Case Study: VC15
Performance of Vertebrae Wells vs. Vertical Wells

SITE
Former D&A Produce (Active Retail and Pharmacy Store), Chipley, FL

CONTAMINATION
Gasoline Range Organics in ground water

OBJECTIVE
This case study explores the use of traditional vertical wells alongside the Vertebrae Well System as remediation tools on the same site. With the use of pressure readings over an extended period of injection time the comparison can be made between the two types of wells and their performance can be assessed.

BACKGROUND
A release of gasoline fuel from a UST at this facility led to soil and groundwater contamination. After tank removal and proper site assessment and a pilot test it was decided to move forward with a combination of the Vertebrae™ Well System (VWS) and traditional vertical wells as the remedial design. An automated injection system, the EN RX Support Platform (SP unit) was utilized for the distribution of an ISCO amendment. The SP unit has a unique feature which allows pressure readings to be recorded throughout the injection process.

SITE LITHOLOGY
The lithology has been described as silty clayey sand from 5-10 bls, cohesive clay from 10-12' bls, sandy clay from 12-22.5' bls, and cohesive clay with sand seams from 22.5-37.5' bls.

WELL DATA
- The four Vertebrae Well Systems are installed between 11-14' bls, consisting of 11 independent 5 ft long well segments.
- The intermediate vertical wells are installed at 17.5-22.5' bls.
- The deep vertical wells are installed at 27.5-32.5' bls.
- Figure 1 shows the well layout with all wells trenched to the injection system compound.

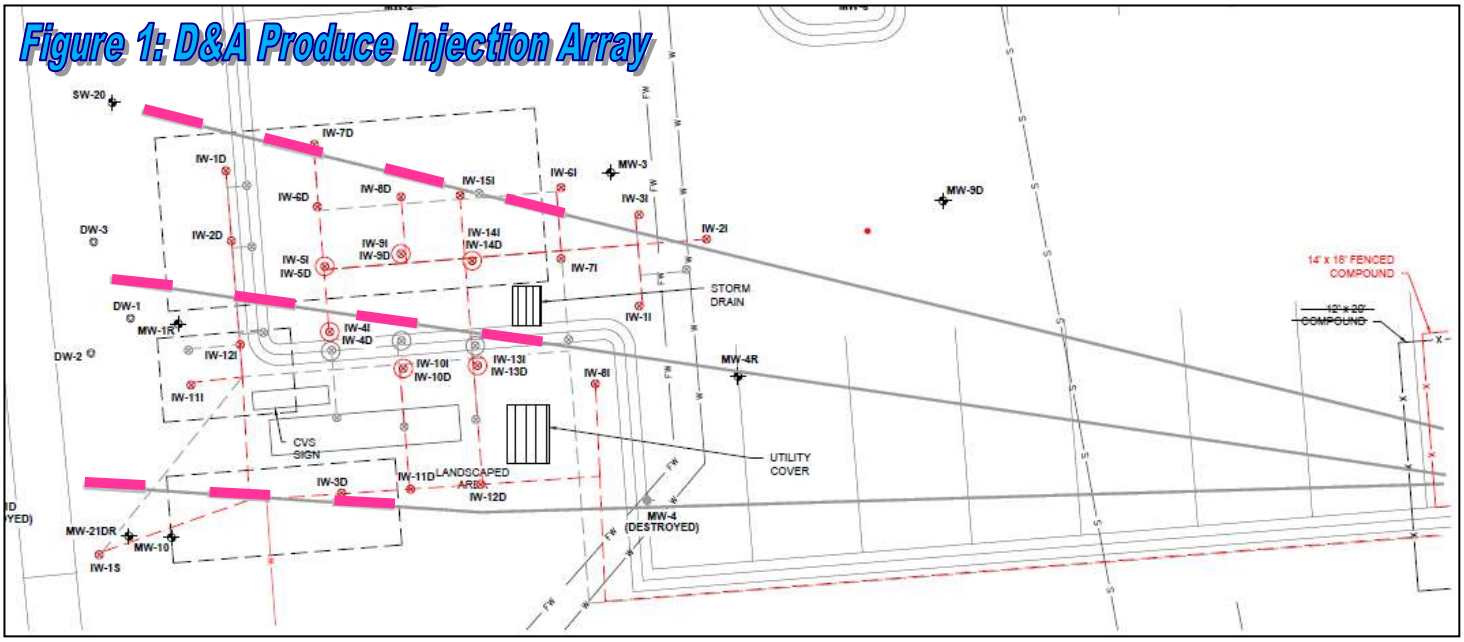

Figure 1: D&A Produce Injection Array

RESULTS

The table below includes three readings of the average pressure recorded at each injection channel. The injection system automates injection into each channel for the same time per cycle (2-mins per channel) and the same flow rate, 0.5 gpm. The Vertebrae well segments experienced on average a pressure of 2.1 psi during injection events. This is much lower when compared with the intermediate vertical wells (average of 10 psi) that were installed in a similar lithology. The deep vertical wells performed with an average pressure of 12.9 psi showing a correlation with the difficulty of injecting into a clay lithology.

Average Pressure Readings (psi)				
	Channel	7/26/2020	10/1/2020	11/17/2020
Vertebrae Well Segments	**1**	1	2	1
	2	1	2	2
	3	2	3	1
	4	1	5	5
	5	0	2	4
Intermediate Vertical Wells	**6**	7	8	9
	7	8	8	17
	8	7	8	16
	9	6	8	9
Deep Vertical Wells	**10**	9	5	7
	11	16	17	17
	12	16	16	17
	13	17	17	16
	14*	1	1	2
	15	8	8	3
	16	2	3	39**
Intermediate Vertical Wells	**17**	2	3	39**
	18	8	8	9

*Channel 14 low pressure due to surfacing issues ** Valve Stuck

CONCLUSION

It is difficult at most sites to compare these two types of wells as it is rare to install them for the same purposes, at similar depths, and in proximal locations. However, this site presented this unique opportunity, and the outcome was impressive. **The Vertebrae well systems appear to perform 4 to 5 times better** (based on pressure) than the vertical wells in the same lithology at similar depths and with the same amount of well screen. Higher flows are likely possible using the Vertebrae well segments, and it is more likely that lower pressure results in a more even injection. This site provides proof of what models have shown, that horizontal applications provide better contact to the subsurface and result in higher performance.

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