Maapera Salinity Field Screening Technology Case Study

Background:

Maapera has developed a soil analysis technology that is able to quantitatively evaluate soil contamination in near real time for field use. This technology is based on Spectrometry and Advanced Algorithms to turn spectral signatures in to meaningful information.

One of the advancements Maapera has developed, in addition to our field ready Hydrocarbon solutions, is to quantify salts contamination.

Typically, a field probe to measure electrical conductivity is used as part of field screening activities with salts contamination.

The challenge with using EC probes for this purpose is that the measurements vary substantially based on 3 factors (salts content, water content, and clay content/ lithology). This means that the probe is trying to measure 3 variables with only one measurement. Scientifically this is not possible and hence this method yield poor correlations to lab results.

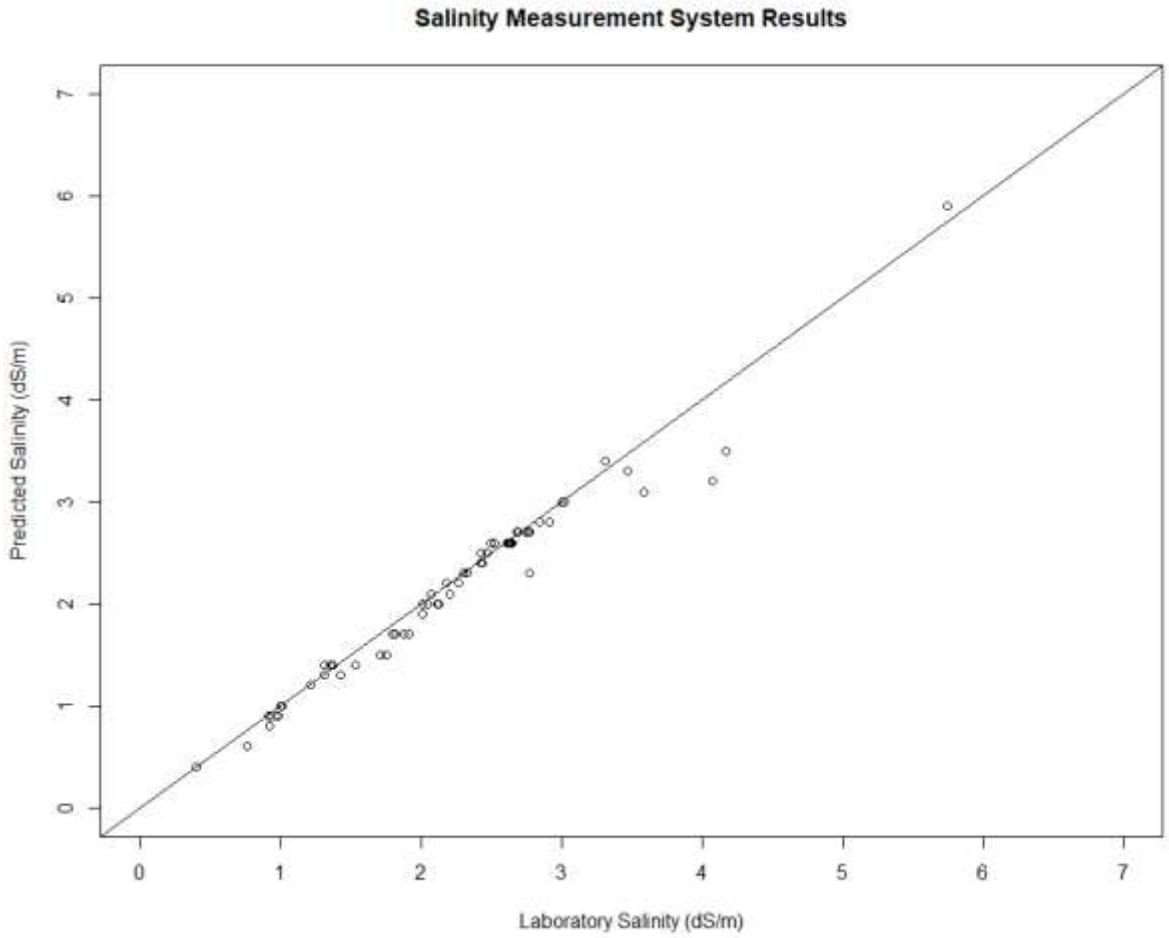
Maapera's NIRS technology is able to determine water content as well as clay content in a sample and when paired with a EC probe data machine learning algorithms can be used to correct the readings.

