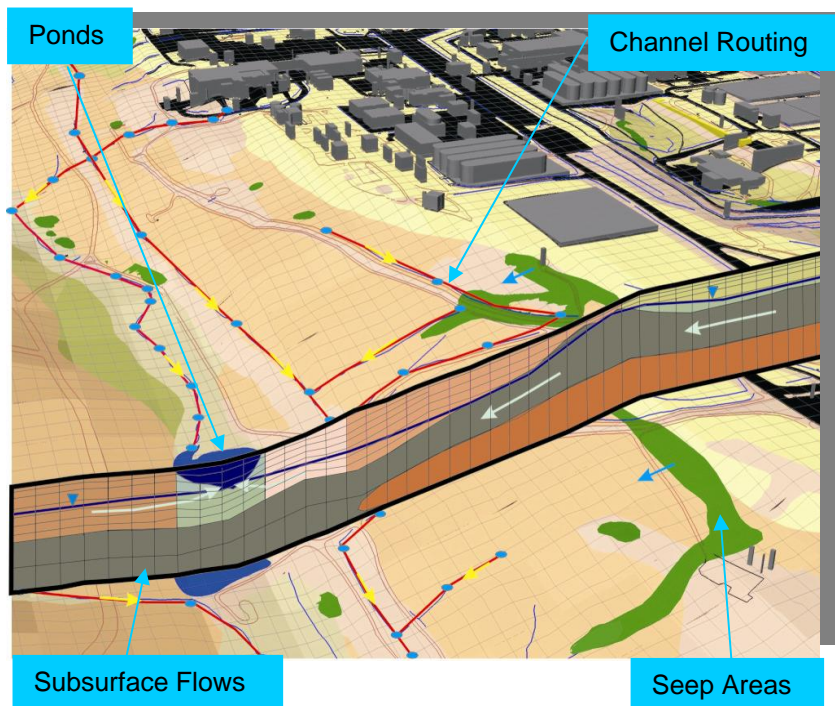


Client: Kaiser-Hill, LLC, Golden, Colorado  
 Project: Rocky Flats Environmental Technology Site (from 2000 to 2005)  
 Location: Former DOE facility located in Golden Colorado

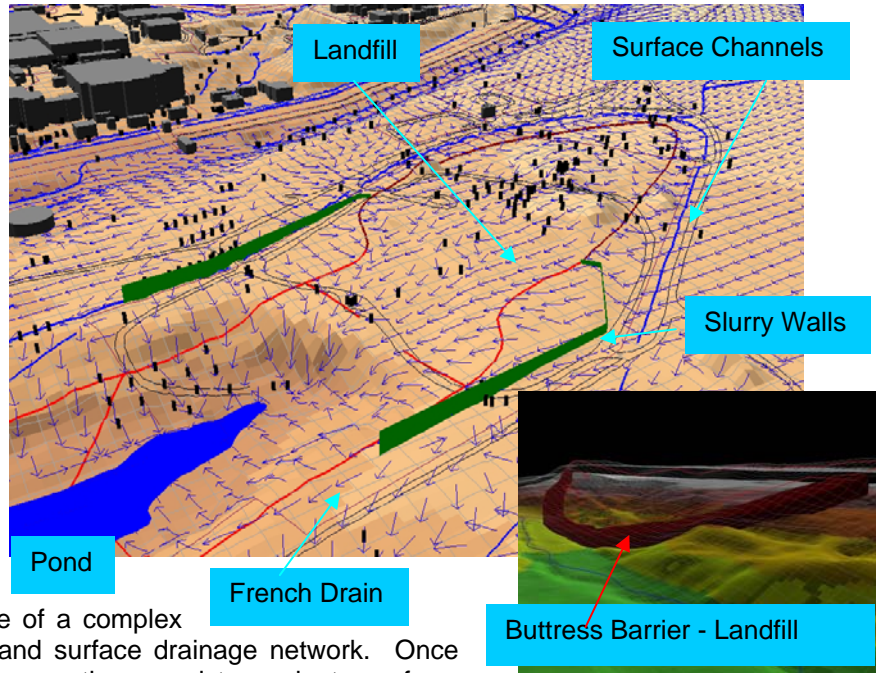
The U.S. Department of Energy (DOE) operated a nuclear weapons parts manufacturing facility at the Rocky Flats Environmental Technology Site (RFETS) in Golden, Colorado, for years. It underwent closure to a National Wildlife Refuge under Kaiser-Hill, LLC. The hydrologic conditions at RFETS are complex and complicated by the industrial surface and subsurface features of the site. To study effects of these changes on the site hydrology and water balance and to evaluate possible future water management scenarios, **Integrated Hydro Systems, LLC** developed a fully integrated hydrologic MIKE SHE/M11 model of the surface-subsurface flow system. To support model development, more detailed analyses, and high-quality presentations, IHS constructed a substantial digital database and Geographical Information System (GIS). A fully-integrated flow model with this detail and complexity had not been previously developed in a semi-arid area. As a result IHS developed and coordinated a comprehensive MIKE SHE/MIKE11 code validation effort in conjunction with the code developers, the Danish Hydraulic Institute.



