

# MEMORANDUM

To: John Hinckley, QEP, Senior Associate  
Resource Systems Group, Inc.

From: Stephen Revell, CPG, Senior Hydrogeologist  
Lincoln Applied Geology, Inc.

Date: May 17, 2007

Re: Red Wing Properties, Inc., Archer Mine – Draft Environmental Impact  
Statement (DEIS)



I've completed my initial review of the DEIS relative to its ground water and surface water components. To the greatest degree, the DEIS generally acknowledges a shallow unconfined (water table) type ground water system beneath the kame and outwash deposits that are proposed to be extracted, but very little information about it has been presented. Fifteen borings were installed to define the deposit, depth to rock if encountered, and depth to water if encountered, yet none of them were constructed as monitoring wells to formally describe the underlying ground water system or its relationship to adjacent surface waters such as Warackamac Lake (the Lake) which is located immediately downgradient ( $\pm 100'$ ) of the bulk of the proposed extraction area and its underlying unconfined ground water system. The relationship between the Lake and this ground water system must be defined to ensure against negative impact to the Lake. The Lake just doesn't exist because of direct fall precipitation entering it. It exists because it receives ground water recharge from an upgradient source which is predicatively the southwest flowing ground water system beneath the proposed mine. The Lake is described as a kettle-type lake. The water surface of a kettle lake is an extension of the ground water system whose surface is exposed to the atmosphere. In short, the Lake is fed by the upgradient ground water system that has yet to be formally defined. The Lake is described as having a fluctuating level of up to 10 to 12 feet from wet weather to dry weather. A lake of this type is intimately related to the upgradient ground water system which recharges it. Any impact to the ground water system whether direct or indirect from the proposed extraction activity will be felt directly by the Lake. Lakes of this type are often viewed as sensitive environments because of their seasonal water level fluctuations and direct association with the upgradient ground water system.

The Lakes water surface elevation is defined as  $\pm 308.8'$ . Is this the high, low, or average level of the Lake which is located  $\pm 100'$  from the finished mine floor level of 315'? Depending on what lake level is represented and its relationship to the ground water system, the finished floor of the mine could be anywhere from in the underlying



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water table to 15' above the underlying water table. As presented, the suggestion is that the underlying water table (or Lake) is 6.2' below the finished mine floor. Because of this intimate association between the Lake and the mine related ground water system it is important to know or define:

1. the dynamics of the ground water system including its fluctuation(s), flow path(s), slope(s), recharge processes, water quality and documented relationship to the Lake,
2. the effect of the mining operation on recharge to the ground water system and the Lake, and
3. the effect of any proposed internal stormwater management program or underground injection control program on the underlying ground water system and the Lake that it recharges.

In summary, my initial review indicates that the surface and ground water systems have not been properly described or defined. Their associated processes and interactions have not been properly described or defined, and the relationship of the proposed mining operation (sand and gravel extraction) on both the surface water (the Lake) system and the underlying ground water system has not been defined. An honest, comprehensive definition of the surface and ground water systems must be done to accurately anticipate any adverse impact of mining on them.

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