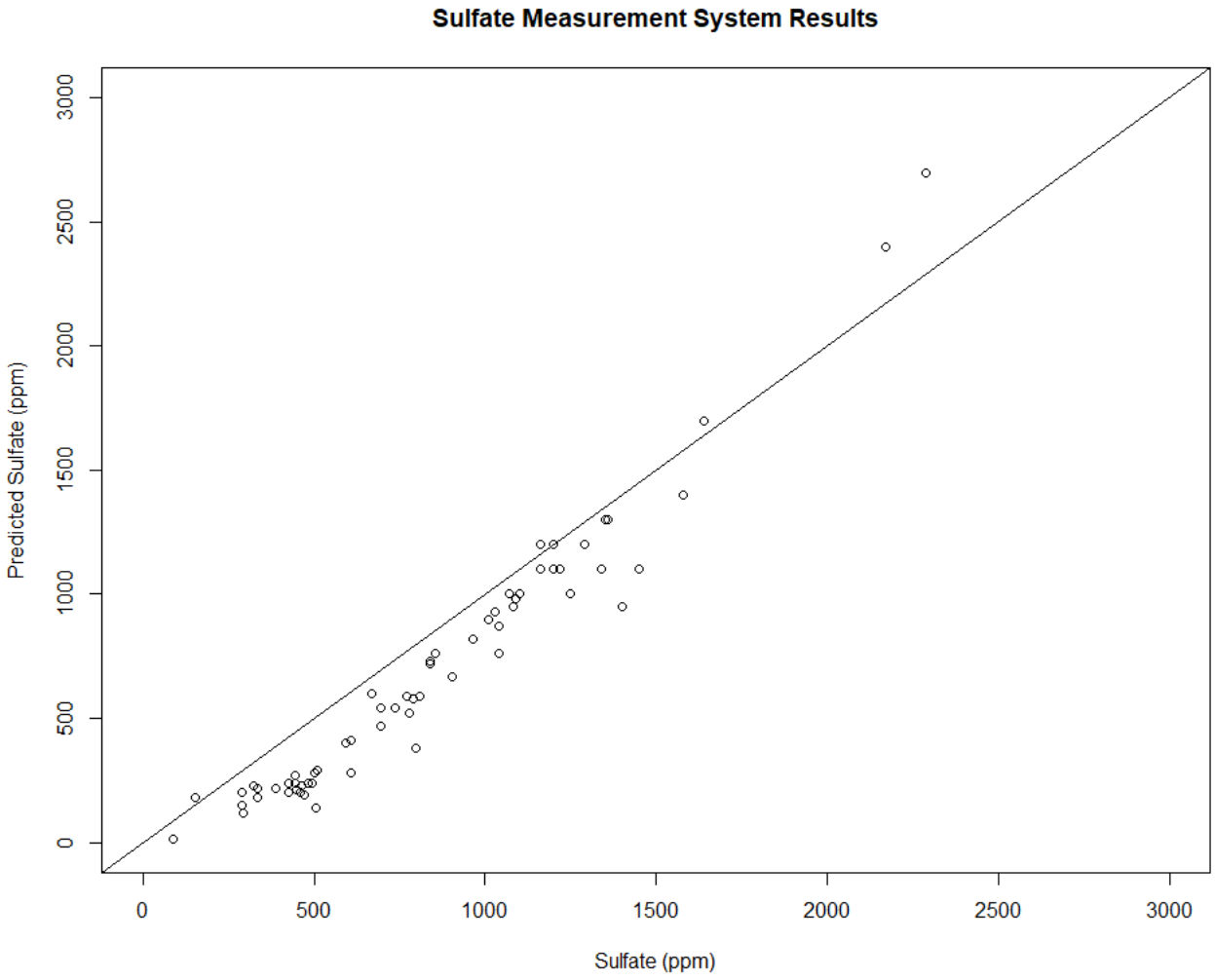
Maapera's salinity measurement system provides highly correlated data for electrical conductivity and sulfate concentrations that is significantly improved from any existing field method today. The Maapera system has also recently started to expand the capabilities of the tool for estimating chlorides and sodium adsorption ratio (SAR) in the field. The results from a an actual field deployment are shown below.

