Comments on Joint FS meeting, April 23-24, Atlanta
GRU DNAPL Team
August 13, 2008

Page 2 It is stated that free-phase NAPL has not been observed in any Lower Hawthorn well. However GeoTrans reported free-phase NAPL from HG-12D (see p. 45 and Table 13 of 2004 Source Evaluation report), HG-10D (see p. 43 and Table 13 of 2004 Source Evaluation report), HG-16D (see p. 48 and Table 12 of 2004 Source Evaluation report). Sustainable recovery of NAPL is one, but not the only, indicator of potentially mobile NAPL.

Page 2 "*MNA will be included in the alternatives for the Lower Hawthorn and the Upper Floridan…*" It should be noted that on p.7 of the Independent Panel report it was indicated that because the redox environment in the FLA was reducing, "*significant degradation of naphthalene would be unlikely.*" In the DNAPL team's view, there will be considerable uncertainty in any predictions of biodegradation, specifically and attenuation in general, of naphthalene or other PAHs and creosote compounds in the FLA. In the absence of biodegradation or sorption, MNA will be due to almost entirely to dispersion and dilution this would not normally be an acceptable remedial option for a sole-source aquifer.

Page 2 With respect to the Surficial Aquifer, the B wells that are screened in the lower part of the Surficial Aquifer "*have consistently shown the higher concentrations of contamination.*" The reason for this may be that the creosote DNAPL has migrated along the bottom of the Aquifer and thus the B wells reflect this deeper zone of contamination. Creosote migration has clearly been occurring for many years, e.g., migration through the Surficial Aquifer was the reason for Beazer plugging and abandoning ITW-21 in 2004 by which time the naphthalene concentration had reached 5570 µg/L in that well. (Beazer abandoned ITW-21 because it was believed that the well cross-connected the Surficial and Upper Hawthorn Aquifers.)

Page 3, It is stated that groundwater concentrations indicated that the Upper Hawthorn is more impacted than the Lower Hawthorn. However, naphthalene concentrations in HG-10D, HG-12D and 16D were 12,000 µg/L, 10,800 µg/L and 10,500 µg/L, respectively, in the Lower Hawthorn and only somewhat

higher in HG-9S, HG-10S and HG-11S at 11,400 µg/L, 13,200 µg/L and 20,200 µg/L in the Upper Hawthorn. All these concentrations may reflect the effective solubility of naphthalene for the possible range of creosote composition.

Page 4 Acenaphthene (a contaminant derived from Koppers) was detected at the site perimeter in FW-11B, FW-24B and FW-22B. One sample in FW-22B was at the Floridan GCTL of 20 µg/L.

Page 4 The ISBS concept assumes that if successfully implemented the MnO_2 coatings that 'encapsulate the source' will be stable. But manganese dioxide is only stable in an oxygenated environment and none of the three contaminated formations at the Koppers site can be considered to be oxygenated due to either the large mass of creosote residuals in the Surficial Aquifer or the natural reducing conditions expected in the HG and FLA. In short, ISBS requires the deep seepage and excess of dissolved oxygen in groundwater for its long-term viability, which is incompatible with the site contamination and the nature of the HG sediments. Furthermore, its implementation is unlikely to produce 'encapsulation' of the creosote DNAPL unless injection points are closely spaced because of the likely spatial variability in the DNAPL distribution and because the relatively high density of the injectate may cause it to sink to the bottom of the injection zone thus failing to contact much of the DNAPL. Also, a recent study of the long-term effectiveness of permanganate injection into a creosote-contaminated source of groundwater contamination indicated that "there was a significant but short-term (months) reduction of mass emanating from the source zone as a result of permanganate treatment but there was no long-term (years) impact on the ability of this coal tar creosote source zone to generate a multi-component plume (Thomson, N.R., Fraser, N.J., Lamarche, C., Barker, J.F., Forsey, S.P., Rebound of a coal Tar Creosote Plume Following Partial Source Zone Treatment with Permanganate, Journal of Contaminant Hydrology (2008)- in press).

Page 5 The DNAPL Recovery Pilot experienced problems that we would expect when one tries to extract a high viscosity NAPL from a water-saturated soil by pumping. Water will flow around the DNAPL and into the well. DNAPL will not enter a well screen unless the DNAPL entry pressure is exceeded, and will follow already DNAPL-wet paths if possible. Ironically, lowering the pumping rate will likely work just as well or better than raising the rate. The situation with PW-1 is somewhat different in that the production of DNAPL from that well was probably due initially to gravity drainage and then to lateral migration. Gravity drainage occurred in the dewatered cone of depression at PW-1 and, we believe, largely ceased because the Surficial Aquifer reached residual saturation within that dewatered zone.

