Hot Spot Detection

Interpolations created using simple geospatial methods may be useful in identifying hot spots; however, plotting data values on a site map relative to suspected historical source or release areas may be equally helpful. Hot spots are often tentatively identified during EDA. A simple graphical presentation of the data may help to identify hot spots because they stand out as areas of high concentration. Box plots, histograms, and normal probability plots may provide objective standards against which to identify extreme values (see GSMC-1, Section 5.1, Graphical Methods, GSMC-1 Section 5.10, Identification of Outliers). Sample design tools specifically for hot spot detection are available in the Visual Sample Plan (VSP) software package. The VSP hot spot detection tool uses a traditional statistics algorithm that does not employ any of the geospatial methods discussed here.

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An area of connected high concentration indicated on map of interpolated data may indicate the presence of a hot spot and inform or optimize future sampling efforts in this area. The concentration level which is used to identify a hot-spot should consider regulatory levels, for example a grouping of concentrations that are above a regulatory level may be considered a hot spot, though not detectable as such through the use of other criteria. Some software programs use parametric statistics such as z-score to identify those areas which have values greater than expected (see ArcGIS and VSP).

Advanced methods such as kriging involve fitting a model of spatial correlation to the data. By examining the data on different scales short-range variability may be distinguished from long-range variability and potentially a hot spot may be detected. The short-range variability may be contributed to by contamination. Principal component analysis can help to identify a single contaminant from the larger data set (Goovaerts 1997).