Some images of the system set up in the field are show below:

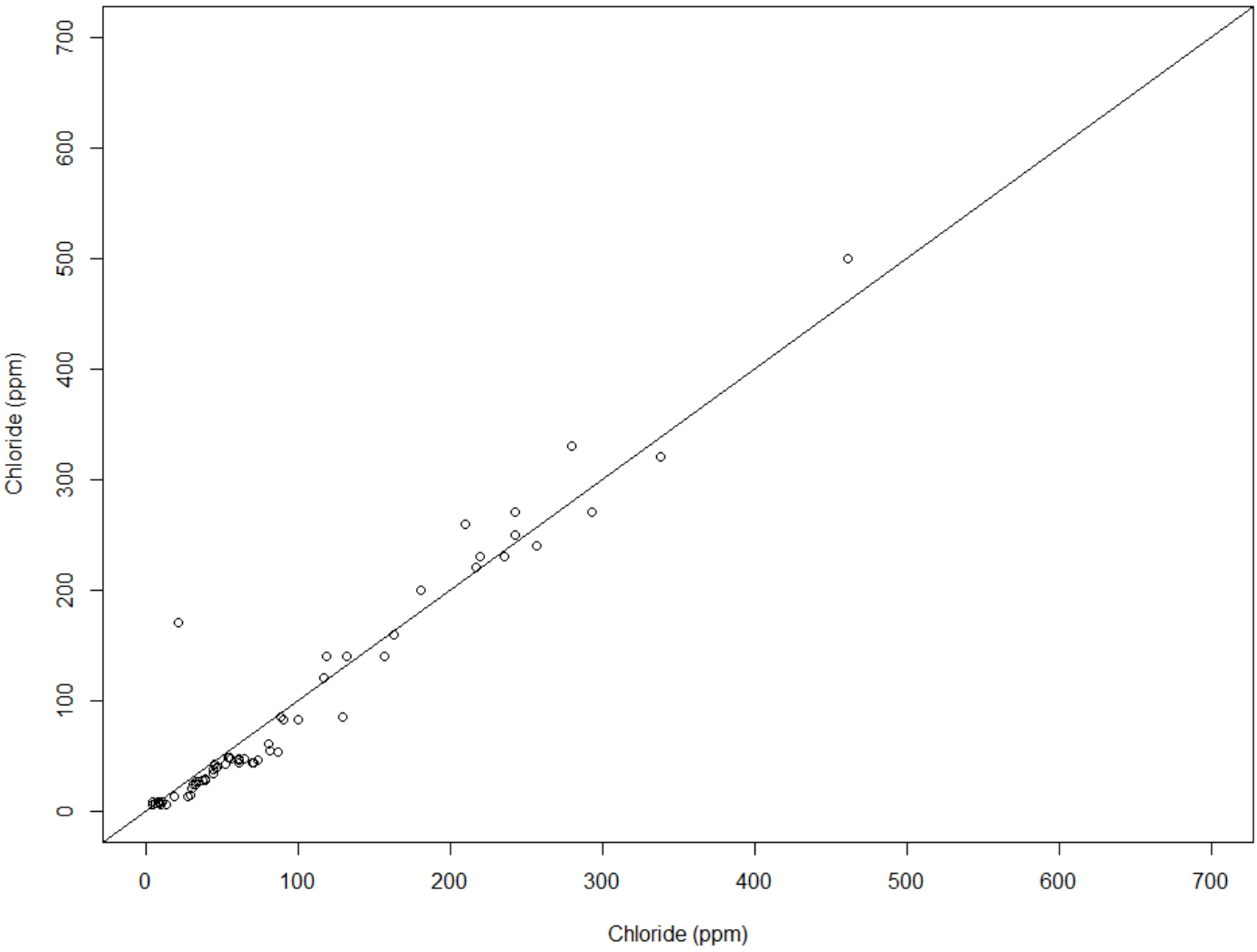
Figures illustrating the results are as follows. The y axis indicated Maapera's values, and the x-axis the third-party laboratory values. For a perfect fit, all datapoints would fall on the black 1:1 line. In addition to the correlation plots we have provided the tabular data as well as visualization of the plumes that was created in near real time with out advanced 3D plotting software.

