ravine complex, lying largely outside the boundary of Zavoral's property, associated with 'Zavoral's Creek', also known locally as 'Crystal Springs Creek'. The ravine has two major branches. The northern branch accepts surface runoff from farmland to the west and north. The southern branch accepts surface runoff from similar farmland, as well as runoff from Zavoral's property along what would be the northern edge of the area to be mined if the gravel mining proposal is implemented. A substantial sub-branch of the southern ravine branch originates within the area which would be mined under the current proposal, and would receive runoff directly from the area. In terms of scenic and geologic significance, this deep, narrow ravine (about 220 wide feet from level ground on the north to equivalent level on the south in the main stem of the ravine) is an outstanding feature. Elevation change from the top of the valley wall to the valley floor in some places exceeds a 150 foot drop over a horizontal distance of only 400 feet. A seasonal waterfall which has formed a broad, curved escarpment some 50 feet in height lies about 100 yards downstream of the confluence of the two branches of the ravine, and there are numerous smaller falls and cascades along the length of the branches and main

stem. Under the lip of the falls, the creek valley is fed by year-round flows from four primary, cold-water springs and numerous additional seeps originating from the cross-section of sandstone bedrock exposed by the ravine. The resulting creek, reported by the Marine-Carnelian Watershed District as supporting trout, enters the St. Croix River across an alluvial fan approximately 900 yards downstream of the major waterfall escarpment.

The ravine, and the adjoining uplands, present a complex of features of an area smaller than but ecologically comparable to the Falls Creek SNA located approximately one mile to the north. Microhabitats ranging from oak – pine savanna to mixed hardwood – pine forest to valley wall springs and a steep-sided creek valley were encountered. Slopes ranging from level ground to vertical cliffs, with a broad range of solar aspects, contribute to the diversity of the plant communities observed.

In my estimation, this creek valley rivals or exceeds the geological and scenic significance of the valley of Curtain Falls which is protected by Interstate State Park at Taylors Falls. The Crystal Springs waterfall exceeds Curtain Falls in height, and the valley contains numerous lesser cascades over exposed sandstone bedrock, while the valley of Curtain Falls lacks any lesser cascades. The ravine's two-branched structure, which makes the valley more geologically and scenically complex, is also a feature not found in the Curtain Falls valley. Other features include extensive lengths of exposed vertical cliff walls of what appears to be Franconia Sandstone, both above and below the primary waterfall. Massive angular (e.g., not rounded by transport within a glacier) blocks of what appear to be Franconia Sandstone, are perched within the overburden above the exposed cliff walls – again a feature not found at the Curtain Falls valley. The cliff walls of Crystal Springs Creek valley represent a geologic feature rare enough to potentially qualify for listing as an Endangered Occurrence Record in the MN DNR Heritage Database

Year-round groundwater output from four points under the lip of the falls where permeable sandstone conducts water over an impermeable layer is of drinkable quality. This and similar groundwater output from bedrock layers along the creek provide a year-round flow of clear, cold water through the portion of the drainage below the primary falls. It is this flow of cold, relatively sediment-free water which contributes to the suitability of the lower portion of the creek for trout habitat.

Plant diversity in and above this valley reflects the slope facing, with dry oak savanna species such as lead plant, silky aster, and pasque flower on the south facing slopes and more northern species such as northern star flower and partridgeberry on the north-facing slopes. There is an abundance of species of woodland wildflowers, ferns, and mosses associated with these slopes and cliffs. Streamside moist-soil specialist species such as liverworts, yellow birch, and both Minnesota species of jewelweed occupy the valley floor and lower slopes.

Over the entire property, there is a noticeable lack of invasives. Common buckthorn which were observed were small and remarkably few in number. Earthworm disturbance of the maple-basswood forest community away from the ravine complex was noted, to about the same extent seen in comparable locations up and down the St. Croix Valley. The site appears, on limited observation, to be

free of serious invasive threats such as garlic mustard, spotted knapweed, leafy spurge, invasive thistles, and similar problem species seen all too frequently at other sites in the St. Croix Valley.

Birds: incidental observations during a mid-day, 2-hour visit

Eastern Phoebe
Scarlet Tanager
Wood Thrush
American Goldfinch
American Redstart
Eastern Wood Pewee
Red-eyed Vireo
Yellow-throated Vireo
Hairy Woodpecker
Red-tailed Hawk

History of Bald Eagles, Tundra and Trumpeter Swans, nesting Great Horned Owls, nesting Pileated Woodpeckers, spring and fall warbler migrations

It is certain that this property, over the course of a year, would provide birders with opportunities to see most of the over 200 bird species which nest in or migrate through the St. Croix River corridor.

This creek valley offers habitat identical to that occupied by Louisiana Waterthrushes (MN and WI special concern species) up and down the St. Croix Valley. A comparable valley lies mostly within the Zavoral property on the south, and there is a record of the Louisiana Waterthrush from this vicinity just outside of the Zavoral property boundary. A shorter valley originates within the east edge of the Zavoral property, also potential future habitat for Louisiana Waterthrush nesting. Riverine hardwood forest habitat present within the Lower St, Croix Valley, including the site visited and the wooded portion of the Zavoral property, is the preferred nesting habitat of Red-shouldered Hawks (MN special concern, WI threatened species). Whether these two species are present on or adjacent to the site now, the suitability of the habitat for them is reason to be wary of the potential disturbances associated with gravel mining operations. Habitat loss/alteration and human disturbance are cited as reasons for the nationwide decline of the Red-shouldered Hawk from the formerly most common forest raptor to a rare species today. [The Nature Conservancy, Species Management Abstract, Red-shouldered Hawk, 1999.] The Louisiana Waterthrush "is sensitive to disturbance of . . . streambeds and associated microhabitat features, as well as water quality". [MN DNR Web page]

II. Aerial photo and GIS observations

Public GIS data was reviewed to determine what concerns would be relevant in assessing potential impacts of gravel mining at the proposed site.

MN DNR Natural Heritage Program rare feature potential was also reviewed. A limitation of the Biological Assessment (Husveth, 2009) prepared for the mining proposal is that it was confined to species which "have the potential to occur on the subject property and may be impacted by proposed

project activities". This omits features which occur or have the potential to occur on property directly adjacent to the subject property.

The entire site visited, and the portions of the Zavoral property which are not disturbed by previous gravel extraction, fall within a MN DNR Central Region Regionally Significant Area (also referred to as RSEA – Regionally Significant Ecological Area) extending without interruption from two miles north of the site to approximately .8 miles south of the site. Apart from interruption by roads, this RSEA extends further, approximately 7 miles south along the St. Croix River Valley. To the north, after a gap of approximately 0.6 miles, RSEAs extend to and beyond the headwaters of the St. Croix River with only small gaps in what is otherwise a continuous corridor. 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. RSEAs are themselves rare, denoting only locations where human disturbance is low and ecological quality remains high in comparison to the non-RSEA human-disturbed land areas which form the majority of the state.

Water quality and relatively undisturbed river corridor conditions are the backbone of the inclusion of this reach of the St. Croix River in the National Wild and Scenic Riverway system and the ongoing ecological, aesthetic, and recreational value of this reach. The relatively undisturbed condition of RSEAs adjacent to the river are a part of what preserves these values. Additionally, evidence of the ecological and aesthetic quality of this reach are found in the designation, by the MN DNR Minnesota County Biological Survey, of the island complex in the St. Croix adjacent to the proposed mining site as "high" in biodiversity significance and the designation of Greenberg Island downstream as "outstanding" in biodiversity significance.

The water quality (including relatively little input of sediment from surface runoff) in the portion of the St. Croix River directly adjacent to and immediately downstream of the proposed extraction site supports eleven species of Minnesota-listed rare mussel species, six of which are listed as threatened in Minnesota and two of which are listed as endangered in Minnesota. The latter two species are also listed as Federally endangered species.

III. Concerns – potential impacts of gravel mining:

Degraded water quality in creeks/ravines

Degraded water quality in St. Croix River

Impacts on bird migration corridors

Increase in fragmentation of forest habitat

Introduction of invasive/noxious plant species

Assurances that Best Management Practices (BMPs) for surface drainage are implemented and sufficient to protect adjacent waters, geological features, and habitat

Negative impacts to suitability of habitat for Louisiana Waterthrush and Red-shouldered Hawk

Impacts on regional biological diversity onsite and on adjacent sites and downriver sites

Impacts on rare geological formations and rare cliff habitats

Impacts on soil and soil temperatures, and consequently on shallow aquifer groundwater temperature and recharge

Anything that would result in an added soil load going into the ravine, including surface runoff or increased rate of groundwater percolation through the overburden and laterally into ravines

Close proximity of extraction to deepest part of adjoining ravine, and drainage from extraction site directly into the upstream end of the south fork of the ravine

Potential for surface runoff from the extraction site to travel into the St. Croix via any of three ravines, and consequent impacts on threatened and endangered mussel species known to be present in this portion of the St. Croix River

Impacts of noise and dust on enjoyment, by landowners and recreational visitors, of pastoral and scenic landscapes over a broad area

Any penetration of groundwater from the overburden, or surface water from a mine pit, into the aquifer in the underlying sandstone

