

MOUNTAIN-PLAINS CONSORTIUM

MPC 21-434 | A. Jones, N. Wehbe, S. Klay and S. Maassen

Mitigation of Corrosion in
Continuously Reinforced
Concrete Pavement
Appendices



A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

Colorado State University
North Dakota State University
South Dakota State University

University of Colorado Denver
University of Denver
University of Utah

Utah State University
University of Wyoming

Mitigation of Corrosion in Continuously Reinforced Concrete Pavement

Volume 2 – Appendices

Allen Jones
Professor
South Dakota State University
Department of Civil and Environmental Engineering
Box 2219, Crothers Engineering Hall 322
Brookings, SD 57007
allen.jones@sdstate.edu

Nadim Wehbe
Professor
South Dakota State University
Department of Civil and Environmental Engineering
Box 2219, Crothers Engineering Hall 322
Brookings, SD 57007
nadim.wehbe@sdstate.edu

Stephanie (Peters) Klay
Shaun Maassen
Graduate Research Assistant
South Dakota State University
Department of Civil and Environmental Engineering
Box 2219, Crothers Engineering Hall 322
Brookings, SD 57007

May 2021

TABLE OF CONTENTS

Appendix A. Site Selection Matrix for Statewide Evaluation	1
Appendix B. equipotential contour maps for initial and Statewide Assessments	7
Appendix C. Chloride Profiles for Initial and Statewide Assessments	79
Appendix D. Pavement Distress Definitions	101
Appendix E. Equipotential Contour Maps for Mitigation Product Assessment.....	102
Appendix F. Plots of Half-Cell Potential Measurements for Field Testing of Mitigation products	168

LIST OF TABLES

Table A.1 Site selection matrix for statewide evaluation	2
--	---

LIST OF FIGURES

Figure B.1: Equipotential contour map legend	8
Figure B.2: MRM 87 fall 2010 from 80 to 100 feet.....	9
Figure B.3: MRM 87 fall 2010 from 60 to 80 feet.....	10
Figure B.4: MRM 87 fall 2010 from 40 to 60 feet.....	11
Figure B.5: MRM 87 fall 2010 from 20 to 40 feet.....	12
Figure B.6: MRM 87 fall 2010 from 0 to 20 feet.....	13
Figure B.7: MRM 87 spring 2011 from 80 to 100 feet.....	14
Figure B.8: MRM 87 spring 2011 from 60 to 80 feet.....	15
Figure B.9: MRM 87 spring 2011 from 40 to 60 feet.....	16
Figure B.10: MRM 87 spring 2011 from 20 to 40 feet.....	17
Figure B.11: MRM 87 spring 2011 from 0 to 20 feet.....	18
Figure B.12: MRM 68 fall 2010 from 80 to 100 feet.....	19
Figure B.13: MRM 68 fall 2010 from 60 to 80 feet.....	20
Figure B.14: MRM 68 fall 2010 from 40 to 60 feet.....	21
Figure B.15: MRM 68 fall 2010 from 20 to 40 feet.....	22
Figure B.16: MRM 68 fall 2010 from 0 to 20 feet.....	23
Figure B.17: MRM 68 spring 2011 from 80 to 100 feet.....	24
Figure B.18: MRM 68 spring 2011 from 60 to 80 feet.....	25
Figure B.19: MRM 68 spring 2011 from 40 to 60 feet.....	26
Figure B.20: MRM 68 spring 2011 from 20 to 40 feet.....	27
Figure B.21: MRM 68 spring 2011 from 0 to 20 feet.....	28
Figure B.22: MRM 411 fall 2010 from 80 to 100 feet.....	29
Figure B.23: MRM 411 fall 2010 from 60 to 80 feet.....	30
Figure B.24: MRM 411 fall 2010 from 40 to 60 feet.....	31
Figure B.25: MRM 411 fall 2010 from 20 to 40 feet.....	32
Figure B.26: MRM 411 fall 2010 from 0 to 20 feet.....	33
Figure B.27: MRM 411 spring 2011 from 80 to 100 feet.....	34
Figure B.28: MRM 411 spring 2011 from 60 to 80 feet.....	35
Figure B.29: MRM 411 spring 2011 from 40 to 60 feet.....	36
Figure B.30: MRM 411 spring 2011 from 20 to 40 feet.....	37
Figure B.31: MRM 411 spring 2011 from 0 to 20 feet.....	38
Figure B.32: MRM 33 from 80 to 100 feet.....	39
Figure B.33: MRM 33 from 60 to 80 feet.....	40
Figure B.34: MRM 33 from 40 to 60 feet.....	41
Figure B.35: MRM 33 from 20 to 40 feet.....	42
Figure B.36: MRM 33 from 0 to 20 feet.....	43
Figure B.37: MRM 44 from 80 to 100 feet.....	44
Figure B.38: MRM 44 from 60 to 80 feet.....	45
Figure B.39: MRM 44 from 40 to 60 feet.....	46
Figure B.40: MRM 44 from 20 to 40 feet.....	47
Figure B.41: MRM 44 from 0 to 20 feet.....	48

Figure B.42: MRM 25 from 80 to 100 feet.....	49
Figure B.43: MRM 25 from 60 to 80 feet.....	50
Figure B.44: MRM 25 from 40 to 60 feet.....	51
Figure B.45: MRM 25 from 20 to 40 feet.....	52
Figure B.46: MRM 25 from 0 to 20 feet.....	53
Figure B.47: MRM 54 from 80 to 100 feet.....	54
Figure B.48: MRM 54 from 60 to 80 feet.....	55
Figure B.49: MRM 54 from 40 to 60 feet.....	56
Figure B.50: MRM 54 from 20 to 40 feet.....	57
Figure B.51: MRM 54 from 0 to 20 feet.....	58
Figure B.52: MRM 222 from 80 to 100 feet.....	59
Figure B.53: MRM 222 from 60 to 80 feet.....	60
Figure B.54: MRM 222 from 40 to 60 feet.....	61
Figure B.55: MRM 222 from 20 to 40 feet.....	62
Figure B.56: MRM 222 from 0 to 20 feet.....	63
Figure B.57: MRM 246 from 80 to 100 feet.....	64
Figure B.58: MRM 246 from 60 to 80 feet.....	65
Figure B.59: MRM 246 from 40 to 60 feet.....	66
Figure B.60: MRM 246 from 20 to 40 feet.....	67
Figure B.61: MRM 246 from 0 to 20 feet.....	68
Figure B.62: MRM 168 NB from 80 to 100 feet	69
Figure B.63: MRM 168 NB from 60 to 80 feet	70
Figure B.64: MRM 168 NB from 40 to 60 feet	71
Figure B.65: MRM 168 NB from 20 to 40 feet	72
Figure B.66: MRM 168 NB from 0 to 20 feet	73
Figure B.67: MRM 168 SB from 80 to 100 feet.....	74
Figure B.68: MRM 168 SB from 60 to 80 feet.....	75
Figure B.69: MRM 168 SB from 40 to 60 feet.....	76
Figure B.70: MRM 168 SB from 20 to 40 feet.....	77
Figure B.71: MRM 168 SB from 0 to 20 feet.....	78
Figure C.1: Vertical chloride profile of dust sample 1 at MRM 87	80
Figure C.2: Vertical chloride profile of dust sample 2 at MRM 87	80
Figure C.3: Vertical chloride profile of dust sample 3 at MRM 87	81
Figure C.4: Vertical chloride profile of dust sample 4 at MRM 87	81
Figure C.5: Vertical chloride profile of dust sample 1 at MRM 68	82
Figure C.6: Vertical chloride profile of dust sample 2 at MRM 68	82
Figure C.7: Vertical chloride profile of dust sample 3 at MRM 68	83
Figure C.8: Vertical chloride profile of dust sample 4 at MRM 68	83
Figure C.9: Vertical chloride profile of dust sample 1 at MRM 411	84
Figure C.10: Vertical chloride profile of dust sample 2 at MRM 411	84
Figure C.11: Vertical chloride profile of dust sample 3 at MRM 411	85
Figure C.12: Vertical chloride profile of dust sample 4 at MRM 411	85
Figure C.13: Vertical chloride profile of dust sample 1 at MRM 33	86
Figure C.14: Vertical chloride profile of dust sample 2 at MRM 33	86
Figure C.15: Vertical chloride profile of dust sample 1 at MRM 44	87
Figure C.16: Vertical chloride profile of dust sample 2 at MRM 44	87
Figure C.17: Vertical chloride profile of dust sample 1 at MRM 25.....	88
Figure C.18: Vertical chloride profile of dust sample 2 at MRM 25	88
Figure C.19: Vertical chloride profile of dust sample 1 at MRM 54	89

Figure C.20: Vertical chloride profile of dust sample 2 at MRM 54.....	89
Figure C.21: Vertical chloride profile of dust sample 1 at MRM 222.....	90
Figure C.22: Vertical chloride profile of dust sample 2 at MRM 222.....	90
Figure C.23: Vertical chloride profile of dust sample 1 at MRM 246.....	91
Figure C.24: Vertical chloride profile of dust sample 2 at MRM 246.....	91
Figure C.25: Vertical chloride profile of dust sample 1 at MRM 168 NB	92
Figure C.26: Vertical chloride profile of dust sample 2 at MRM 168 NB	92
Figure C.27: Vertical chloride profile of dust sample 1 at MRM 168SB	93
Figure C.28: Vertical chloride profile of dust sample 2 at MRM 168SB	93
Figure C.29: Horizontal chloride profile of core MRM 87-3 at depth 0.5 inches	94
Figure C.30: Horizontal chloride profile of core MRM 87-3 at depth 1.5 inches	94
Figure C.31: Horizontal chloride profile of core MRM 87-3 at depth 2.5 inches	95
Figure C.32: Horizontal chloride profile of core MRM 87-3 at depth 3.5 inches	95
Figure C.33: Horizontal chloride profile of core MRM 68-3 at depth 0.5 inches	96
Figure C.34: Horizontal chloride profile of core MRM 68-3 at depth 1.5 inches	96
Figure C.35: Horizontal chloride profile of core MRM 68-3 at depth 2.5 inches	97
Figure C.36: Horizontal chloride profile of core MRM 68-3 at depth 3.5 inches	97
Figure C.37: Horizontal chloride profile of core MRM 68-3 at depth 4.5 inches	98
Figure C.38: Horizontal chloride profile of core MRM 411-1 at depth 0.5 inches	98
Figure C.39: Horizontal chloride profile of core MRM 411-1 at depth 1.5 inches	99
Figure C.40: Horizontal chloride profile of core MRM 411-1 at depth 2.5 inches	99
Figure C.41: Horizontal chloride profile of core MRM 411-1 at depth 3.5 inches	100
 Figure E.1: Legend for half-cell potential contour maps	103
Figure E.2: Section A – 8/25/2011.....	104
Figure E.3: Section A – 10/6/2011.....	105
Figure E.4: Section A – 10/27/2012.....	106
Figure E.5: Section A – 4/10/2012.....	107
Figure E.6: Section A – 5/9/2012.....	108
Figure E.7: Section B – 8/25/2011.....	109
Figure E.8: Section B – 10/6/2011.....	110
Figure E.9: Section B – 10/27/2012.....	111
Figure E.10: Section B – 4/10/2012.....	112
Figure E.11: Section B – 5/9/2012.....	113
Figure E.12: Section C – 8/25/2011.....	114
Figure E.13: Section C – 10/6/2011.....	115
Figure E.14: Section C – 10/27/2012.....	116
Figure E.15: Section C – 4/10/2012.....	117
Figure E.16: Section C – 5/9/2012.....	118
Figure E.17: Section D – 8/25/2011.....	119
Figure E.18: Section D – 10/6/2011.....	120
Figure E.19: Section D – 10/27/2012.....	121
Figure E.20: Section D – 4/10/2012.....	122
Figure E.21: Section D – 5/9/2012.....	123
Figure E.22: Section E – 8/25/2011	124
Figure E.23: Section E – 10/6/2011	125
Figure E.24: Section E – 10/27/2011	126
Figure E.25: Section E – 4/10/2012	127
Figure E.26: Section E – 5/9/2012	128
Figure E.27: Section F – 8/25/2011	129

Figure E.28: Section F – 10/6/2011	130
Figure E.29: Section F – 10/27/2011	131
Figure E.30: Section F – 4/10/2012	132
Figure E.31: Section F – 5/9/2012	133
Figure E.32: Section G – 8/25/2011.....	134
Figure E.33: Section G – 10/6/2011.....	135
Figure E.34: Section G – 10/27/2011.....	136
Figure E.35: Section G – 4/10/2012.....	137
Figure E.36: Section G – 5/9/2012.....	138
Figure E.37: Legend for the difference in half-cell potential contour maps	139
Figure E.38: Section A – Difference between 8/25/2011 and 10/6/2011	140
Figure E.39: Section A – Difference between 10/6/2011 and 10/27/2011	141
Figure E.40: Section A – Difference between 10/27/2011 and 4/10/2012	142
Figure E.41: Section A – Difference between 4/10/2012 and 5/9/2012	143
Figure E.42: Section B – Difference between 8/25/2011 and 10/6/2011.....	144
Figure E.43: Section B – Difference between 10/6/2011 and 10/27/2011.....	145
Figure E.44: Section B – Difference between 10/27/2011 and 4/10/2012.....	146
Figure E.45: Section B – Difference between 4/10/2012 and 5/9/2012.....	147
Figure E.46: Section C – Difference between 8/25/2011 and 10/6/2011.....	148
Figure E.47: Section C – Difference between 10/6/2011 and 10/27/2011.....	149
Figure E.48: Section C – Difference between 10/27/2011 and 4/10/2012.....	150
Figure E.49: Section C – Difference between 4/10/2012 and 5/9/2012.....	151
Figure E.50: Section D – Difference between 8/25/2011 and 10/6/2011	152
Figure E.51: Section D – Difference between 10/6/2011 and 10/27/2011	153
Figure E.52: Section D – Difference between 10/27/2011 and 4/10/2012	154
Figure E.53: Section D – Difference between 4/10/2012 and 5/9/2012	155
Figure E.54: Section E – Difference between 8/25/2011 and 10/6/2011	156
Figure E.55: Section E – Difference between 10/6/2011 and 10/27/2011	157
Figure E.56: Section E – Difference between 10/27/2011 and 4/10/2012.....	158
Figure E.57: Section E – Difference between 4/10/2012 and 5/9/2012.....	159
Figure E.58: Section F – Difference between 8/25/2011 and 10/6/2011	160
Figure E.59: Section F – Difference between 10/6/2011 and 10/27/2011	161
Figure E.60: Section F – Difference between 10/27/2011 and 4/10/2012	162
Figure E.61: Section F – Difference between 4/10/2012 and 5/9/2012.....	163
Figure E.62: Section G – Difference between 8/25/2011 and 10/6/2011	164
Figure E.63: Section G – Difference between 10/6/2011 and 10/27/2011	165
Figure E.64: Section G – Difference between 10/27/2011 and 4/10/2012	166
Figure E.65: Section G – Difference between 4/10/2012 and 5/9/2012	167
Figure F.1: Section A – Half-cell potential on 8/25/11.....	169
Figure F.2: Section A – Half-cell potential on 10/6/11.....	169
Figure F.3: Section A – Half-cell potential on 10/27/11.....	170
Figure F.4: Section A – Half-cell potential on 4/10/12.....	170
Figure F.5: Section A – Half-cell potential on 5/9/12.....	171
Figure F.6: Section B – Half-cell potential on 8/25/11.....	171
Figure F.7: Section B – Half-cell potential on 10/6/11.....	172
Figure F.8: Section B – Half-cell potential in 10/27/11.....	172
Figure F.9: Section B – Half-cell potential on 4/10/12.....	173
Figure F.10: Section B – Half-cell potential on 5/9/12.....	173
Figure F.11: Section C – Half-cell potential on 8/25/11.....	174

Figure F.12: Section C – Half-cell potential on 10/6/11	174
Figure F.13: Section C – Half-cell potential in 10/27/11	175
Figure F.14: Section C – Half-cell potential on 4/10/12.....	175
Figure F.15: Section C – Half-cell potential on 5/9/12.....	176
Figure F.16: Section D – Half-cell potential on 8/25/11.....	176
Figure F.17: Section D – Half-cell potential on 10/6/11.....	177
Figure F.18: Section D – Half-cell potential in 10/27/11.....	177
Figure F.19: Section D – Half-cell potential on 4/10/12.....	178
Figure F.20: Section D – Half-cell potential on 5/9/12.....	178
Figure F.21: Section E – Half-cell potential on 8/25/11	179
Figure F.22: Section E – Half-cell potential on 10/6/11	179
Figure F.23: Section E – Half-cell potential on 10/27/11	180
Figure F.24: Section E – Half-cell potential on 4/10/12	180
Figure F.25: Section E – Half-cell potential on 5/9/12	181
Figure F.26: Section F – Half-cell potential on 8/25/11	181
Figure F.27: Section F – Half-cell potential on 10/6/11	182
Figure F.28: Section F – Half-cell potential on 10/27/11	182
Figure F.29: Section F – Half-cell potential on 4/10/12	183
Figure F.30: Section F – Half-cell potential on 5/9/12	183
Figure F.31: Section G – Half-cell potential on 8/25/11	184
Figure F.32: Section G – Half-cell potential on 10/6/11.....	184
Figure F.33: Section G – Half-cell potential on 10/27/11.....	185
Figure F.34: Section G – Half-cell potential on 4/10/12.....	185
Figure F.35: Section G – Half-cell potential on 5/9/12.....	186
Figure F.36: Section A – Change in Half-cell potential from 8/25/11 to 10/6/11	186
Figure F.37: Section A – Change in Half-cell potential from 10/6/11 to 10/27/11	187
Figure F.38: Section A – Change in Half-cell potential from 10/27/11 to 4/10/12	187
Figure F.39: Section A – Change in Half-cell potential from 4/10/12 to 5/9/12	188
Figure F.40: Section A – Change in Half-cell potential from 8/25/11 to 5/9/12	188
Figure F.41: Section B – Change in Half-cell potential from 8/25/11 to 10/6/11.....	189
Figure F.42: Section B – Change in Half-cell potential from 10/6/11 to 10/27/11.....	189
Figure F.43: Section B – Change in Half-cell potential from 10/27/11 to 4/10/12.....	190
Figure F.44: Section B – Change in Half-cell potential from 4/10/12 to 5/9/12.....	190
Figure F.45: Section B – Change in Half-cell potential from 8/25/11 to 5/9/12.....	191
Figure F.46: Section C – Change in Half-cell potential from 8/25/11 to 10/6/11.....	191
Figure F.47: Section C – Change in Half-cell potential from 10/6/11 to 10/27/11.....	192
Figure F.48: Section C – Change in Half-cell potential from 10/27/11 to 4/10/12.....	192
Figure F.49: Section C – Change in Half-cell potential from 4/10/12 to 5/9/12.....	193
Figure F.50: Section C – Change in Half-cell potential from 8/25/11 to 5/9/12.....	193
Figure F.51: Section D – Change in Half-cell potential from 8/25/11 to 10/6/11	194
Figure F.52: Section D – Change in Half-cell potential from 10/6/11 to 10/27/11	194
Figure F.53: Section D – Change in Half-cell potential from 10/27/11 to 4/10/12	195
Figure F.54: Section D – Change in Half-cell potential from 4/10/12 to 5/9/12	195
Figure F.55: Section D – Change in Half-cell potential from 8/25/11 to 5/9/12	196
Figure F.56: Section E – Change in Half-cell potential from 8/25/11 to 10/6/11.....	196
Figure F.57: Section E – Change in Half-cell potential from 10/6/11 to 10/27/11	197
Figure F.58: Section E – Change in Half-cell potential from 10/27/11 to 4/10/12	197
Figure F.59: Section E – Change in Half-cell potential from 4/10/12 to 5/9/12.....	198
Figure F.60: Section E – Change in Half-cell potential from 8/25/11 to 5/9/12.....	198

Figure F.61: Section F – Change in Half-cell potential from 8/25/11 to 10/6/11	199
Figure F.62: Section F – Change in Half-cell potential from 10/6/11 to 10/27/11	199
Figure F.63: Section F – Change in Half-cell potential from 10/27/11 to 4/10/12	200
Figure F.64: Section F – Change in Half-cell potential from 4/10/12 to 5/9/12	200
Figure F.65: Section F – Change in Half-cell potential from 8/25/11 to 5/9/12	201
Figure F.66: Section G – Change in Half-cell potential from 8/25/11 to 10/6/11	201
Figure F.67: Section G – Change in Half-cell potential from 10/6/11 to 10/27/11	202
Figure F.68: Section G – Change in Half-cell potential from 10/27/11 to 4/10/12	202
Figure F.69: Section G – Change in Half-cell potential from 4/10/12 to 5/9/12	203
Figure F.70: Section G – Change in Half-cell potential from 8/25/11 to 5/9/12	203

APPENDIX A. SITE SELECTION MATRIX FOR STATEWIDE EVALUATION

Table A.1: Site selection matrix for statewide evaluation

Project Rank ⁽¹⁾	Project Rating ^{(5),(6)}	Segment Rank ⁽²⁾	Segment Rating ^{(5),(6)}	Interstate	Beginning MRM	Ending MRM	Length (miles)	Lane	Project Number ⁽³⁾	Region/ Reporting Unit ^{(1),(4)}	Surface Condition Index ⁽⁴⁾	Year Built ⁽⁴⁾	Precipitation Region ⁽⁵⁾	Average 3-year Maintenance Cost (per mile) ⁽⁴⁾	Estimated Deicer Applied per mile (lbs) ^{(3),(5)}	Indices ⁽⁵⁾				
																Condition Value	Age Value	Precipitation Value	Maintenance Activities Value	Deicer Application Value
1	1.429	12	1.422	I-29	65.00	72.00	7.00	NB	IM 29-2(9)61	271	4.02	2001	Wet	1807	459,127	0.804	0.500	0.5	0.334	0.059
		13	1.440	I-29	61.00	64.57	3.57	NB	IM 29-2(9)61	271	4.11	2001	Wet	1807	459,127	0.822	0.500	0.5	0.334	0.059
		16	1.458	I-29	64.57	65.00	0.43	NB	IM 29-2(9)61	271	4.20	2001	Wet	1807	459,127	0.840	0.500	0.5	0.334	0.059
2	1.442	1	1.118	I-229	5.70	8.28	2.58	NB	IM 229-2(50)2	271	4.17	2001	Wet	2712	459,127	0.834	0.500	0.5	0.000	0.059
		3	1.418	I-229	2.08	2.89	0.81	NB	IM 229-2(50)2	271	4.20	2001	Wet	1914	459,127	0.840	0.500	0.5	0.294	0.059
		3	1.418	I-229	2.89	3.12	0.23	NB	IM 229-2(50)2	271	4.20	2001	Wet	1914	459,127	0.840	0.500	0.5	0.294	0.059
		3	1.418	I-229	3.93	4.16	0.23	NB	IM 229-2(50)2	271	4.20	2001	Wet	1914	459,127	0.840	0.500	0.5	0.294	0.059
		3	1.418	I-229	4.95	5.00	0.05	NB	IM 229-2(50)2	271	4.20	2001	Wet	1914	459,127	0.840	0.500	0.5	0.294	0.059
		7	1.418	I-229	2.07	2.08	0.01	NB	IM 229-2(50)2	271	4.20	2001	Wet	1913	459,127	0.840	0.500	0.5	0.295	0.059
		7	1.418	I-229	3.12	3.93	0.81	NB	IM 229-2(50)2	271	4.20	2001	Wet	1913	459,127	0.840	0.500	0.5	0.295	0.059
		7	1.418	I-229	4.16	4.95	0.79	NB	IM 229-2(50)2	271	4.20	2001	Wet	1913	459,127	0.840	0.500	0.5	0.295	0.059
		7	1.419	I-229	5.00	5.32	0.32	NB	IM 229-2(50)2	271	4.20	2001	Wet	1912	459,127	0.840	0.500	0.5	0.295	0.059
		19	1.578	I-229	2.94	3.12	0.18	SB	IM 229-2(50)2	271	4.05	2001	Wet	1399	459,127	0.810	0.500	0.5	0.484	0.059
		20	1.594	I-229	3.12	3.97	0.85	SB	IM 229-2(50)2	271	4.13	2001	Wet	1398	459,127	0.826	0.500	0.5	0.485	0.059
		20	1.595	I-229	5.70	8.28	2.58	SB	IM 229-2(50)2	271	4.24	2001	Wet	1455	459,127	0.848	0.500	0.5	0.463	0.059
		23	1.603	I-229	3.97	4.16	0.19	SB	IM 229-2(50)2	271	4.17	2001	Wet	1397	459,127	0.834	0.500	0.5	0.485	0.059
		24	1.608	I-229	4.16	5.32	1.16	SB	IM 229-2(50)2	271	4.20	2001	Wet	1398	459,127	0.840	0.500	0.5	0.485	0.059
		24	1.609	I-229	2.08	2.94	0.86	SB	IM 229-2(50)2	271	4.20	2001	Wet	1397	459,127	0.840	0.500	0.5	0.485	0.059
		26	1.609	I-229	2.07	2.08	0.01	SB	IM 229-2(50)2	271	4.20	2001	Wet	1395	459,127	0.840	0.500	0.5	0.486	0.059

Project Rank (1)	Project Rating (5),(6)	Segment Rank (2)	Segment Rating (5),(6)	Interstate	Beginning MRM	Ending MRM	Length (miles)	Lane	Project Number ⁽³⁾	Region/Reporting Unit (1),(4)	Surface Condition Index (4)	Year Built (4)	Precipitation Region ⁽⁵⁾	Average 3-year Maintenance Cost (per mile) ⁽⁴⁾	Indices ⁽⁵⁾					
															Estimated Deicer Applied per mile (lbs) (3),(5)	Condition Value	Age Value	Precipitation Value	Maintenance Activities Value	Deicer Application Value
3	1.461	2	1.344	I-29	83.00	83.70	0.70	NB	IM 29-3(68)80	271	4.12	2003	Wet	2047	487,828	0.824	0.667	0.5	0.245	0.000
		11	1.361	I-29	80.29	83.00	2.71	NB	IM 29-3(68)80	271	4.20	2003	Wet	2046	487,828	0.840	0.667	0.5	0.246	0.000
		28	1.573	I-29	83.00	83.38	0.38	SB	IM 29-3(68)80	271	4.20	2003	Wet	1470	487,828	0.840	0.667	0.5	0.458	0.000
		29	1.577	I-29	80.29	83.00	2.71	SB	IM 29-3(68)80	271	4.22	2003	Wet	1470	487,828	0.844	0.667	0.5	0.458	0.000
4	1.492	14	1.385	I-29	79.98	80.29	0.31	NB	IM 29-3(38)79 & P 1298(2)	271	4.20	2004	Wet	2047	487,828	0.840	0.750	0.5	0.245	0.000
		15	1.386	I-29	79.26	79.98	0.72	NB	IM 29-3(38)79 & P 1298(2)	271	4.20	2004	Wet	2046	487,828	0.840	0.750	0.5	0.246	0.000
		31	1.598	I-29	79.26	79.98	0.72	SB	IM 29-3(38)79 & P 1298(2)	271	4.20	2004	Wet	1470	487,828	0.840	0.750	0.5	0.458	0.000
		31	1.598	I-29	79.98	80.29	0.31	SB	IM 29-3(38)79 & P 1298(2)	271	4.20	2004	Wet	1470	487,828	0.840	0.750	0.5	0.458	0.000
5	1.551	26	1.551	I-29	85.35	97.00	11.65	NB	IM 29-3(82)84	271	3.68	1999	Wet	975	487,828	0.736	0.333	0.5	0.640	0.000
6	1.597	17	1.498	I-29	83.38	84.21	0.83	SB	IM 29-3(83)84	271	4.20	2000	Wet	1469	487,828	0.840	0.417	0.5	0.458	0.000
		33	1.604	I-29	85.00	97.00	12.00	SB	IM 29-3(83)84	271	4.02	2000	Wet	1085	487,828	0.804	0.417	0.5	0.600	0.000
7	1.602	22	1.602	I-29	61.00	72.00	11.00	SB	IM 29-2(10)62	271	4.18	2000	Wet	1336	459,127	0.836	0.417	0.5	0.507	0.059
8	1.641	18	1.558	I-29	72.00	73.78	1.78	NB	IM 29-2(52)72	271	4.20	2005	Wet	1807	459,127	0.840	0.833	0.5	0.334	0.059
		36	1.731	I-29	72.00	73.66	1.66	SB	IM 29-2(52)72	271	4.20	2005	Wet	1336	459,127	0.840	0.833	0.5	0.507	0.059
9	1.649	30	1.649	I-90	401.61	412.00	10.39	WB	IM 90-9(63)401	271	4.01	1997	Wet	913	459,127	0.802	0.167	0.5	0.663	0.059
10	1.707	34	1.707	I-90	401.61	412.00	10.39	EB	IMID 90-9(70)401	271	3.89	1998	Wet	758	459,127	0.778	0.250	0.5	0.721	0.059
11	1.719	35	1.719	I-29	97.00	110.10	13.10	NB	IM 29-3(92)97	272	3.66	1998	Wet	975	392,085	0.732	0.250	0.5	0.640	0.196
12	1.753	37	1.753	I-29	97.00	110.11	13.11	SB	IM29-3(89)97	272	4.16	1997	Wet	1085	392,085	0.832	0.167	0.5	0.600	0.196
13	2.262	38	2.262	I-29	110.10	110.10	0.00	NB	IM 29-4(58)	272	5.00	2009	Wet	974	392,085	1.000	1.167	0.5	0.641	0.196

Project Rank ⁽¹⁾	Project Rating ^{(5),(6)}	Segment Rank ⁽²⁾	Segment Rating ^{(5),(6)}	Interstate	Beginning MRM	Ending MRM	Length (miles)	Lane	Project Number ⁽³⁾	Region/Reporting Unit ^{(1),(4)}	Surface Condition Index ⁽⁴⁾	Year Built ⁽⁴⁾	Precipitation Region ⁽⁵⁾	Average 3-year Maintenance Cost (per mile) ⁽⁴⁾	Estimated Deicer Applied per mile (lbs) ^{(3),(5)}	Condition Value	Age Value	Precipitation Value	Maintenance Activities Value	Deicer Application Value
14	2.526	40	2.526	I-90	213.10	226.68	13.58	EB	IM 90-5(66)187	391	4.01	2000	Dry	688	144,958	0.802	0.417	1	0.746	0.703
		41	2.533	I-90	226.68	227.00	0.32	EB	IM 90-5(66)187	391	4.04	2000	Dry	685	144,958	0.808	0.417	1	0.747	0.703
15	2.539	39	2.515	I-90	18.48	19.42	0.94	EB	IM 90-1(45)18	451	4.06	2001	Dry	657	173,100	0.812	0.500	1	0.758	0.645
		43	2.541	I-90	19.42	28.34	8.92	EB	IM 90-1(45)18	451	4.19	2001	Dry	656	173,100	0.838	0.500	1	0.758	0.645
16	2.567	44	2.567	I-90	10.08	18.48	8.40	EB		451	3.82	2005	Dry	656	173,100	0.764	0.833	1	0.758	0.645
17	2.579	45	2.579	I-29	27.00	37.32	10.32	SB	IM 29-1(44)27	291	4.33	2001	Wet	764	112,280	0.866	0.500	0.5	0.718	0.770
118	2.638	442	2.535	I-90	210.14	213.10	2.96	EB	IM 90-5(52)210	391	4.18	1999	Dry	688	144,958	0.836	0.333	1	0.746	0.703
		52	2.739	I-90	210.14	213.15	3.01	WB	IM 90-5(52)210	391	4.42	1999	Dry	265	144,958	0.884	0.333	1	0.902	0.703
19	2.643	46	2.636	I-90	264.68	265.00	0.32	EB	IM 90-5(80)262	253	4.20	1995	Wet	523	41,895	0.840	0.000	0.5	0.807	0.914
		46	2.637	I-90	263.34	264.68	1.34	EB	IM 90-5(80)262	253	4.20	1995	Wet	522	41,895	0.840	0.000	0.5	0.808	0.914
		48	2.651	I-90	263.39	265.00	1.61	WB	IM 90-5(80)262	253	4.29	1995	Wet	533	41,895	0.858	0.000	0.5	0.803	0.914
20	2.681	49	2.681	I-90	10.08	18.58	8.50	WB		451	3.46	2005	Dry	152	173,100	0.692	0.833	1	0.944	0.645
21	2.693	50	2.684	I-90	18.58	19.42	0.84	WB	IM 90-1(25)19	451	4.10	2000	Dry	152	173,100	0.820	0.417	1	0.944	0.645
		51	2.694	I-90	19.42	28.34	8.92	WB	IM 90-1(25)19	451	4.15	2000	Dry	152	173,100	0.830	0.417	1	0.944	0.645
22	2.742	53	2.742	I-90	213.15	227.00	13.85	WB	IM 90-5(53)213	391	4.18	2001	Dry	264	144,958	0.836	0.500	1	0.903	0.703
23	2.747	54	2.747	I-90	251.60	259.90	8.30	EB	IM-IDR 90-5(73)251	253	4.08	1996	Dry	429	41,895	0.816	0.083	1	0.842	0.914
24	2.814	55	2.814	I-29	27.00	37.32	10.32	NB	IM 29-1(63)	291	4.49	2002	Wet	282	112,280	0.898	0.583	0.5	0.896	0.770
25	2.824	56	2.824	I-29	37.32	46.31	8.99	SB	IM 29-1(84)	291	4.93	2006	Wet	764	112,280	0.986	0.917	0.5	0.718	0.770
26	2.826	57	2.822	I-90	251.60	259.52	7.92	WB	IM 90-5(86)251	253	4.07	1997	Dry	289	41,895	0.814	0.167	1	0.893	0.914
		73	2.954	I-90	259.60	259.88	0.28	WB	IM 90-5(86)251	253	4.20	1997	Dry	0	41,895	0.840	0.167	1	1.000	0.914
27	2.853	58	2.853	I-29	4.64	17.00	12.36	NB	IM 29-1(72)4	291	4.25	2006	Wet	316	112,280	0.850	0.917	0.5	0.883	0.770

Project Rank ⁽¹⁾	Project Rating ^{(5), (6)}	Segment Rank ⁽²⁾	Segment Rating ^{(5), (6)}	Interstate	Beginning MRM	Ending MRM	Length (miles)	Lane	Project Number ⁽³⁾	Region/ Reporting Unit ^{(1),(4)}	Surface Condition Index ⁽⁴⁾	Year Built ⁽⁴⁾	Precipitation Region ⁽⁵⁾	Average 3-year Maintenance Cost (per mile) ⁽⁴⁾	Estimated Deicer Applied per mile (lbs) ^{(3),(5)}	Condition Value	Age Value	Precipitation Value	Maintenance Activities Value	Deicer Application Value
28	2.866	59	2.864	I-90	335.00	344.34	9.34	EB	IM-BRF 90-8(40)334	252	3.99	2003	Wet	85	86,853	0.798	0.667	0.5	0.969	0.822
		69	2.906	I-90	334.54	335.00	0.46	EB	IM-BRF 90-8(40)334	252	4.20	2003	Wet	84	86,853	0.840	0.667	0.5	0.969	0.822
29	2.877	60	2.877	I-90	353.07	362.00	8.93	EB	IM 90-8(79)353	252	4.18	2002	Wet	85	86,853	0.836	0.583	0.5	0.969	0.822
30	2.882	63	2.882	I-90	353.07	362.00	8.93	WB	IM 90-8-(33)353	252	4.30	2001	Wet	68	86,853	0.860	0.500	0.5	0.975	0.822
31	2.883	61	2.881	I-90	338.42	343.73	5.31	WB	IM 90-8(83)334	252	4.17	2002	Wet	68	86,853	0.834	0.583	0.5	0.975	0.822
		61	2.881	I-90	343.73	344.34	0.61	WB	IM 90-8(83)334	252	4.17	2002	Wet	68	86,853	0.834	0.583	0.5	0.975	0.822
		64	2.887	I-90	335.00	338.00	3.00	WB	IM 90-8(83)334	252	4.20	2002	Wet	68	86,853	0.840	0.583	0.5	0.975	0.822
		64	2.887	I-90	334.54	335.00	0.46	WB	IM 90-8(83)334	252	4.20	2002	Wet	67	86,853	0.840	0.583	0.5	0.975	0.822
		64	2.887	I-90	338.00	338.42	0.42	WB	IM 90-8(83)334	252	4.20	2002	Wet	67	86,853	0.840	0.583	0.5	0.975	0.822
32	2.915	71	2.915	I-90	344.34	353.07	8.73	WB	IM-BRF 90-8(41)344	252	4.09	2004	Wet	67	86,853	0.818	0.750	0.5	0.975	0.822
33 (tie)	2.916	67	2.907	I-90	247.00	251.60	4.60	EB	IM 90-5(6 1)236	391	4.56	2007	Dry	429	144,958	0.912	1.000	1	0.842	0.703
		68	2.912	I-90	246.00	247.00	1.00	EB	IM 90-5(6 1)236	391	4.59	2007	Dry	430	144,958	0.918	1.000	1	0.841	0.703
		70	2.921	I-90	236.00	246.00	10.00	EB	IM 90-5(6 1)236	391	4.63	2007	Dry	429	144,958	0.926	1.000	1	0.842	0.703
33 (tie)	2.916	71	2.916	I-90	344.34	353.07	8.73	EB	IM 90-8(43)344	252	4.00	2005	Wet	85	86,853	0.800	0.833	0.5	0.969	0.822
35	2.967	74	2.967	I-29	165.00	179.00	14.00	SB	IMBR29-6(23)164	171	4.02	2004	Dry	449	22,729	0.804	0.750	1	0.834	0.953
36	3.008	75	3.008	I-29	151.22	165.00	13.78	SB	IM29-6(21)	171	4.35	2003	Dry	449	22,729	0.870	0.667	1	0.834	0.953
37	3.114	77	3.114	I-29	139.30	151.22	11.92	SB	IM29-5(22)141	171	4.38	2007	Dry	449	22,729	0.876	1.000	1	0.834	0.953
38	3.120	76	3.079	I-90	52.44	56.00	3.56	EB	IMBF 90-1(10)6	452	4.47	2005	Dry	122	83,170	0.894	0.833	1	0.955	0.830
		79	3.161	I-90	52.44	56.00	3.56	WB	IMBF 90-1(10)6	452	4.80	2005	Dry	78	83,170	0.960	0.833	1	0.971	0.830
39	3.136	78	3.136	I-29	151.31	165.00	13.69	NB	IMBF29-6(15)151	171	4.21	2005	Dry	162	22,729	0.842	0.833	1	0.940	0.953
40	3.173	80	3.173	I-29	165.00	179.00	14.00	NB	IM29-6(26)164	171	4.27	2006	Dry	162	22,729	0.854	0.917	1	0.940	0.953

Notes:

Recommended projects in bold print.

- (1) Projects are ranked from 1 to 40, with 1 being the lowest quality and 40 being the highest quality
- (2) Pavement Segments are ranked from 1 to 80, with 1 being the lowest quality and 80 being the highest quality
- (3) Information provided by SDDOT
- (4) Information provided by SDDOT Highway Needs and Project Analysis Report
- (5) See attached discussion
- (6)

<u>Category</u>	<u>Weighting Factor</u>
Condition	1.00
Age	0.30
Precipitation	0.15
Maintenance	1.00
Deicer Application	1.00

 - (a) Project within 20 miles of Sioux Falls
 - (b) Tested previously, exclude
 - (c) Maintenance site, exclude

APPENDIX B. EQUIPOTENTIAL CONTOUR MAPS FOR INITIAL AND STATEWIDE ASSESSMENTS

Crack and Equipotential Maps

MRM 87 Fall 2010

MRM 87 Spring 2011

MRM 68 Fall 2010

MRM 68 Spring 2011

MRM 411 Fall 2010

MRM 411 Spring 2011

MRM 33

MRM 44

MRM 25

MRM 54

MRM 222

MRM 246

MRM 168NB

MRM 168SB

Minimum Reading (mV)	Maximum Reading (mV)	Color
-750.00	-720.00	Red
-720.00	-690.00	Orange Red
-690.00	-660.00	Orange
-660.00	-630.00	Orange Yellow
-630.00	-600.00	Yellow
-600.00	-570.00	Light Green
-570.00	-540.00	Green
-540.00	-510.00	Dark Green
-510.00	-480.00	Dark Green
-480.00	-450.00	Dark Green
-450.00	-420.00	Dark Green
-420.00	-390.00	Cyan
-390.00	-360.00	Cyan
-360.00	-330.00	Cyan
-330.00	-300.00	Blue
-300.00	-270.00	Blue
-270.00	-240.00	Dark Blue
-240.00	-210.00	Dark Blue
-210.00	-180.00	Dark Blue
-180.00	-150.00	Purple