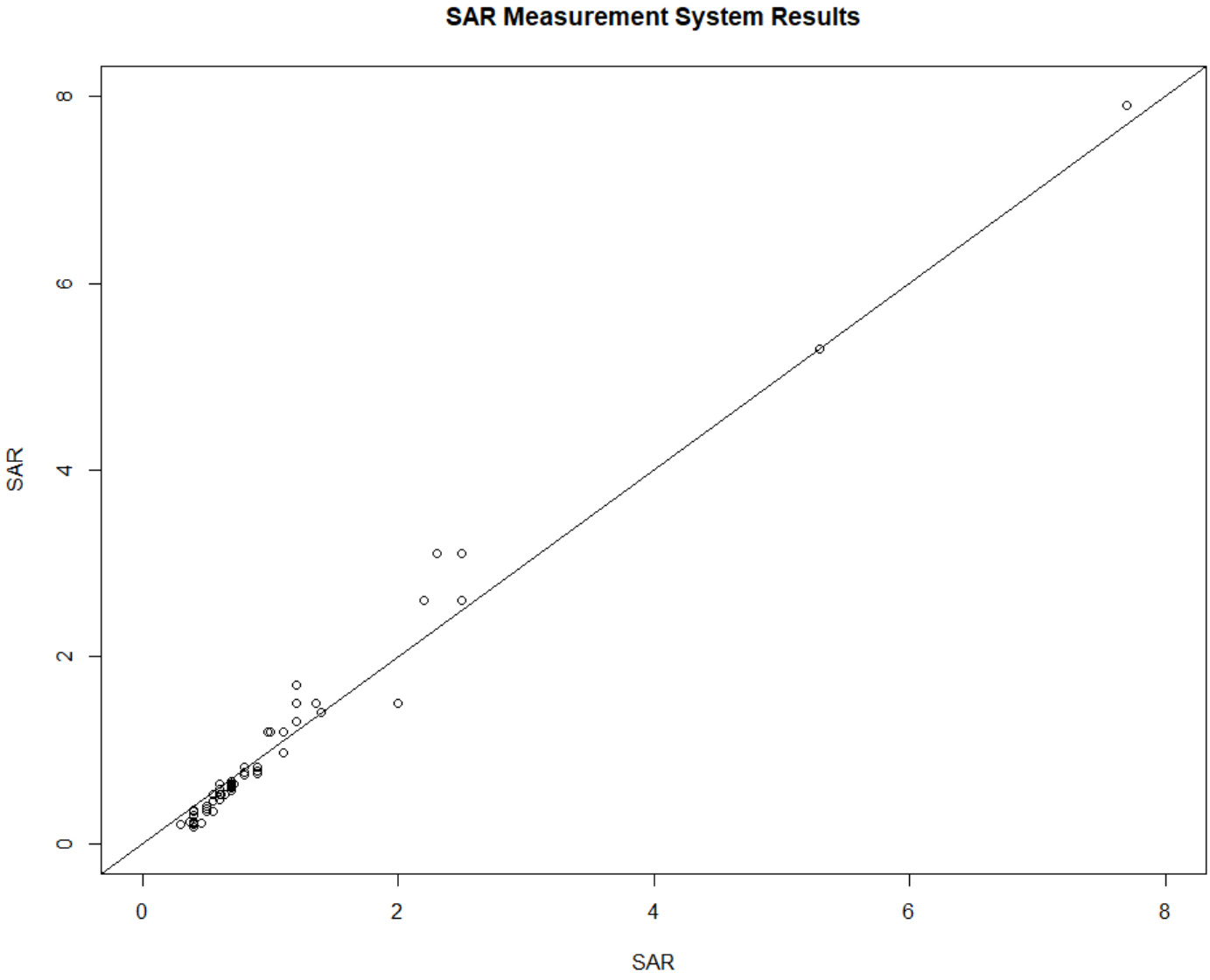
Correlation to Lab:




Sulfate Measurement System Results
Predicted Sulfate (ppm)
Sulfate (ppm)
0
500
1000
1500
2000
2500
3000

Chloride Measurement System Results




SAR Measurement System Results
SAR
SAR
0
2
4
6
8
0
2
4
6
8

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Analysis Results Comparison

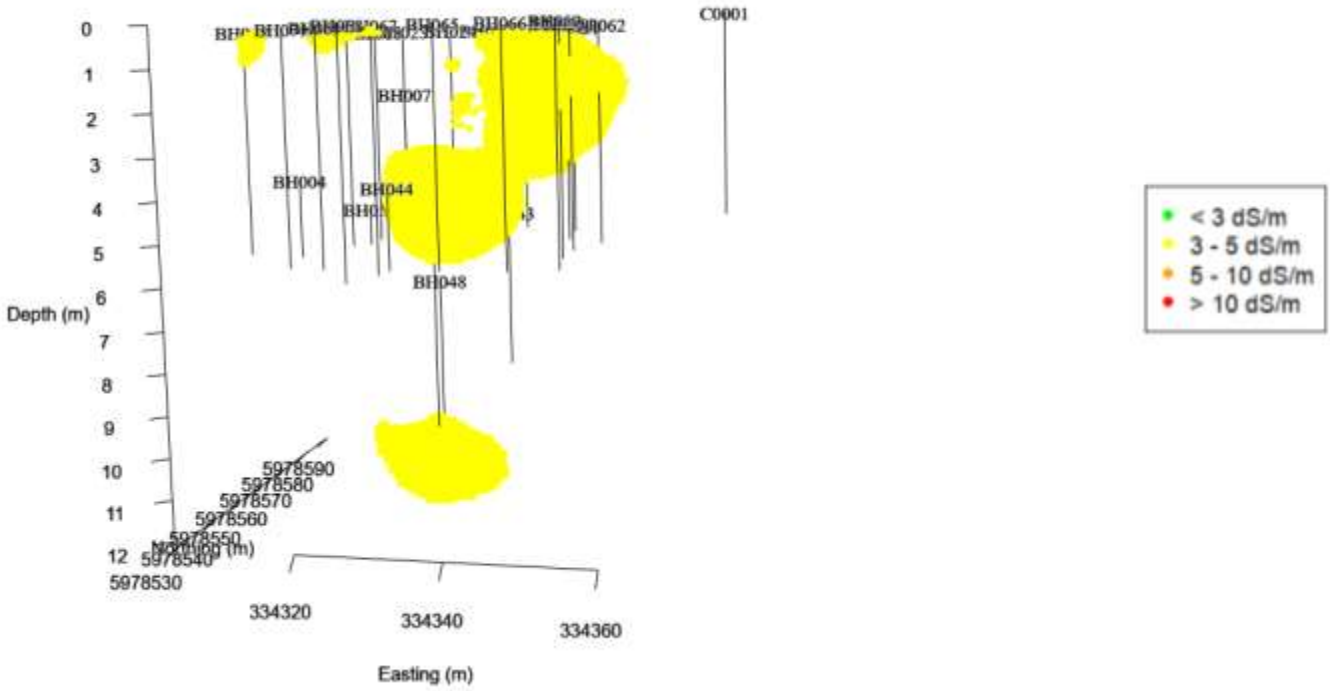
The following table provides Maapera's results along with results from a third party analytical laboratory.

	Maapera				Third Party Lab Results			
Sample	EC	Chlorides (ppm)	Sulfate (ppm)	SAR	EC	Chlorides	Sulfate (ppm)	SAR
BH004_3.7_4	1.2	14	120	1.2	1.21	29	293	1.1
BH007_2.7_3	2.3	85	590	0.34	2.33	129	771	0.4
BH007_3.7_4	1.5	42	190	0.21	1.75	52	470	0.4
BH014_0.7_1	2.8	240	930	0.62	2.84	257	1030	0.7
BH014_3.7_4	1.4	42	230	0.74	1.37	45	324	0.8
BH018_2.7_3	2	250	220	0.3	2.01	243	335	0.4
BH018_3.7_4	1.9	270	180	0.36	2.01	243	335	0.4
BH018_4.7_5	2.4	47	380	0.4	2.43	65	799	0.5
BH018_5.7_6	2.7	39	870	0.66	2.68	46	1040	0.7
BH023_2.7_3	1.7	140	200	0.21	1.91	157	459	0.4
BH023_3.7_4	2.5	230	220	0.2	2.47	220	386	0.4
BH023_4.7_5	2	34	540	0.37	2.12	44	696	0.5
BH023_5.7_6	2	37	470	0.4	2.12	44	696	0.5
BH024_2.7_3	2	140	230	0.47	2.05	157	463	0.6
BH024_3.7_4	3.1	500	280	0.58	3.59	461	502	0.6
BH024_4.7_5	2.3	43	580	0.4	2.3	71	788	0.5
BH024_5.7_6	2.2	34	670	0.62	2.27	44	904	0.7
BH025_0.7_1	2.1	24	1000	0.56	2.21	31	1070	0.7
BH025_3.7_4	1.4	8.2	200	0.18	1.53	9	426	0.4
BH043_4.7_5	3.4	330	760	0.82	3.31	280	855	0.8
BH043_5.7_6	2.7	270	1100	0.64	2.77	293	1340	0.7
BH043_6.7_7	1.5	48	540	1.2	1.71	54	738	1
BH043_7.7_8	2.4	24	410	1.4	2.43	33	606	1.4
BH044_3.7_4	2.2	48	600	0.64	2.18	55	670	0.7
BH047_4.7_5	3.5	770	1300	3.1	4.17	666	1350	2.3
BH047_5.7_6	3.3	320	950	1.3	3.47	338	1080	1.2
BH047_6.7_7	2.4	220	1100	1.7	2.44	217	1220	1.2
BH047_7.7_8	2.5	26	280	1.4	2.43	33	606	1.4
BH047_8.7_9	1.7	13	140	2.6	1.82	28	504	2.2
BH048_6.7_7	2.6	160	760	1.5	2.52	163	1040	1.2
BH048_8.7_9	1.4	29	150	2.6	1.31	39	290	2.5
BH050_3.7_4	1.3	28	200	3.1	1.31	39	290	2.5
BH051_0.7_1	2.7	43	1100	0.82	2.76	61	1450	0.9
BH051_2.7_3	2.7	47	1100	0.78	2.76	61	1450	0.9
BH057_0.7_1	3.2	55	2700	5.3	4.07	82	2290	5.3
BH059_0.7_1	2.6	53	1100	0.6	2.65	87	1200	0.7
BH059_1.7_2	2.1	40	1300	0.22	2.07	47	1350	0.4