Page 6 The group concluded that there would be no drilling through the Middle Clay under a Source Zone for any remedial option. We assume that the DNAPL Source Zone boundaries referenced in the meeting minutes are those identified on maps presented in recent Geotrans reports (footprint of presumed limits of DNAPL source areas in the Surficial Aquifer). This prohibition would preclude additional characterization and the use of in-situ remedial alternatives that involve injection or extraction of fluids as remediation techniques in the Lower Hawthorn (within the currently defined sources). It could also limit remedial activities in the Floridan.

Page 6 Remedial Options for the Lower Hawthorn: The idea that the middle clay unit is competent, (i.e., without through-going joints or bioturbation features that conduct DNAPL and contaminated groundwater) and should not be penetrated further by additional borings and wells is not supported by analytical data. Monitoring wells as far apart as HG-2D, HG-4D, HG-4I, HG-16D and HG-6D all showed evidence in 2004 of naphthalene in excess of 3,000 ppb, which at about 20-30% of the effective solubility of naphthalene in creosote. This is a strong indicator of DNAPL near these monitoring wells and that the actual source areas in the Upper HG and Lower HG are larger than currently depicted. Limiting remediation of the Lower Hawthorn to treating groundwater impacts downgradient of the currently defined sources will be a never-ending process – even if the actual source areas are as small as the areas currently mapped. We believe that proper drilling and casing techniques can prevent 'dragdown' of what is a very viscous creosote DNAPL, i.e., 25 times more viscous than groundwater.

Page 6 Points of compliance in all aquifer units must, at a minimum, be within the Koppers property boundary.

Comments to Specific Alternatives

General Comment:

It is not clear what criteria will be used to evaluate the effectiveness of ISBS, ISS, or similar remedial actions.

The following comments may apply to multiple Alternatives with similar technologies:

Alternative 2:

Hawthorn Group (Lower and Upper) - Groundwater:

1) The existing monitoring well network is insufficient to document that groundwater plumes are stable/expanding/retreating. There is already clear evidence that plumes extend off site in both the Upper Hawthorn and Lower Hawthorn. We would like to see the locations of the 8 Upper and 4 Lower Hawthorn wells proposed to complete the monitoring network and to monitor stability of the plume/plumes. Plume stability, i.e. whether the plumes are expanding, can only be determined with monitoring wells situated close to the leading edges of the plumes.
2) Triggers for implementing the contingency must be presented in the FS.
3) Specifics of the contingencies should include treating or containing the area beneath the currently identified source areas that have the potential to be sources of groundwater contamination to the FLA.
4) Source areas may be larger than currently depicted.

Upper Floridan Aquifer - Groundwater:

1) We believe that additional monitoring wells are required at the perimeter of the Koppers site.
2) Triggers for implementing any contingency must be presented in the FS.

Alternative 3A

DNAPL

Surficial Aquifer and Upper Hawthorn Group:

1) Gradient control (pumping from within the slurry wall) should be employed at all source areas long-term. This is proposed in Alternatives 5A and 5C.
2) As stated in the first comment to the meeting minutes "Sustainable recovery of NAPL is one, but not the only, indicator of potentially mobile NAPL".

Upper and Lower Hawthorn Group:

1) An inadequate number of Upper and Lower Hawthorn Group wells exist within, or near, the DNAPL source areas to monitor the presence of DNAPL and water quality. Because our goal is to protect the Floridan aquifer, it is essential to monitor groundwater contamination in the Lower Hawthorn Group sediments because these are now the immediate source of contamination of the drinking-water aquifer. This sampling is not being done on a regular basis. Hawthorn wells installed in 2004 have not been sampled since with the exception of nine wells sampled in 2008 – a gap of more than three years. Those nine wells were sampled concurrently with the newly installed offsite Hawthorn wells.
2) The lateral extent of source areas in Upper Hawthorn and in the Lower Hawthorn may be larger than in the Surficial Aquifer; therefore, mobile or residual DNAPL may be present in the Upper Hawthorn Group outside slurry walls intended to

encompass the “Source Areas” as identified in the Surficial Aquifer (the boundary now presented on maps).