Figure B.1: Equipotential contour map legend

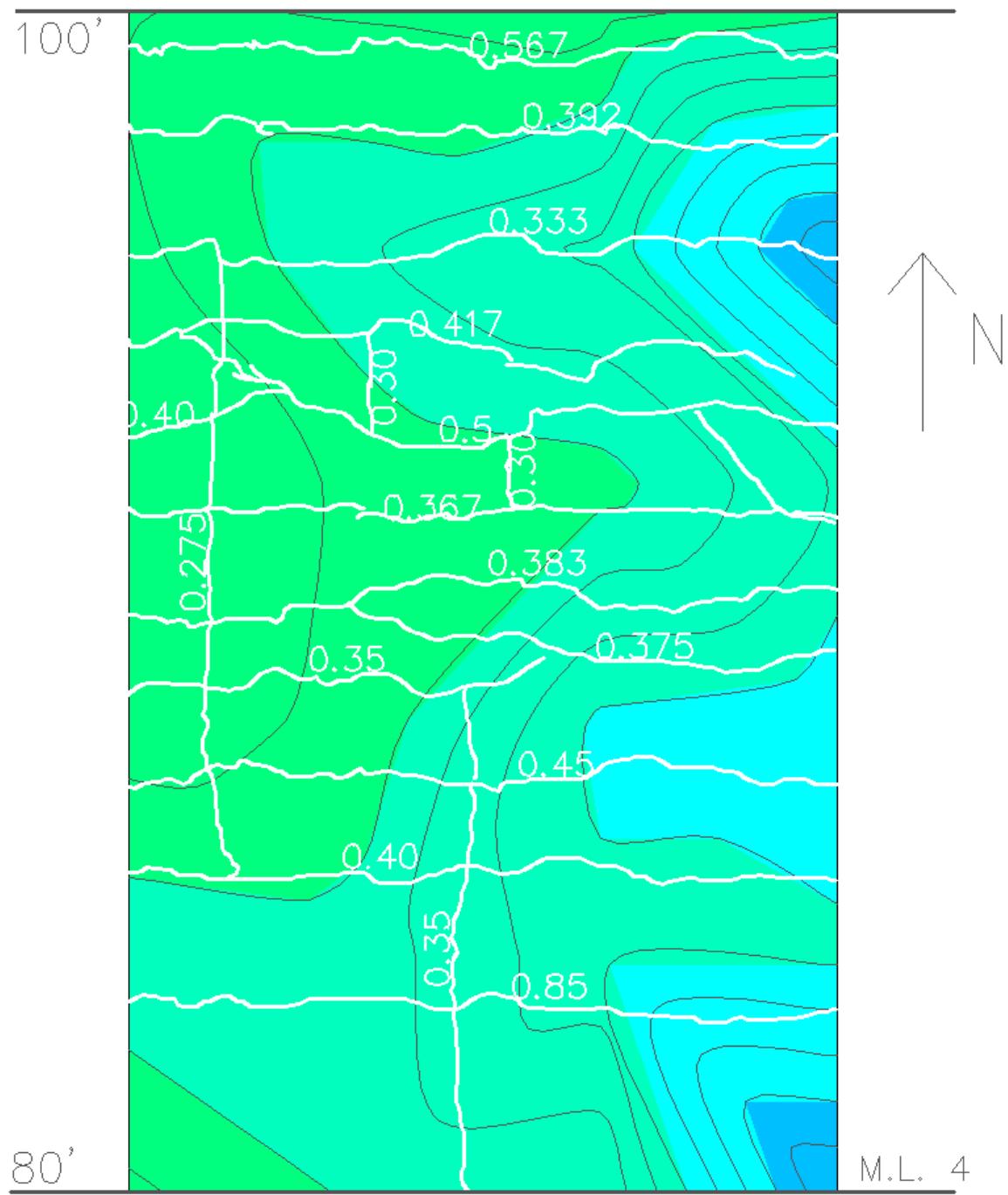


Figure B.2: MRM 87 fall 2010 from 80 to 100 feet

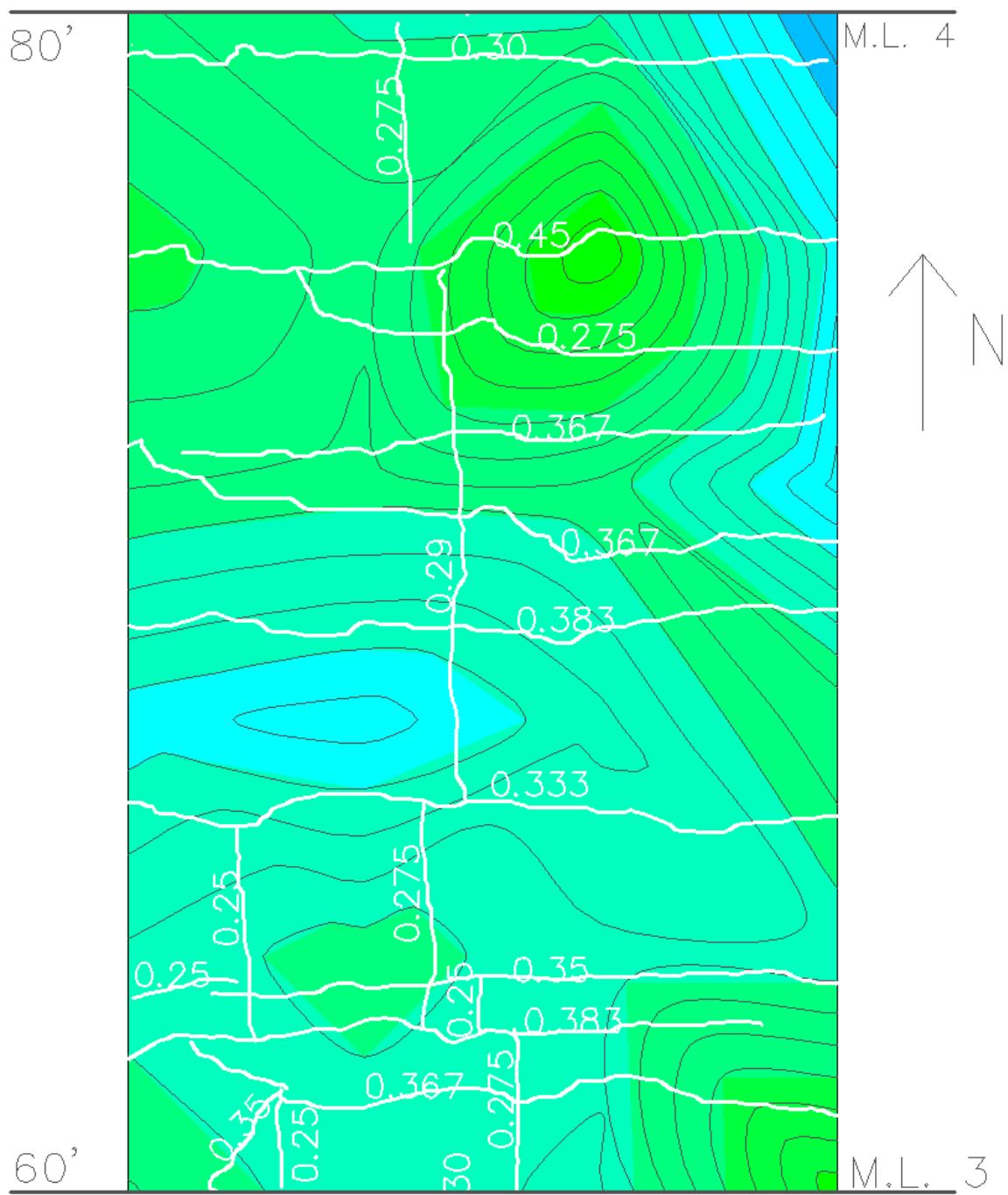


Figure B.3: MRM 87 fall 2010 from 60 to 80 feet

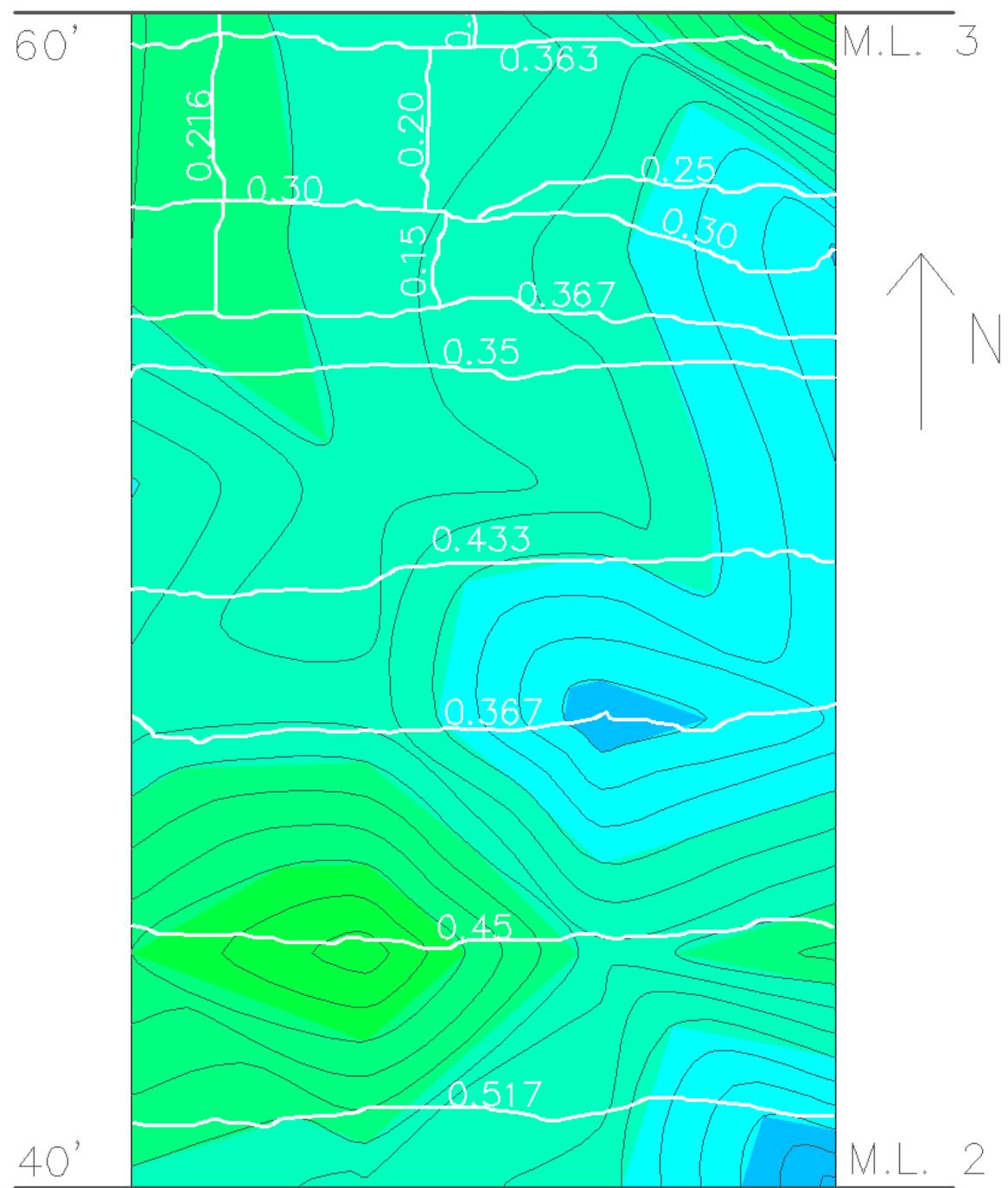


Figure B.4: MRM 87 fall 2010 from 40 to 60 feet

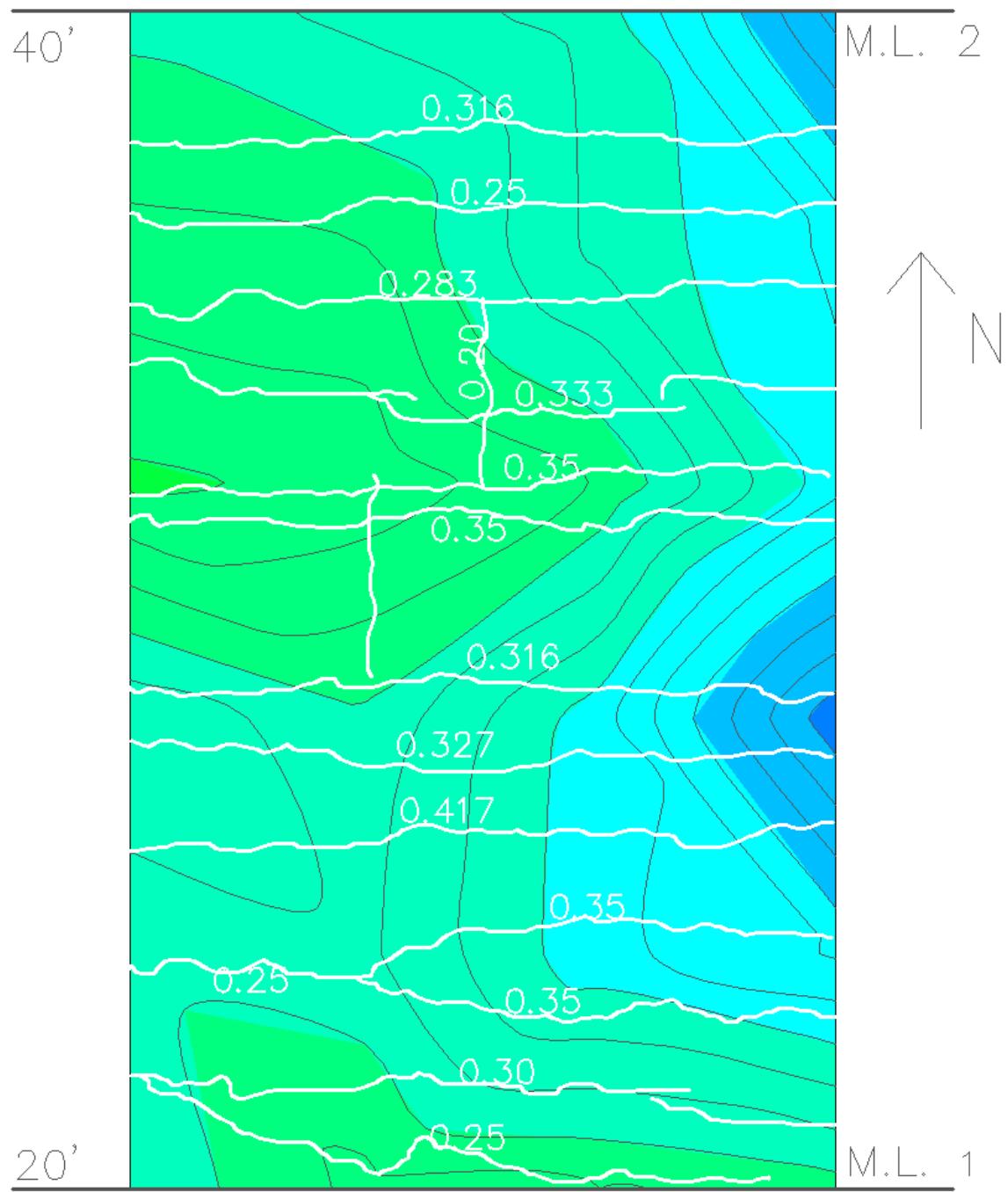


Figure B.5: MRM 87 fall 2010 from 20 to 40 feet

