the east bank of the Rogue River into the channel and may have excavated the channel of Rum Creek some 20 to 50 feet.

Generally speaking, we would expect that precipitation on the property and in areas to the east to percolate vertically to a saturated zone, then migrate as groundwater west toward the Rogue River and north toward Rum Creek. Existing groundwater and surface water level data bears that out, generally. Rose & Westra, Inc.'s August 16, 2012 submittal alludes to the possibility of, as they termed it, "stream flow" through portions of the site. Variation in flow patterns, from fanning out radially under some conditions to focused, "stream flow", under other conditions, is not unexpected in areas where fill material abuts natural soils. Understanding where the soil-fill contact lies and the differing hydraulic characteristics across this line will be necessary to accurately depict and quantify contaminant migration.

In addition to knowing the location and properties of the soil-fill contact, other geometric aspects of the flow system need definition. For example, what is the vertical limit beyond which we do not expect contaminants to migrate? This limit may be a physical barrier to vertical migration or hydraulic limits imposed by the influence of the main hydraulic sink, the surface water bodies. Several local water wells encountered a significant thickness of clay beginning some tens of feet below ground surface. Does such a layer exist beneath the site? If so, at what depth? Also, above that vertical limit, what are the hydraulic characteristics (hydraulic conductivity) and distribution of the various soil types encountered (i.e. the peat layer beneath the former laundry building near Rum Creek)?

Based upon the most recent submittals there appears to be three potential source areas: the Underground Storage Tank (UST) area, "the pit", and the Waste Water Treatment Plant (WWTP). The WWTP may itself have multiple release locations, but that will have to be evaluated in depth as additional data is gathered. Some soil has been excavated, but I could not find verification samples. The lateral or vertical extent of impact is not defined in any of these areas. In particular, the vertical extent of impact in the WWTP area needs to be defined. The clarifier, aeration, and EQ tanks for this system were large. When operating, these tanks may have released contaminants under a hydraulic head significantly greater than the surrounding aquifer, potentially driving contaminants deep below the water table. Concentrations of contaminants above GSI criteria have been detected in monitoring wells MW-1 and MW-2 adjacent to two of the tanks.

Source areas in addition to the three mentioned above could exist elsewhere on the property. DEQ's files contain very little information describing waste generation and handling prior to the installation of the waste water treatment plant. Similarly, little information is available describing where in the facility each process took place. The locations of historic waste disposal as well as process chemical usage should be tested to confirm that undetected sources do not remain.

In order to calculate the mass of contaminants leaving via groundwater, we must have a good sense of the lateral and vertical extent of each contaminant source area and resulting plume. Soil and groundwater samples sufficient to reasonably define the extent of the source areas and existing contaminant migration are prerequisite to calculating mass loading to the river and creek. The degree of investigation thus far, while useful, does not permit us to estimate the extent of impact on mass and cross-sections in a meaningful way.

The direction and quantification of contaminant migration from source areas to receptors is required by the DEQ to concur with assertions of the acceptability of risk, if such assertions are made in the future. A program of response activities to address the above questions would include the following elements: