# Ensure personnel and community protection by determining optimal locations and safe modes of operation for flare stacks and burner pits.

Used appropriate gas dispersion and heat flux models in different release scenarios involving a wide range of weather conditions to identify safe locations and modes of operation for flare stacks and burner pits near two well sites.

### Challenge

Define safe locations for burner pits and flare stacks in a complex in a drilling site with complex terrain to avoid heat, $SO_2$ or $H_2S$ exposure.

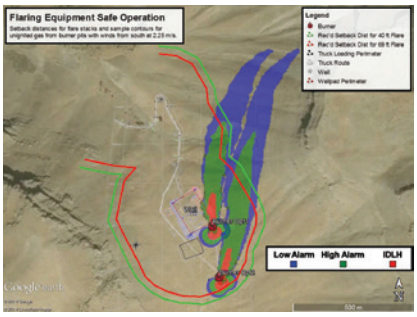
### Solution

Computational Fluid Dynamics (CFD) models with topography were used to evaluate the burner pits and an empirical model was applied to define heat flux and flare stack dispersion contours.

### Results

Identified safe locations for flare stacks and determined conditions for safe operation of burner pits to prevent potential hazards.

Two drilling sites were located in areas with complex terrain and limited space to position flaring equipment. During well cleanout activities, high volumes of combustible crude with elevated levels of $H_2S$ can pass into the burner pits. It is vital that operations occur safely, avoiding worker exposure to toxic gases or excessive heat. Determining appropriate locations for flaring equipment required proper gas dispersion and heat flux models for horizontal and vertical releases.



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## KEY CUSTOMER BENEFITS

### Applied top-notch technology for accurate assessments

Horizontal releases are greatly influenced by terrain, which is why CFD models with satellite elevation data were used to accurately simulate dispersion models of the burner pit releases. In addition, a suite of in-house software was used to generate hazard contours for each scenario and determine the maximum potential toxic gas concentrations and heat radiation levels at all locations where personnel or the public were present.

### Provided clear findings enabling the customer to make informed decisions

All modeling results were converted into clear illustrations that showed varying contours representing different concentrations of $H_2S$ or $SO_2$ (low, high or Immediately Dangerous to Life & Health - IDLH). These were overlaid onto satellite images (from Google Earth) of the well site, indicating whether areas with danger of toxic gas exposure overlapped any work site or public locations. Through these, images safe locations and modes of operation for the burner pits could clearly be identified as well as setback distances for the flare stack.

### Devised a table with the adequate mode of operation for each burner pit, depending on weather conditions

Proprietary software was used to generate tables that quantified the highest potential concentrations of $H_2S$ or $SO_2$ at each location under every simulated condition. A separate table for each burner pit was produced, summarizing modes of safe operation for different wind directions, identifying whether a release under a particular weather condition would lead to low, high or IDLH concentrations of toxic gases in a determined area.