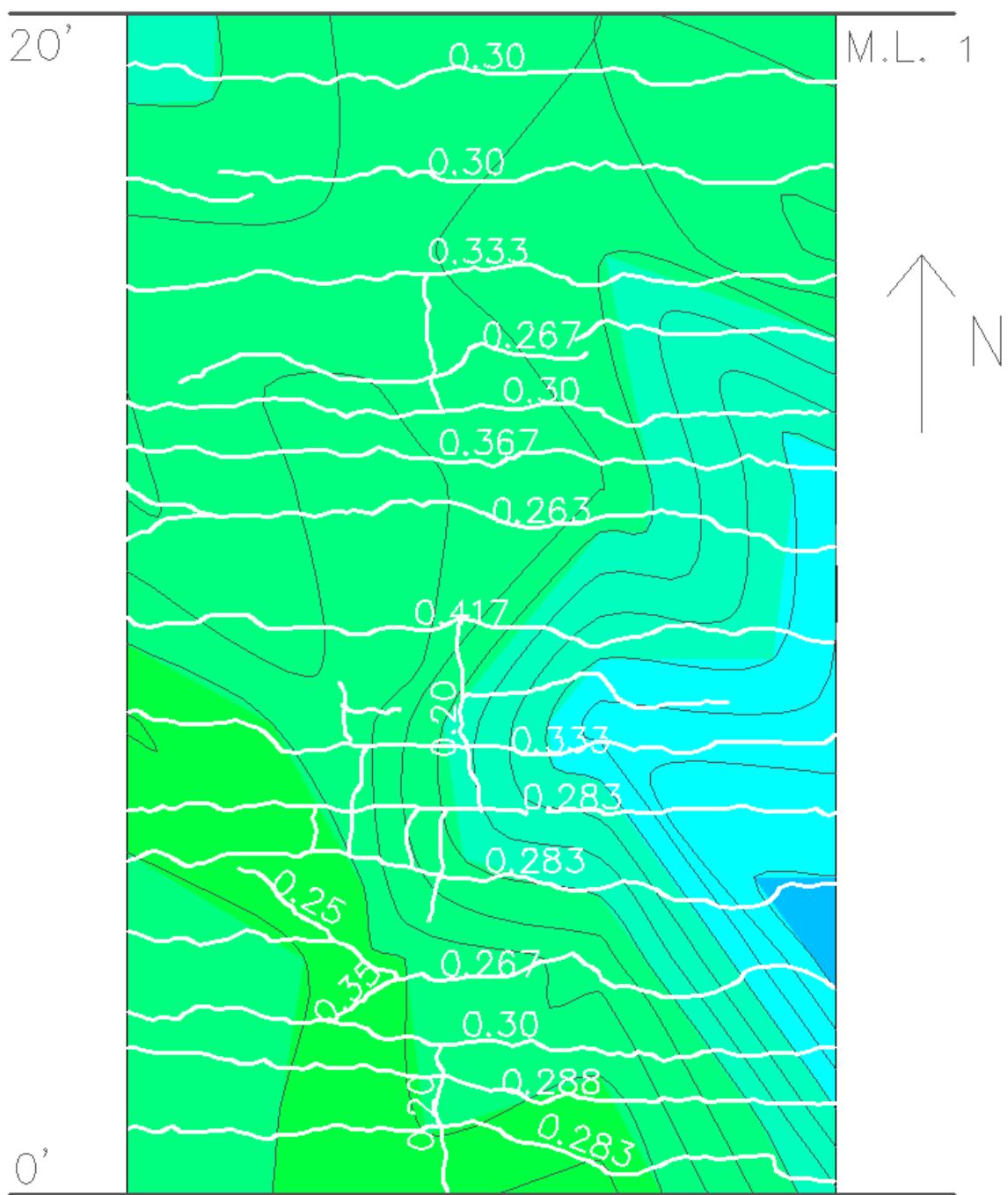


Figure B.6: MRM 87 fall 2010 from 0 to 20 feet

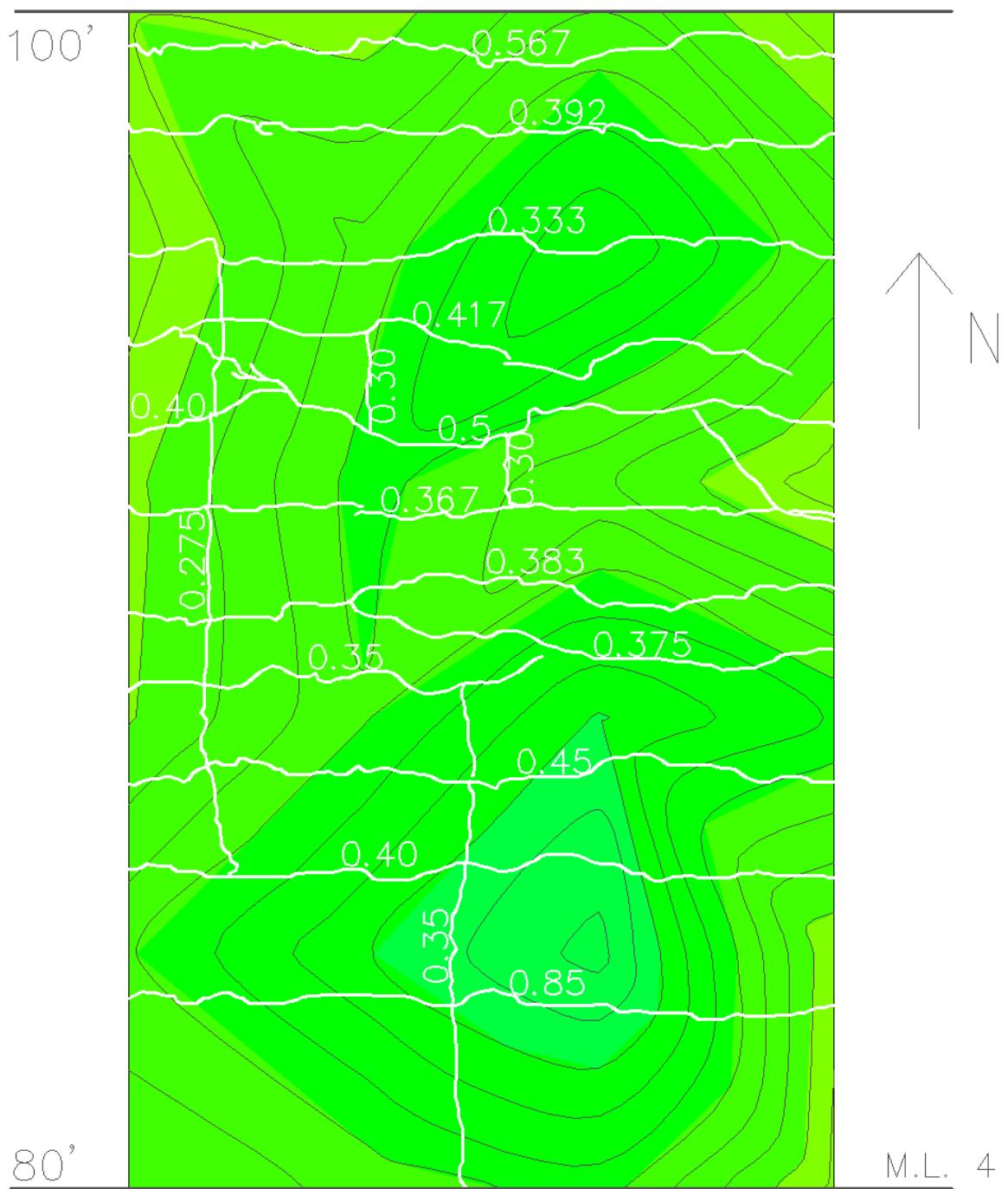


Figure B.7: MRM 87 spring 2011 from 80 to 100 feet

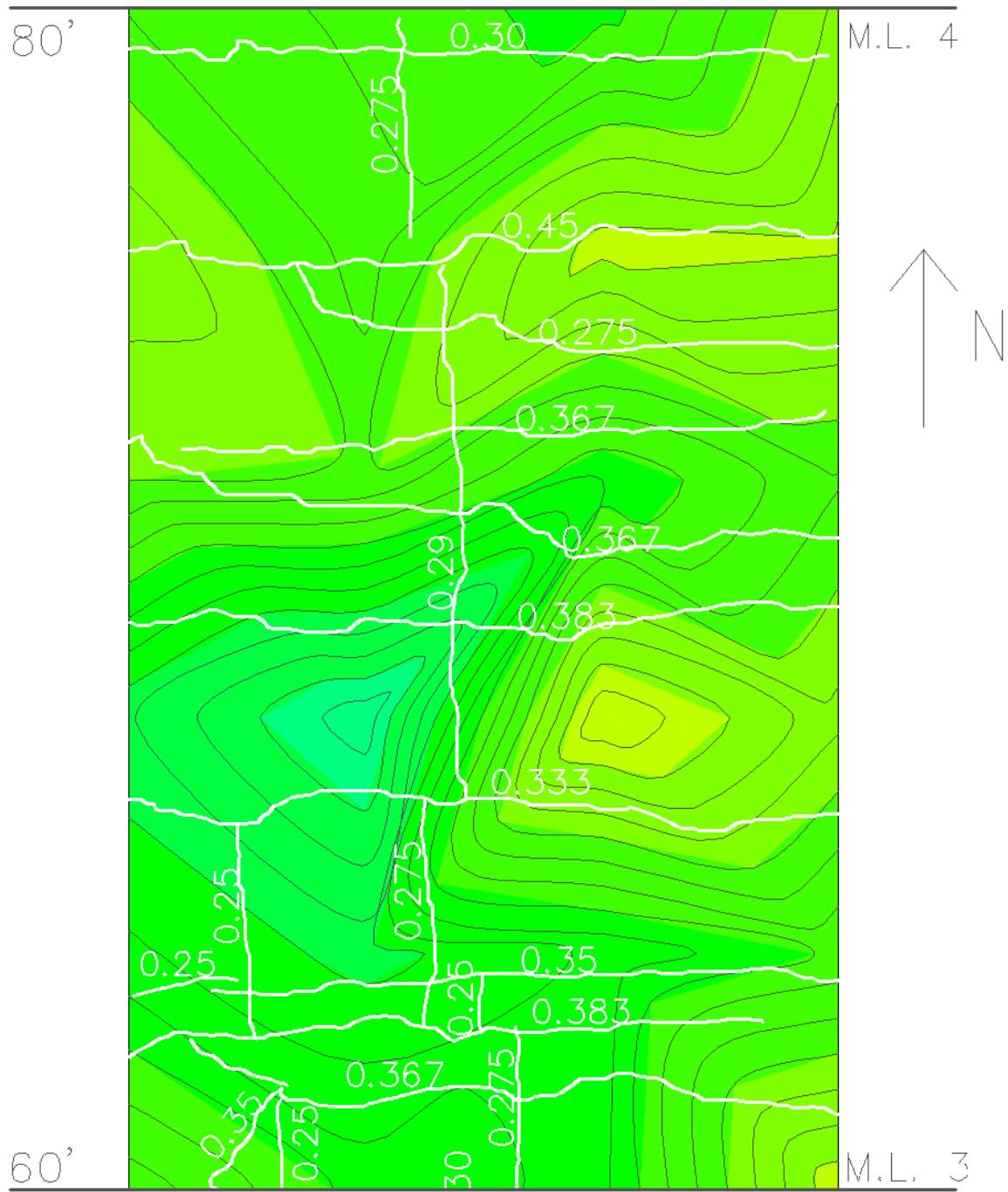


Figure B.8: MRM 87 spring 2011 from 60 to 80 feet

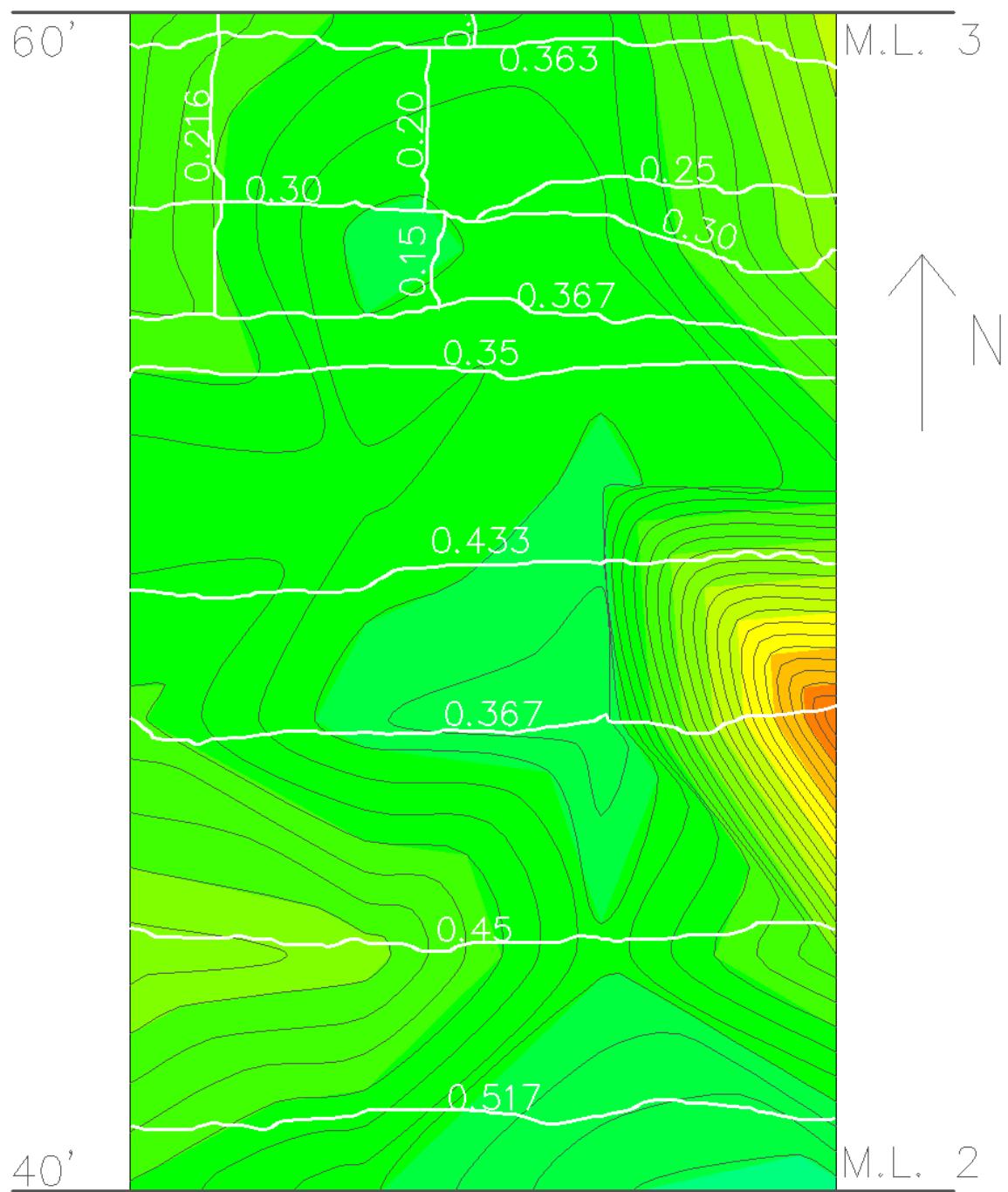


Figure B.9: MRM 87 spring 2011 from 40 to 60 feet

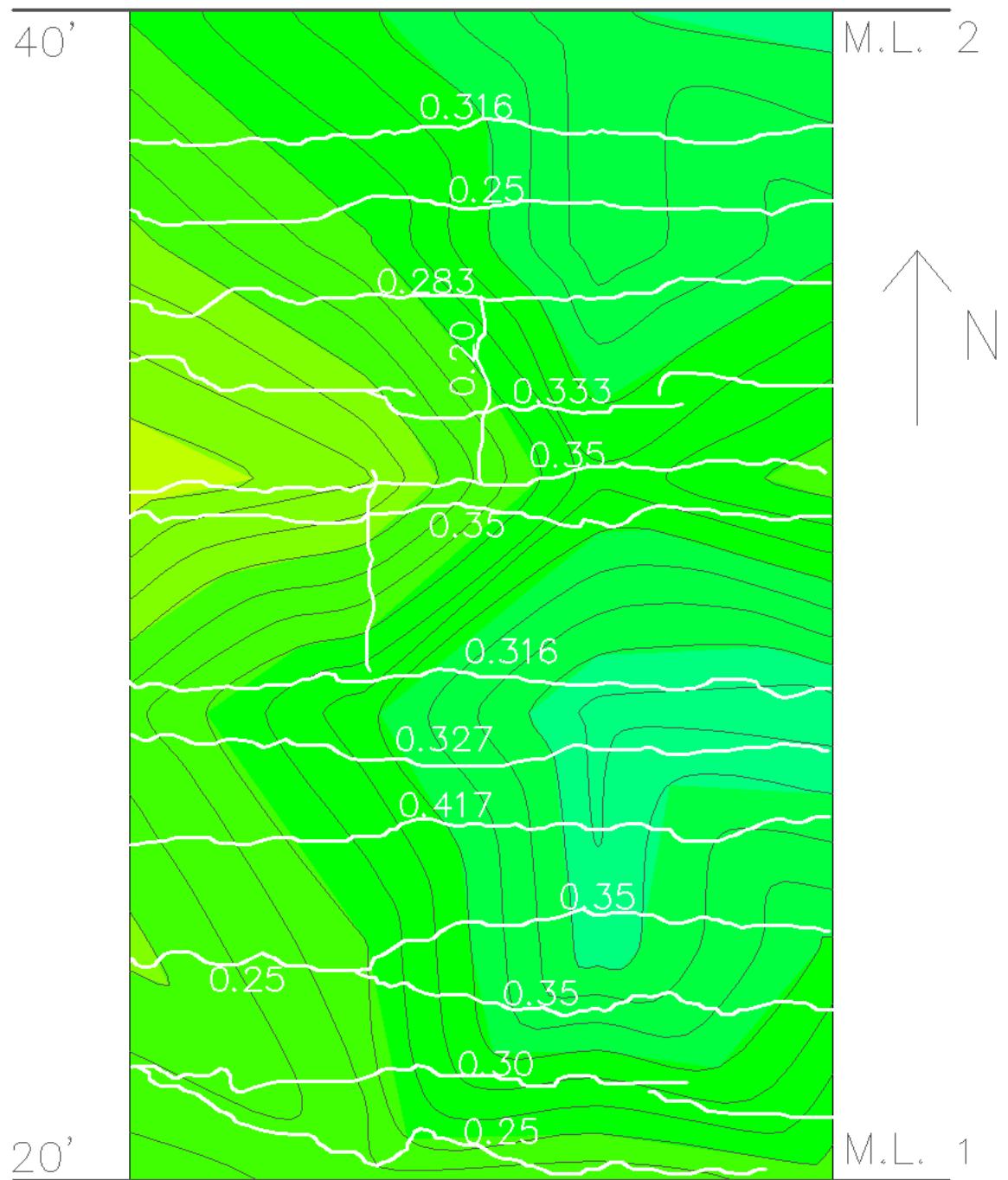


