

Case Study: VC8

Vertebrae Well Systems for Biosparging

SITE

Talquin General Store - Active Retail Gasoline Station, Tallahassee, Florida
Facility ID 9046008

CONTAMINATION

Dissolved petroleum constituents were estimated to impact approximately 66,000 cubic feet, on and off site, due to spills from the on-site USTs. The plume begins on-site and travels under the adjacent roadway.

OBJECTIVE

The design involved two Vertebrae™ Well Systems (VWS) to provide targeted biosparging activities utilizing seven independent well segments. The VWS were designed to target the core of the plume and fan out downgradient to the furthest extent of the plume.

This case study illustrates how VWS can be efficiently utilized for biosparging events by targeting the entire plume, regardless of the build environment, roadway and structures, as well as subsurface utility issues.

BACKGROUND

A release was reported in 1994 in response to the automatic vapor detector alarms. In both 2007 and 2013 excavations took place with the removal of 1,800 tons of contaminated soil, followed by the application of oxidizing agent to the excavation sidewalls. These activities were limited by the right of way along the south side of the site. After AS/SVE pilot testing, biosparging was determined to be the most effective course of remediation.

INSTALLATION DETAILS

Figure 1 illustrates how seven well segments were installed without consideration to typical infrastructure obstacles; going under US 90, the site parking lot and driveway, and the building. The Vertebrae Well Systems were installed at the rear of the site which eliminated business disruption while also allowing access to the entire plume. Installation of both Vertebrae Well Systems were completed over two and half days including development activities. The seven well segments were constructed with 1-inch nominal HDPE screens and geotextile with ¾-inch riser tubing to the surface.

SYSTEM OPERATION RESULTS

The biosparge system became fully operational in May 2019. The designed flow rate was 6 cubic feet per minute (cfm) per well segment. At start up, due to high pressures measured in nearby monitoring wells, the operation was adjusted to 1.5-1.8 cfm per segment.

