



The miracles of science™

Plume 1 Northwest Hydrogeologic Characterization Report DuPont Oakley Site

SUMMARY

The Plume 1 Northwest (NW) Hydrogeologic Characterization Report presents Surficial and Upper Aquifer data associated with Plume 1 specifically in the area adjacent to the E. I. du Pont de Nemours and Company (DuPont) northwestern property boundary. These data were gathered during an investigation conducted as part of the Phase 2 Groundwater RFI at the Oakley Site. In conjunction with previously assembled lithological and chemical information, the newly collected data helped to fill data gaps and updated the Plume 1 NW conceptual model. Additionally, the data will be used to support the selection and design of potential groundwater mitigation measures.

The objectives of this Plume 1 NW hydrogeologic characterization investigation report were to:

- Further evaluate subsurface geologic and hydrogeologic characteristics in the northwestern distal portion of Plume 1 in the Surficial and Upper Aquifers
- Characterize the vertical distribution of constituents of potential concern (COPCs)
- Identify the overall plume trajectory (lateral and vertical)
- Fill data gaps and create a comprehensive Plume 1 NW conceptual model
- Provide the data necessary for evaluating groundwater mitigation technologies for corrective action programs.

Plume 1 contains commingled COPCs associated with the former Chlorofluorocarbon (CFC) and Anti-knock Compounds (AKC) Manufacturing Areas as well as the former Emergency and East and West Basin waste management areas (WMAs). Plume 1 is a collection of several smaller plumes located in the central and western portions of the site. The primary axis of Plume 1 trends south to north towards the San Joaquin River. However, in the Surficial and Upper Aquifers, there is a northwesterly flow component towards the Lauritzen Yacht Harbor (LYH). The data suggest that the LYH basins were dredged into the Surficial/Upper Aquitard potentially penetrating into the top portion of the Upper Aquifer, or at least reducing the aquitard thickness which would result in enhanced communication between the aquifer and the LYH basin. Consequently, the basins may act as preferential discharge points for both the Surficial and Upper Aquifers.

Historical site investigation data indicate that the majority of the Plume 1 constituent mass is located in the Lower Aquifer; therefore, this aquifer has been the primary focus of previous investigations and the installation of the permeable reactive barrier (PRB) Interim Measure. Recent work has been targeted towards understanding the lateral COPC distribution in the Surficial and Upper Aquifers. During the RFI process, several investigations were conducted in the Plume 1 NW area. The information from those investigations was used in conjunction with the data collected during this investigation to provide a complete conceptual model for Plume 1 NW.

The hydrogeologic characterization investigation activities included the installation of cone penetrometer test (CPT) borings to perform continuous logging and groundwater sampling on June 19 through June 26, 2006. A total of 30 CPT locations (06CPT-01 to 06CPT-30) were advanced to depths of 40 feet to 60 feet below ground surface (bgs) to the bottom of Upper Aquifer unit to provide lithological and hydrogeological information of the subsurface beneath the area of investigation. Two to four discrete groundwater samples were collected at each CPT location via the HydroPunch® technique. The groundwater samples were collected from intervals that were selected based on the CPT logs. The intervals that indicated the presence of coarse-grained materials were targeted for sampling. The groundwater samples were submitted for laboratory analysis for volatile organic compounds (VOCs).

Soil sampling was also conducted to obtain additional geotechnical and chemical data from the lithologic units to support the evaluation of groundwater mitigation technologies for corrective action programs. After completion of the CPT borings and receipt of the laboratory data, the lithological information and groundwater sample VOC results were evaluated to select two additional boring locations (06HSA-01 and 06HSA-02) within the investigation area. A total of eight soil samples were collected using Shelby tubes and submitted for laboratory analysis of VOCs and numerous geotechnical parameters.

In conjunction with the available lithological and chemical information, the newly collected data was used to fill data gaps and confirm the Plume 1 NW conceptual model. The objectives of the characterization and related report detailed above have been completed. The following is a summary of the major findings from this investigation:

- Overall, the stratigraphy is complex due to the fluvial depositional environment and is composed of two major groundwater-bearing intervals, the Surficial and Upper Aquifers. Each aquifer consists of sand, silty sand, and clayey sand intervals of varying horizontal and vertical extents. A generally consistent, thick interval comprised of clays and silty clays separates the two aquifer units and is designated as the Surficial-Upper Aquitard. Although composed of cohesive fine-grained materials, this interval does contain scattered lenses of stiff fine-grained sands.
- Groundwater flow within the Surficial and Upper Aquifers is controlled by the stratigraphy and the surface water features. In the Plume 1 NW area, the LYH boat basin creates a localized influence on groundwater causing it to flow to the northwest.
- The findings of this investigation indicate that the hydrostratigraphy at the Oakley Site is a major influence on contaminant transport. The higher velocities occur in the more permeable sections of the Surficial and Upper Aquifers. These data emphasize the importance of the more permeable zones of the aquifers, especially because 1) these zones are where the discharge is occurring, and 2) these zones provide preferential pathways for the transport of contaminants within the aquifers.
- The distribution of COPCs within Plume 1 NW reflect the locations and history of various site manufacturing activities in the former AKC and CFC manufacturing areas.

- The COPCs in groundwater that exceed the water quality objectives (WQOs) are carbon tetrachloride (CT), 1,2 – DCA, tetrachloroethene (PCE), trichlorofluoromethane (CFC-11), and trichlorotrifluoroethane (CFC-113).
- The lateral extents of the plumes fall into two general locations within the study area. CFC-11 and CFC-113 plumes are located in the western areas of the study area due to their source locations (CFC manufacturing area and spill area) and groundwater movement to the north. Plumes of CT, PCE, and 1,2-DCA are located in the eastern portions of the study area due to source locations in the eastern portion of the CFC Manufacturing Area and AKC Manufacturing Area and groundwater movement to the north and then to the northwest.
- Groundwater discharge to the surface water is limited to the southern portion of the LYH marina. Discharge to surface water appears likely for CFC-11 from both the Surficial and Upper Aquifers, 1,2-DCA from the Upper Aquifer, and CFC-113, also from the Upper Aquifer.

There are some minor limitations to the dataset due to the limited amount of current data from the LYH tract. Groundwater samples collected between 2000 and 2006 from previous CPT programs may also reflect different concentrations from those present during the Plume 1 NW field program completed in 2006. However, sufficient data are available to initiate the implementation of a remedial options analysis to determine the efficacy of various options for COPC plumes investigated in this study with subsequent pilot studies for viable technologies in 2008.