Figure B.10: MRM 87 spring 2011 from 20 to 40 feet

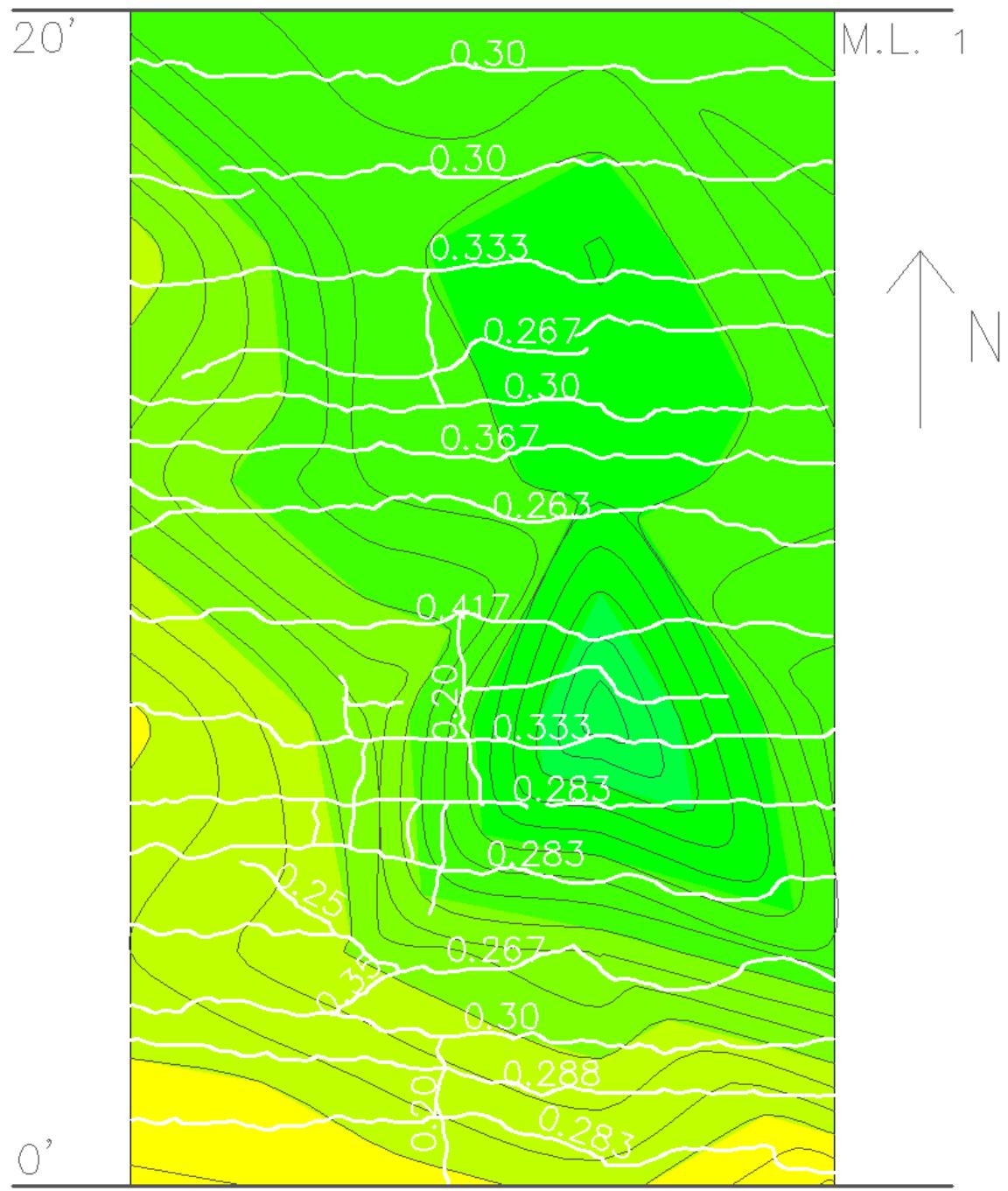


Figure B.11: MRM 87 spring 2011 from 0 to 20 feet

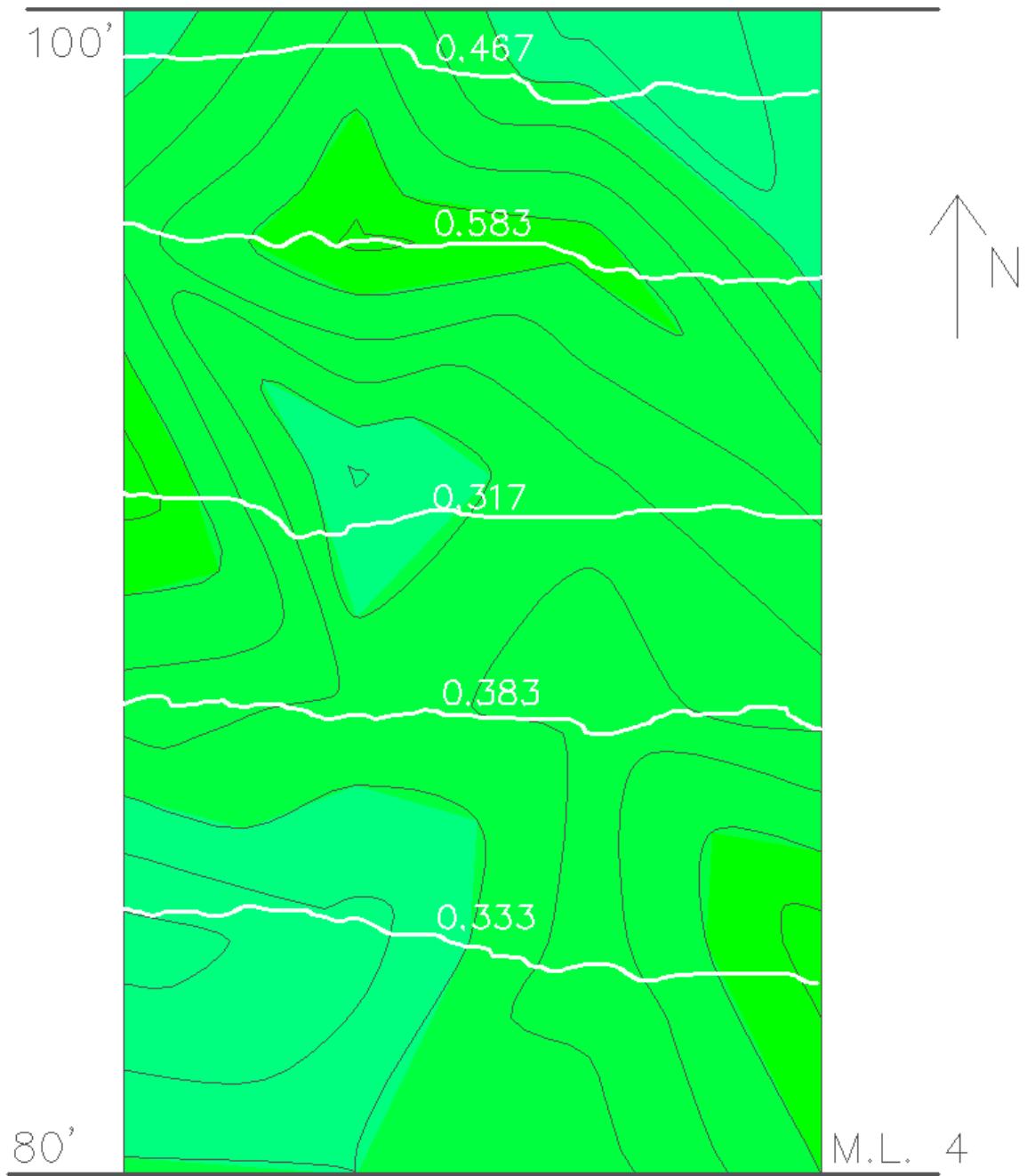


Figure B.12: MRM 68 fall 2010 from 80 to 100 feet

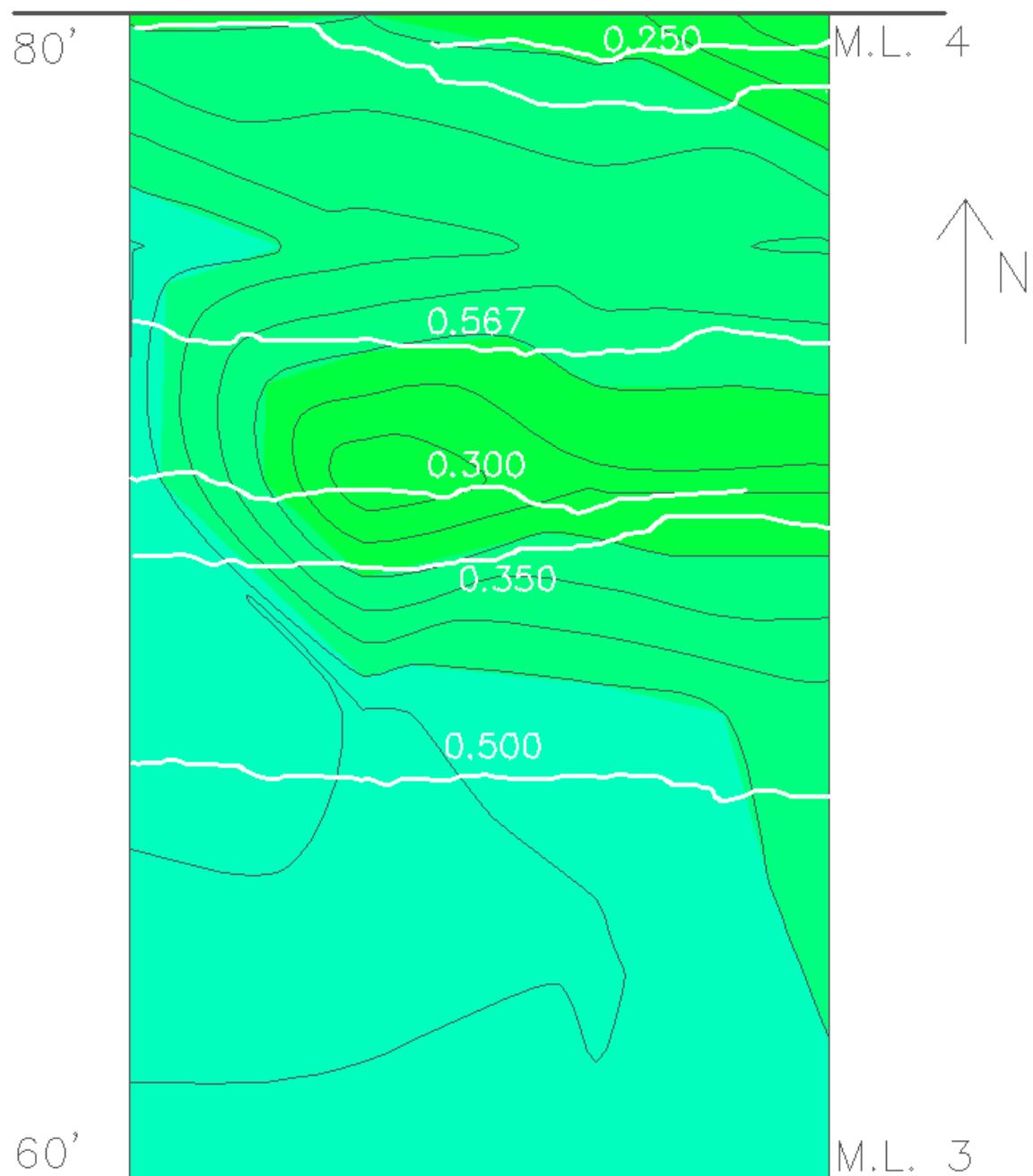


Figure B.13: MRM 68 fall 2010 from 60 to 80 feet

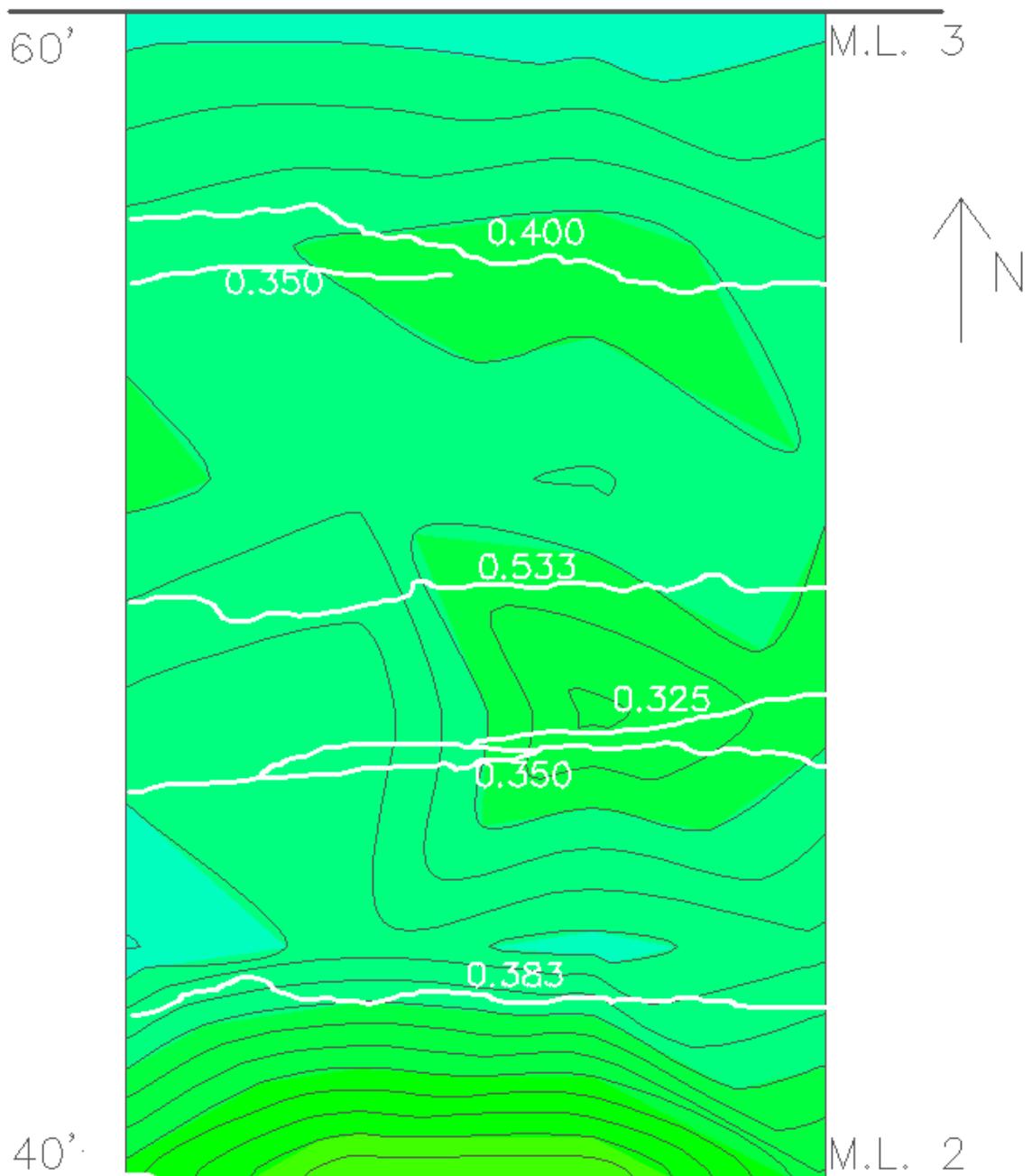


Figure B.14: MRM 68 fall 2010 from 40 to 60 feet