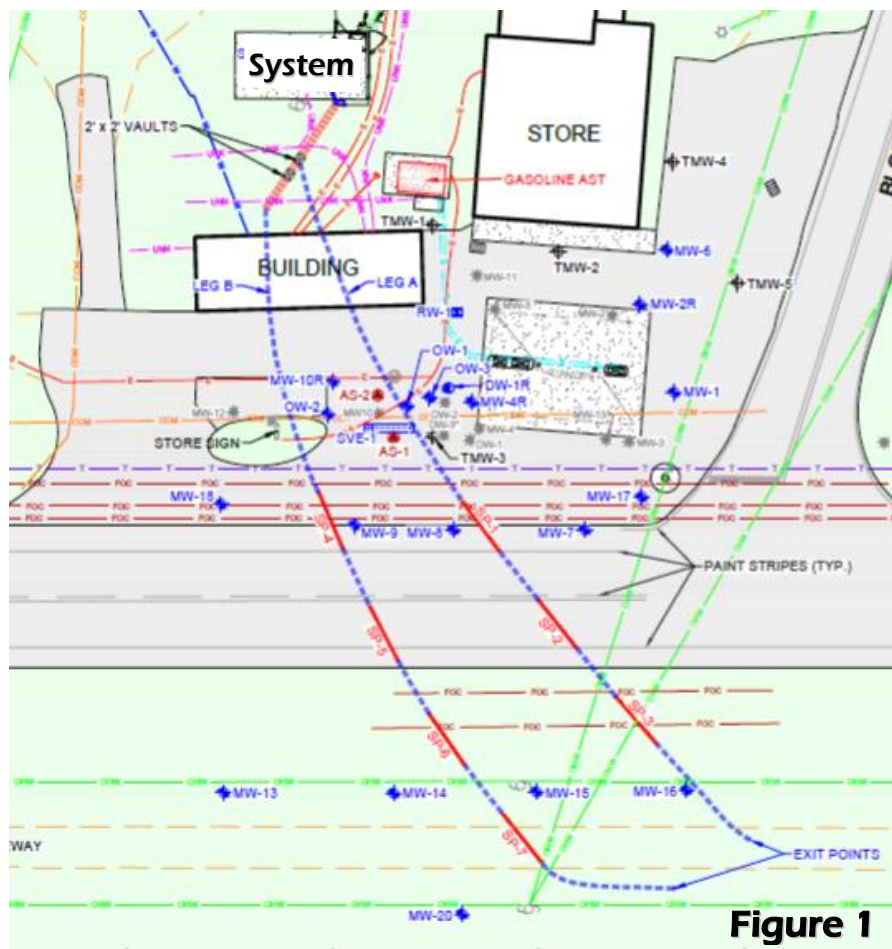


Figure 1

PERFORMANCE MONITORING RESULTS

The biosparge system has been successfully operational with the most recent data set taken in August, 2019 and the reductions were dramatic as represented in Table 1. An average reduction of over 90% was seen across these key monitoring wells. These are impressive results especially on a biosparge site operating significantly under its designed flow rates for 90 days. Coverage and control were clearly noted by Dissolved Oxygen (DO) readings in many of the wells and significant influence was observed across the site. Balancing of the biosparge system was easily achieved with the individual control delivered by the Vertebrae Well Systems.

Table 1

| Talquin General Store | Sample ID | MW-7 | MW-8 | MW-9 | MW-20 |
|----------------------------|-------------|------------|--------------|------------|--------|
| Parameters | Sample Date | | | | |
| Benzene (ug/L) | 9/17/2018 | 285 | 1,790 | 677 | 0.31U |
| | 8/15/2019 | 20 | 47 | 0.25U | 0.25U |
| | Reduction | 93% | 97% | 100% | N/A |
| Ethylbenzene (ug/L) | 9/17/2018 | 186 | 1,020 | 363 | 0.36U |
| | 8/15/2019 | 36 | 25 | 0.27U | 0.42U |
| | Reduction | 81% | 98% | 100% | N/A |
| Toluene (ug/L) | 9/17/2018 | 3.1U | 50 | 14 | 0.72U |
| | 8/15/2019 | 1 | 4 | 0.24U | 0.24U |
| | Reduction | 68% | 92% | 100% | N/A |
| Xylene (ug/L) | 9/17/2018 | 11.1U | 338 | 23.8U | 0.72U |
| | 8/15/2019 | 11 | 54 | 0.50U | 0.50U |
| | Reduction | 0% | 84% | 100% | N/A |
| Naphthalene (ug/L) | 9/17/2018 | 80 | 372 | 197 | 0.33 U |
| | 8/15/2019 | 12 U | 1.2U | 1.2U | 1.3U |
| | Reduction | 85% | 100% | 100% | N/A |
| 1-Methylnaphthalene (ug/L) | 9/17/2018 | 13 | 31 | 27 | 0.33 U |
| | 8/15/2019 | 2.7 U | 0.59U | 0.59U | 0.62U |
| | Reduction | 79% | 100% | 100% | N/A |
| 2-Methylnaphthalene (ug/L) | 9/17/2018 | 17 | 83 | 57 | 0.33 U |
| | 8/15/2019 | 3.6 U | 0.62U | 0.62U | 0.64U |
| | Reduction | 78% | 100% | 100% | N/A |

COST

Faced with a daunting situation, highlighted by the fact that the FDOT would not allow trenching through the roadway and wells adjacent to the road would not have provided complete coverage. Regardless this was not only a reasonable approach, but was also very cost-efficient. The drilling and the well installation cost \$40,400 and represented a huge savings of a limited number of alternatives.

CONCLUSIONS

Vertebrae Well Systems are an excellent tool for implementing a biosparge remediation strategy. Cost effectively, it can be constructed to provide complete plume coverage in hard to access areas. The horizontal nature of the Vertebrae well system allows the biosparge wells to be installed under physical impediments with no disruption. The Vertebrae Well System allows for enhanced control as each well segment is independent. This is critical, because as the contaminant plume is reduced and changes shape, the Vertebrae Well Systems can be regulated to adapt to new conditions.

As more sites utilize Vertebrae for remediation, and experience the added control and improved efficiency, more sites will choose Vertebrae as the preferred "tool" to implement the selected remedial approach.