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A Dual & Multi Phase Revival

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The purpose of this document is to bring to your attention a better way to perform Dual & Multi Phase remediation. This statement seems very strange to me because I have been marketing single phase recovery (i.e. skimming free floating product only) for over 20 years. Let's begin by taking note of the word "Revival" appearing in the title of this paper. The word "Revival" implies that the above mentioned methodologies may possibly have some undesirable aspects that Regulators and Clients alike would like some relief from. I am speaking of the O&M costs for above ground water treatment. This paper will present a lower cost way of performing dual & Multi Phase remediation.

In a traditional dual phase/total fluids pump and treat system, the total fluids pumps create a thoroughly emulsified cocktail and send it up to an above ground water treatment system for separation and disposal. The greater the emulsification, the bigger the oil-water separator has to be. If there happens to be any hardness or heavy concentrations of iron in the water heading for the air-stripper, well, that becomes a scaling nightmare. In a traditional multi-phase/bioslupper slurp and treat system, the vacuum extraction process also creates an unbelievable emulsified cocktail much worse than total fluids pumping. In some cases the cocktail mixture of water and free product does not separate at all. The bioslupper system also has the same air-stripper problems mentioned above. An additional setback to these approaches, is they both use fixed down well inlet recovery technology (i.e. the free product inlets do not track the varying water/product interface). On many occasions (i.e. days, weeks, months) the down well recovery hardware does not bring up any free product due to its placement. Furthermore, as free product thicknesses in the wells decline, make-up fuel costs for air treatment go through the roof and O&M costs increase. I do not believe I am overstating the adventures of prolonged down times and high demand for operator time on sites for these approaches.

I believe most Regulators and Clients have always wanted "CLOSURE" as the goal of any remediation action. In a lot of cases due to water conditions and technology, the Regulator and Client have experienced only the goal of operating a remediation system with minimum down time. The rest of this paper will focus on how to change/revive the above mentioned approaches to give the Regulators and Clients what they want.

To obtain closure of an LNAPL (Light Nonaqueous-Phase Liquid) site, one must first determine the location of the free product plume. Traditionally, this has been accomplished through the placing of monitoring wells. Gauging of the wells provides the thickness of the plume, and the well boring logs provide the type of geology in which the free product plume resides. This approach of data gathering will not lead to "Closure". It does not identify how much free product is located below the water line. There is a new ASTM #E2531-06 Standard Guide that speaks to this issue. I have observed sites where all free product floating on top of the water table was recovered and "Closure" status given by the Regulator. Years later, the same old free product showed up again in wells on the site. Why? It is due to the original characterization of the site. Obviously, there was some free product not detected. There is new commercially available technology that can clearly identify free product in the vedose zone and in the groundwater. It is called Laser-Induced Fluorescence (LIF). This sensing technology (trade name: UVOST) was developed by Dakota Technologies located in Fargo, North Dakota.

If we can now know how deep the LNAPL layer goes below top of static groundwater using LIF. Then the question arises how do we expose this area if it's several feet below water. Traditional methods mentioned above can be sized to handle this situation. However, there will be a large price tag to treat this additional water.

I would like to suggest a technology trade to reduce the cost of water treatment. I suggest we install a water depression pump at the bottom of the well several feet away from the top of water at full depression depth. I also suggest we install a free product skimmer in the same well at the water/product interface. If we pump free product directly to a holding tank, we will not need an oil-water separator. If we pump lightly contaminated water, we may not need an air stripper. The dissolve phase can be treated using carbon filtration. You can also add vacuum to this system to increase

radius of influence, increase LNAPL recovery, and scrub the vadose zone. Every site has its challenges. I hope I have provided some new helpful information for your next project. Please feel free to call Xitech with any questions. We at Xitech Instruments really strive to provide good workable solutions for your groundwater contamination problems. Thank you again for visiting our web site and reading this paper. Please feel free to browse our other papers and documents as well.