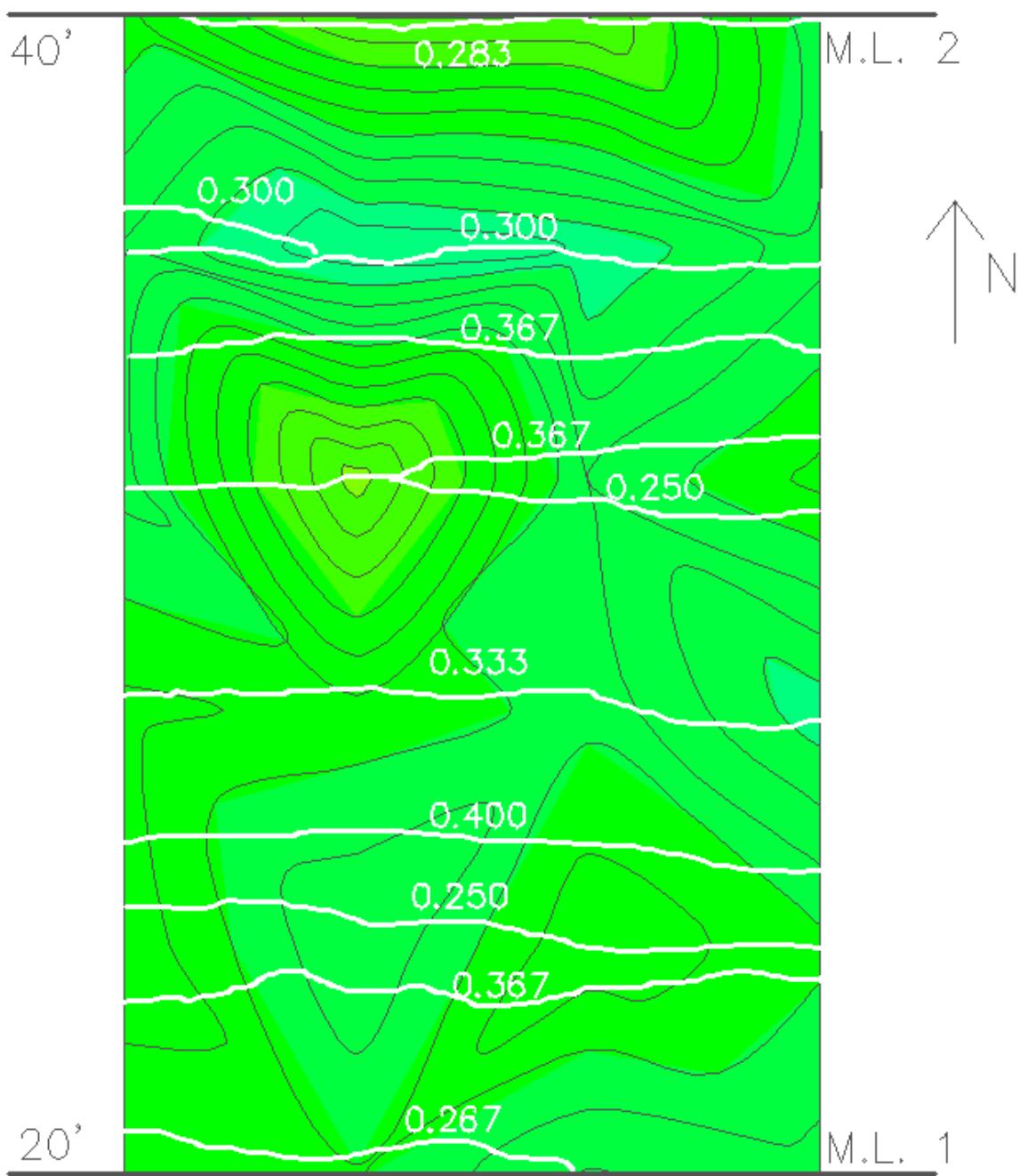


Figure B.15: MRM 68 fall 2010 from 20 to 40 feet

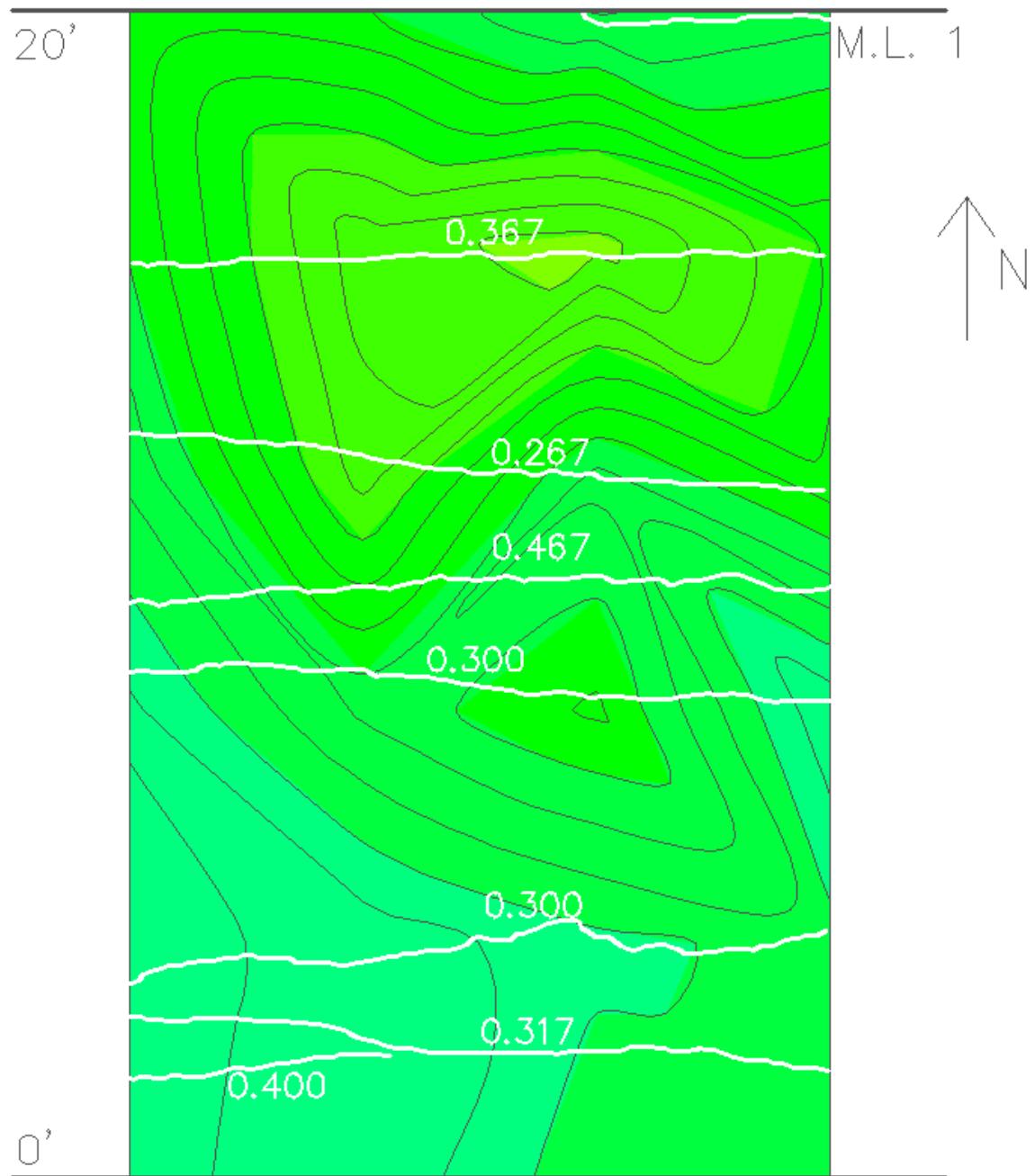


Figure B.16: MRM 68 fall 2010 from 0 to 20 feet

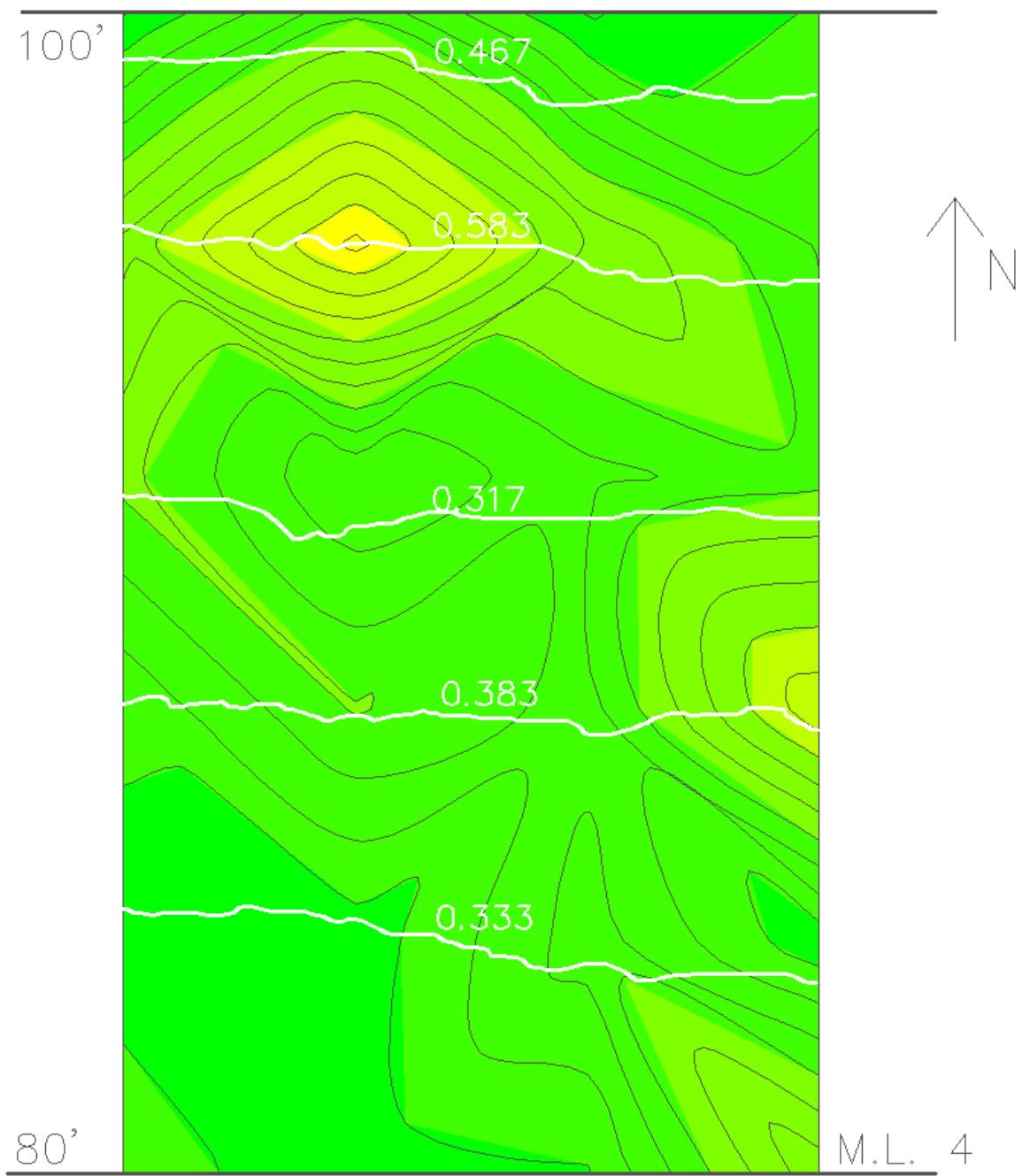


Figure B.17: MRM 68 spring 2011 from 80 to 100 feet

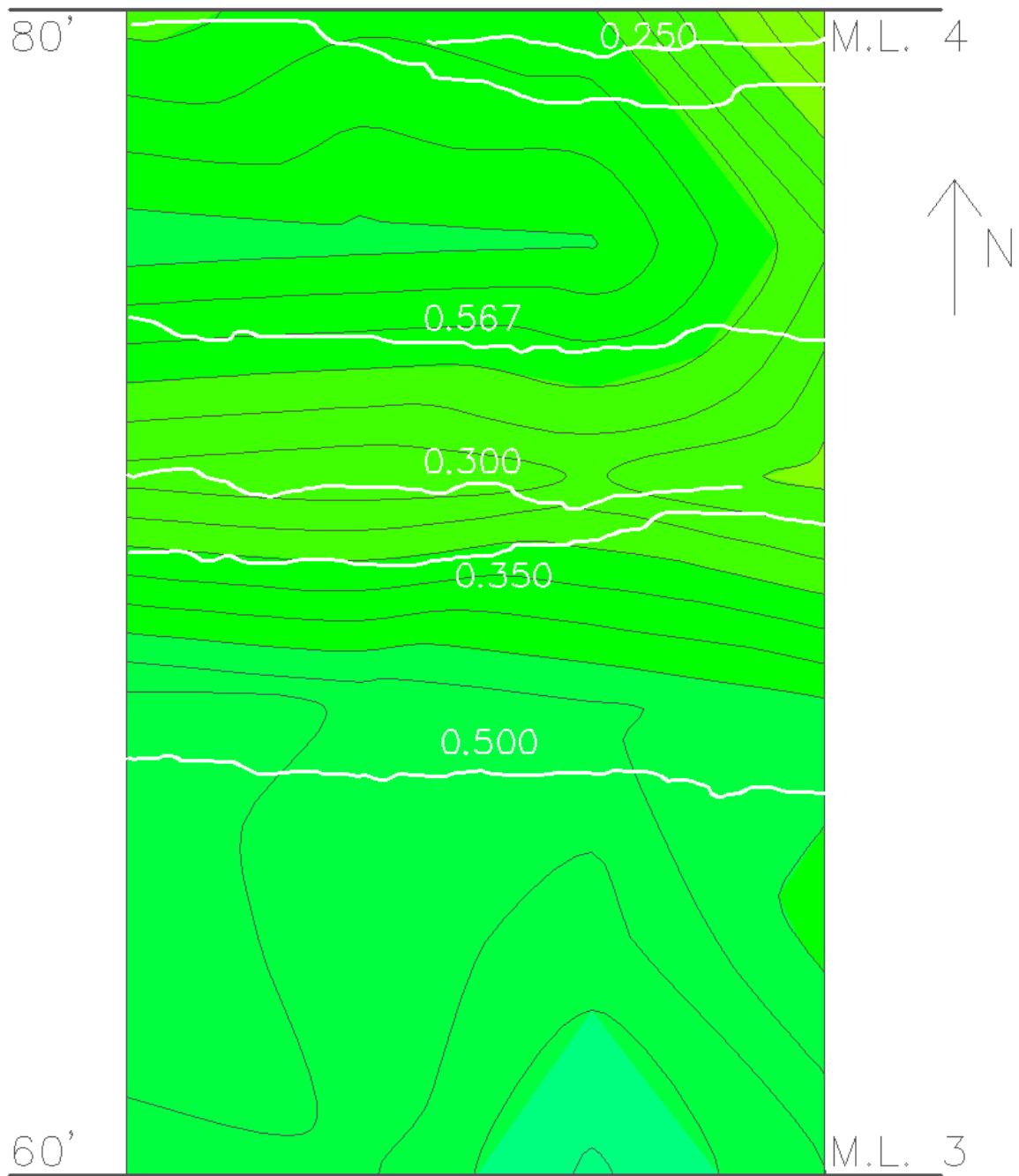


Figure B.18: MRM 68 spring 2011 from 60 to 80 feet

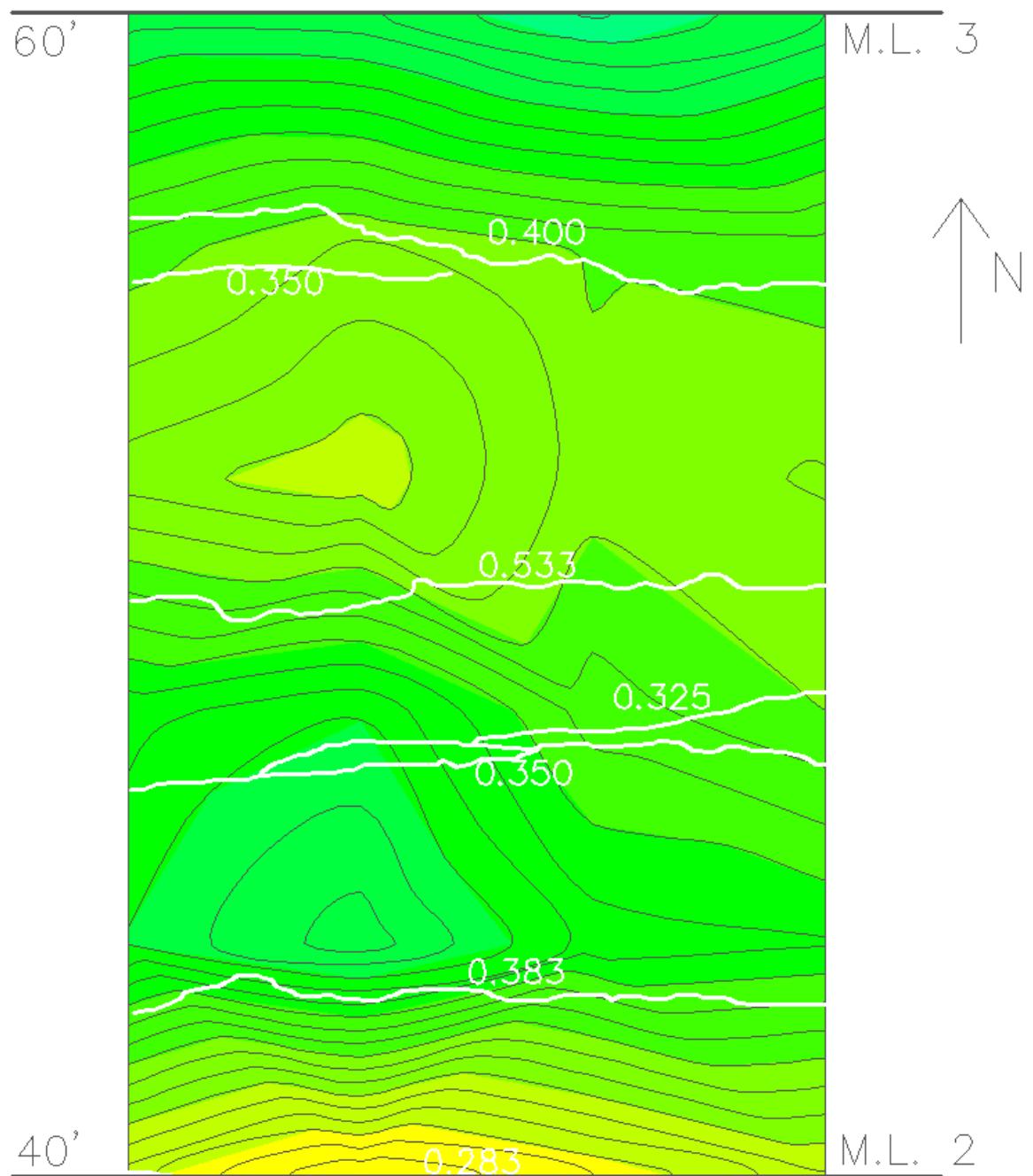