IHS utilized an innovative step-wise process-coupling approach in preparing the full integrated water balance model, and several sub-scale integrated models to better understand and parameterize the complex system flow dynamics. The model was primarily used to assess system response to wet- and dry-year climate impacts for different proposed site-closure land reconfiguration designs. Changes to the land surface topography, site drainage routing, operation and design of final surface reservoir system, hundreds of miles of subsurface utility corridors and storm/sanitary drains were incorporated into the final-state integrated model. Results were used to make critical decisions on future operation and maintenance of surface reservoirs, to support later more detailed studies on wetland design and sustainability for different climate regimes, to assess impacts to contaminant plume

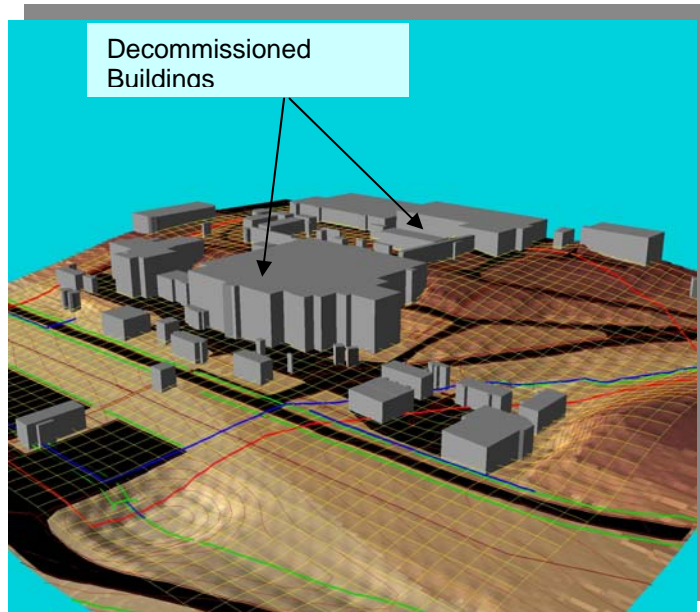
migration and surface water discharge areas, to modify surface drainage and routing and to make additional modifications to the proposed land surface topography.

The integrated flow models successfully reproduced the range of annual winter snowmelt to summer ephemeral event-driven flow dynamics observed in the significant amount of continuously monitored surface and subsurface flow measurements at the site. This modeling work and subsequent presentations by IHS dramatically changed the basic understanding and public/agency perception of how groundwater flow, surface water flow and their interaction occur at RFETS. It was successfully peer-reviewed in detail by several different nationally recognized expert panels. Results were presented to various agencies (EPA, state health department, US Fish/Wildlife, Cities, Counties, DOE) and various concerned citizen groups overseeing site closure. And Kaiser-Hill, LLC and SM Stoller Corporation continue to retain Integrated Hydro Systems, LLC as the primary modeling consulting group.



Working closely with a nationally-recognized team of geotechnical engineers, IHS developed localized, high-resolution integrated flow models of two former industrial landfills to better understand the coupled surface water-groundwater flow dynamics in these systems. They were also used to evaluate the hydrologic performance of a complex groundwater collection/barrier system and surface drainage network. Once developed and calibrated, the models were then used to evaluate surface-groundwater response to closure designs to improve wildlife-riparian habitat, and to evaluate possible closure assessment monitoring locations. Results presented to attorneys, consultants, citizen groups, and various federal and state regulators including US Fish and Wildlife, US EPA, and State Public Health were well received.

Localized, high-resolution integrated MIKE SHE/M11 surface-groundwater flow models were developed for seven former deep-basement nuclear manufacturing structures. These models were constructed to address

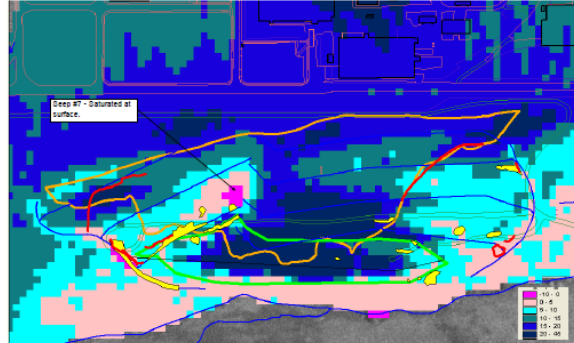


several concerns identified by state and federal agencies, including developing a fundamental understanding of surface-groundwater dynamics surrounding the buildings for current and alternative closure configurations, for both typical and extreme annual and event-level climate sequences. Model results were used to predict potential seep areas and discharge rates, 3-D groundwater flow and integrated contaminant transport. The model was also used to evaluate several engineered systems to control groundwater and surface water flows. Results were presented to Kaiser-Hill, LLC, other consultants, attorneys, and local, state and federal agencies. Kaiser-Hill, LLC plans for proposed closure configurations and engineering controls were subsequently accepted by regulators based on modeling results.



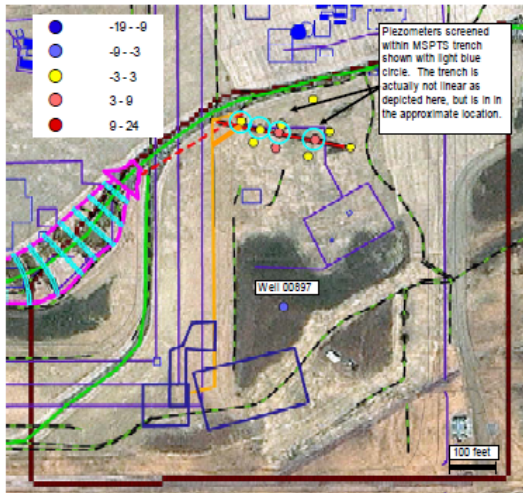
Client: S.M.Stoller Corporation, Broomfield, Colorado  
 Project: Rocky Flats Environmental Technology Site post-closure (2007)  
 Location: Former DOE facility located in Golden Colorado  
 Contact:

IHS was contracted by the S.M.Stoller Corporation, the US DOE Legacy Management company, to perform post-closure modeling evaluation of the integrated flow system and contaminant plume fate/transport. This was a unique opportunity for IHS to assess the validity of previous post-closure hydrologic predictions made using the former Site Wide Water Balance model and fate/transport predictions using the GMS USGS Modflow/RT3D software.



Results were not directly comparable because the final land configuration (i.e., topography, vegetation etc) were not exactly the same as in the original SWWB model, though they were close. Results showed that none of the original conclusions changed. In more localized modeling areas (i.e., the Original Landfill area, or the Mound VOC treatment area), new information allowed for better description of local flow conditions. Results were presented to US DOE, SMStoller and state regulators.

Change in observed water levels (average, 1999/2000 vs. 2006/2007). Piezometers installed within the ground water intercept trench are circled in blue.



Observed flow data from MSPTS effluent manhole flume.

