NAPL Containment at the Former Northern Indiana Public Service Company Manufactured Gas Plant in Fort Wayne, Indiana

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A non-aqueous phase liquid (NAPL) containment system has been designed for the former Northern Indiana Public Service Company Manufactured Gas Plant (MGP) located on a three acre site adjacent to the St. Mary's River in downtown Fort Wayne, Indiana. The former MGP office building, is now the very popular "Gas House Restaurant". Construction is scheduled for fall 2000. Extensive site investigations revealed the presence of discrete pockets of coal tar product, a dense non-aqueous phase liquid (DNAPL), and varying concentrations of dissolved phase contaminants. DNAPL contamination is generally present throughout a large vertical portion of the soil column to a depth of 35 feet and a wide areal extent; however, there is no evidence to suggest a widespread continuous (i.e., hydraulically connected) DNAPL layer at the site. The main remedial action objective is containment to prevent seepage of NAPL into the river. A slurry wall was selected to physically contain the coal tar product and dissolved phase contaminants. The feasibility study determined that excavation and DNAPL removal was prohibitively expensive due to the 35 foot depth and depth to groundwater of 12 feet. A 4% bentonite/soil mixture will be used to construct a 3 foot wide containment wall with a maximum permeability of 10^{-7} cm/s. The slurry wall will be 540 feet long by 35 feet deep (a minimum of 5 feet into the till layer) and will enclose the site along the river and the northern boundary of the site. A secondary remedial objective is to recover DNAPL coal tar product. The proposed DNAPL recovery system will consist of six (6) discrete, 30-32 foot deep by 50 to 125 foot long pea gravel trenches that total 585 feet, eight (8) 4-inch diameter groundwater extraction wells, and six (6) 4-inch diameter DNAPL extraction wells. The trenches will provide an increased hydraulic gradient within a capture zone much larger than that of single wells. The groundwater table will be lowered up to 10 feet; thereby mobilizing coal tar previously bound by buoyancy forces in the upper part of the saturated zone. Depressing the groundwater table inside of the slurry wall will create an inward gradient toward the contaminated areas of the site, thus creating a hydraulic barrier to dissolved phase migration. A slurry wall backfill, which will be compatible with the site groundwater and DNAPL, was selected following extensive laboratory testing. Test protocols were altered after new research (McCaulou and Huling, 1999) indicated that hydrated soil/bentonite soil mixtures might develop desiccation cracks when permeated with DNAPL. Filter cake tests determined that bentonite appeared more resistant to desiccation than attapulgite. Soil/bentonite mixture compatibility and permeability was then evaluated by permeating different percent bentonite mixtures sequentially with site groundwater and DNAPL. Permeability tests showed that site groundwater had no effect on either of the 4% or 6% bentonite mixtures. Despite surface cracks, short-circuiting of DNAPL was not observed and Darcian flow was maintained. Based on these results, a 4% bentonite mixture with site soils was selected as the slurry wall backfill. A 48-inch, brick combined sewer overflow (CSO) line (constructed in 1881) and a 36-inch storm drain cross the northern portion of the site. The containment wall in the area of the drains will be constructed by jet grouting methods in order to avoid excavation across and below the drain lines. In order to eliminate this pathway for NAPL and dissolved phase discharge to the river, a construction contract for rehabilitation of the brick CSO line by the cured-in-place liner method was completed in the summer of 2000.