BH060_0.7_1	3	260	1000	0.63	3	210	1100	0.6
BH060_2.7_3	2	46	730	0.3	2.13	74	839	0.4
BH061_0.7_1	3	230	980	0.4	3.02	236	1090	0.5
BH061_1.7_2	2.6	140	820	0.21	2.63	132	964	0.3
BH061_4.7_5	2.7	83	1200	0.34	2.76	90	1290	0.5
BH062_0.7_1	2.6	82	1200	0.35	2.64	100	1200	0.5
BH062_3.7_4	2.6	26	720	0.23	2.5	35	840	0.4
BH063_0.7_1	5.9	60	2400	7.9	5.75	81	2170	7.7
BH063_3.7_4	2.6	85	520	0.2	2.62	89	779	0.4
BH064_0.7_1	2.7	28	1300	0.74	2.68	37	1360	0.8
BH064_2.7_3	1.4	8.1	270	0.2	1.36	11	444	0.4
BH065_0.7_1	2.8	200	1200	0.52	2.91	181	1160	0.6
BH065_1.7_2	1.7	47	400	0.61	1.88	56	594	0.7
BH066_0.7_1	2.3	120	1100	0.73	2.77	117	1160	0.8
BH067_0.7_1	2.7	44	1400	1.2	2.69	70	1580	1
BH069_0.7_1	2.6	46	950	1.5	2.52	61	1400	2
BH070_1_1.3	2.7	20	1000	0.97	2.75	30	1250	1.1
C0001_0.15_0.3	0.4	170	12	0.22	0.4	21.3	87.2	0.46
C0001_0.3_0.6	2.6	13	1700	0.64	2.61	18.6	1640	0.72
C0001_0.7_1	1.7	7.7	900	1.2	1.8	8.5	1010	0.98
C0001_0_0.15	0.6	140	180	0.23	0.76	119	152	0.37
C0001_1.3_1.6	1	7.7	290	0.35	1	8.3	510	0.55
C0001_1.7_2	0.8	8.2	210	0.45	0.92	9.4	450	0.55
C0001_1_1.3	1.3	7.4	590	0.76	1.43	6	810	0.8
C0001_2.3_2.6	0.9	6	240	0.53	0.91	5	425	0.61
C0001_2.7_3	0.9	6	240	0.53	0.97	13.7	493	0.64
C0001_2_2.3	0.9	6	240	0.53	0.93	10.2	444	0.55
C0001_3.7_4	0.9	7.5	280	0.75	0.98	5	501	0.9
C0001_4.2_4.5	1	7.4	240	1.5	1.01	8.6	482	1.36

Spatial Analysis

Electrical Conductivity 3d Plot.



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Chloride Concentration 3d Plot