Any interference with water movement through the underlying sandstone

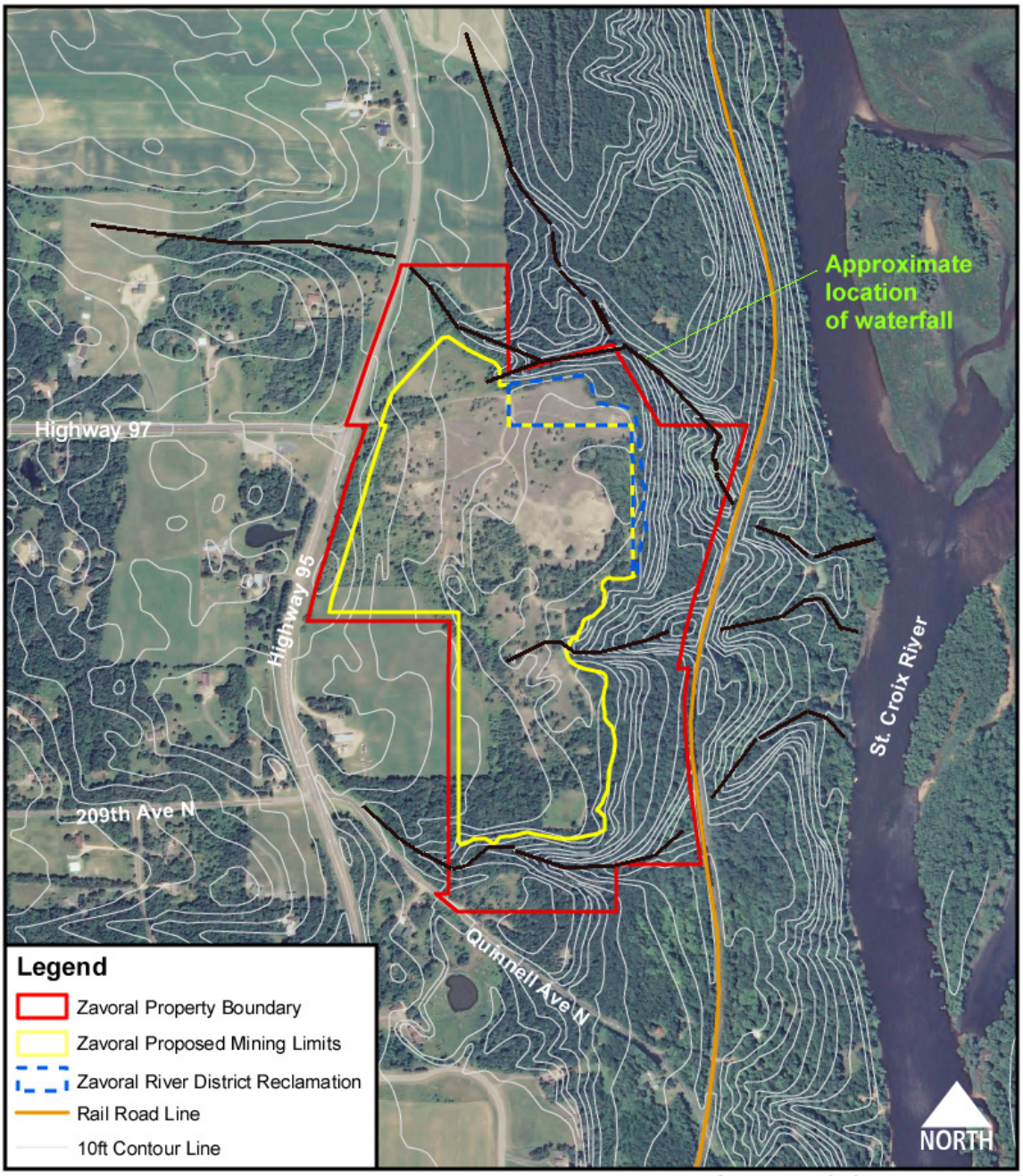
In consideration of the last two points, is the direction or volume of subsurface water flow through the aggregate material which is proposed to be mined known? Is the depth to excavate to reach this flow below the existing surface known? Is it known how subsurface flow would be altered by digging deeper than the existing surface of the Zavoral property?

IV. Summary

The outstanding quality of the scenic, geological, groundwater, and habitat features of the ravine of Crystal Springs Creek, and the rarity of comparable features in this region, along with the presence or potential presence of state and federally listed rare bird and mussel species in proximity to the area to be mined, and the vulnerability of the nationally-significant St. Croix River to degradation of water quality due to the location of the proposed mining area on or adjacent to the headwaters of three well-developed, high-gradient ravines, argues for considerable caution in assessing a proposal to mine gravel in such a sensitive area.

[Crawford_Natural Features Assessment.doc]

Illustration from Tiller Corporation, Zavoral Property Biological Assessment, Final Report, December 17, 2009, prepared by Jason Husveth, Critical Connections Ecological Services, Inc.
Superimposed black lines highlight ravines and drainage sources



Zavoral Property Site Location

Aerial Photo Source: 2008 FSA Color Aerial Photograph
November 24, 2009

Feet
0 260 520 1,040 1,560 2,080

Critical Connections
Ecological Services, Inc.
14760 Oakhill Road • Scandia, Minnesota 55073
P: 651.433.4410 F: 651.433.4528 E: info@ccesinc.com

Figure 1