Figure B.19: MRM 68 spring 2011 from 40 to 60 feet

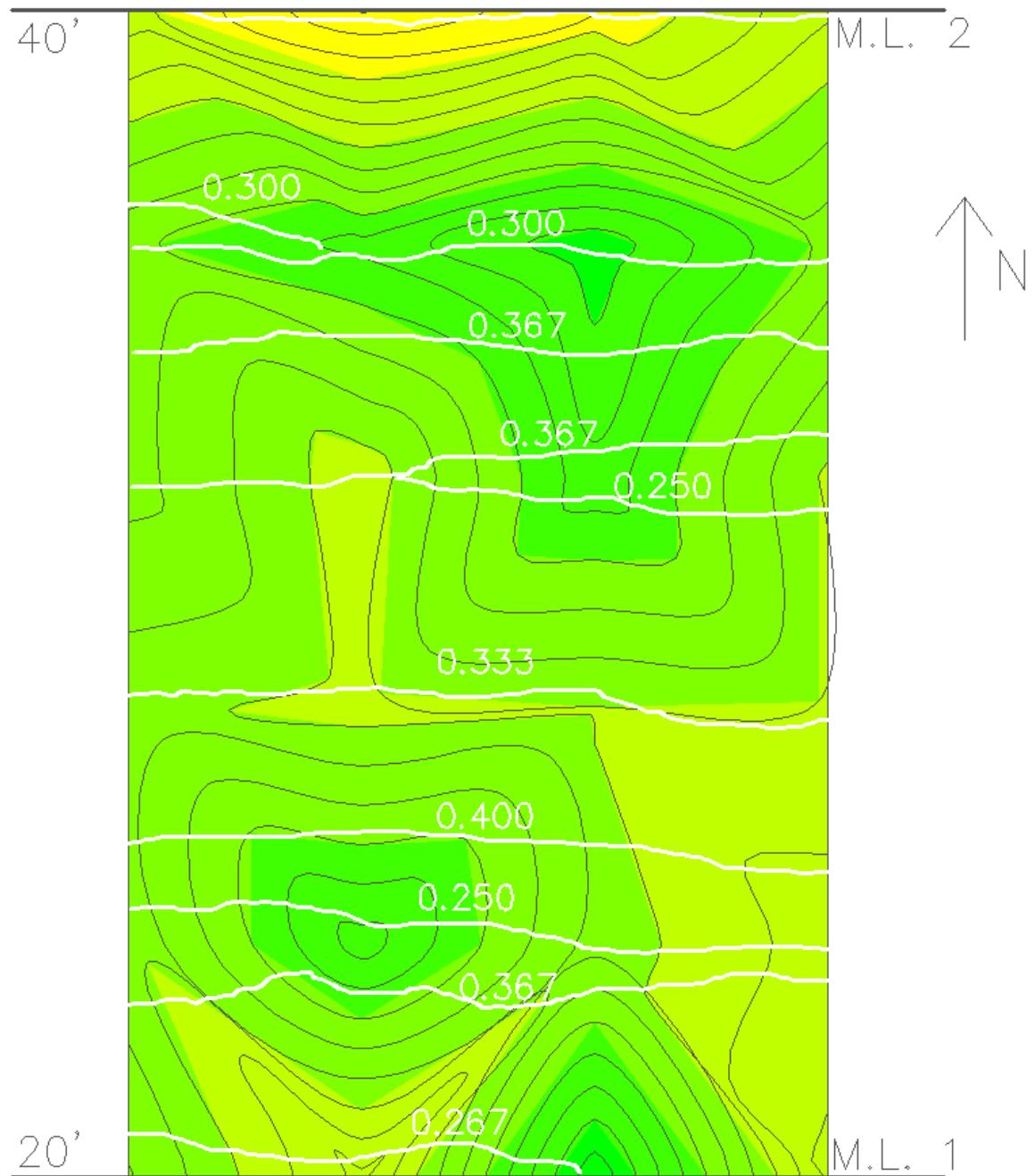


Figure B.20: MRM 68 spring 2011 from 20 to 40 feet

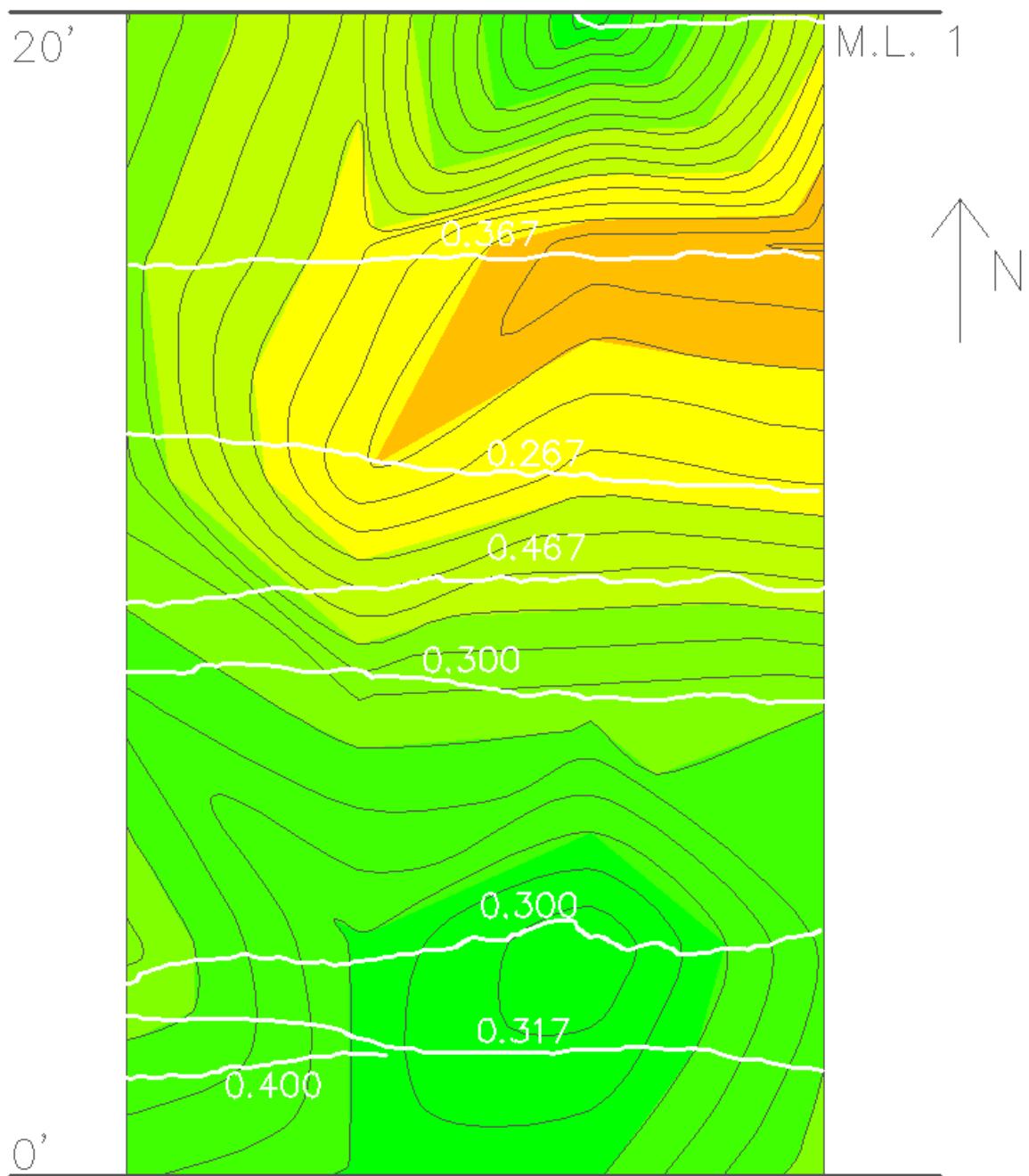


Figure B.21: MRM 68 spring 2011 from 0 to 20 feet

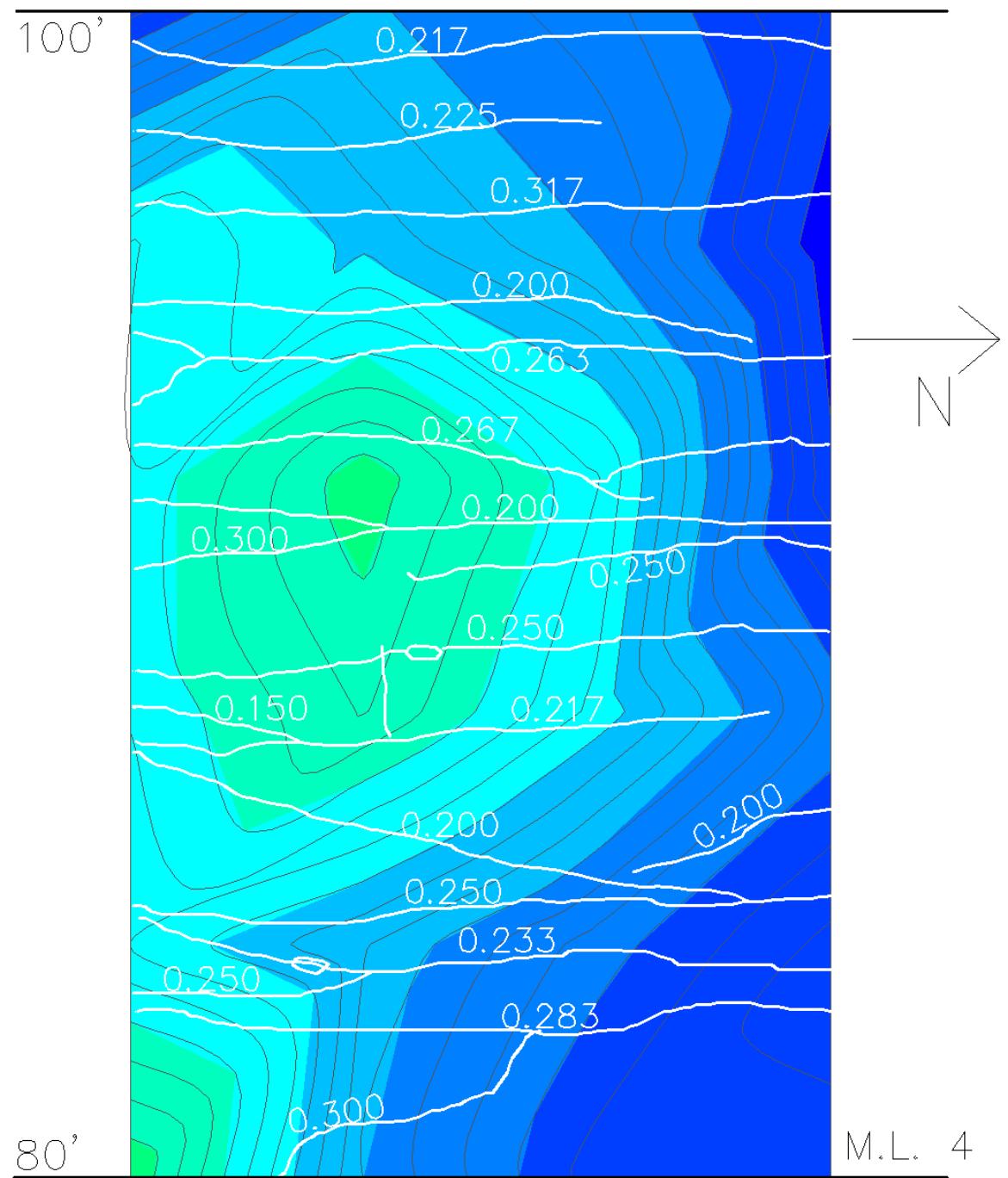


Figure B.22: MRM 411 fall 2010 from 80 to 100 feet

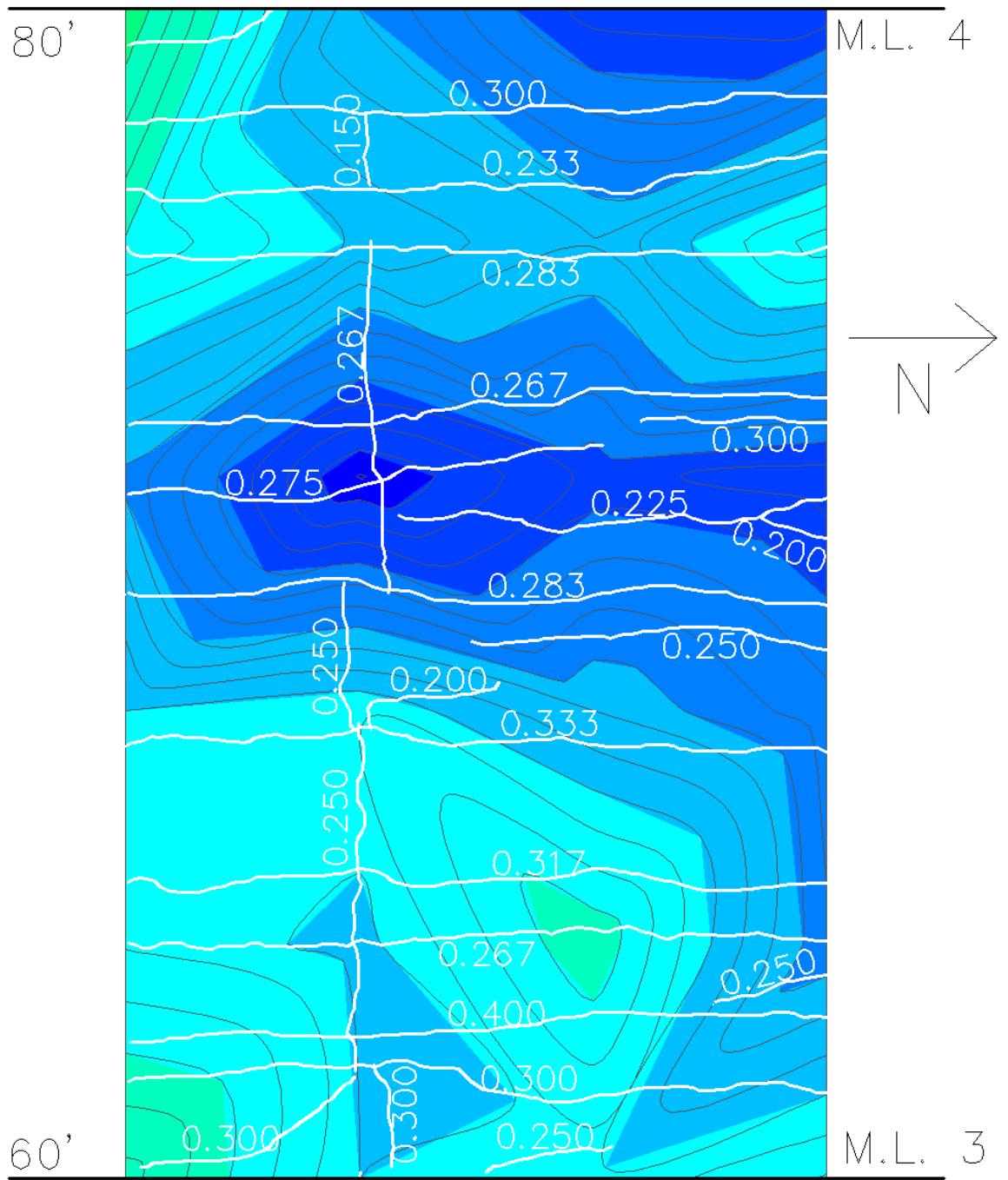


Figure B.23: MRM 411 fall 2010 from 60 to 80 feet

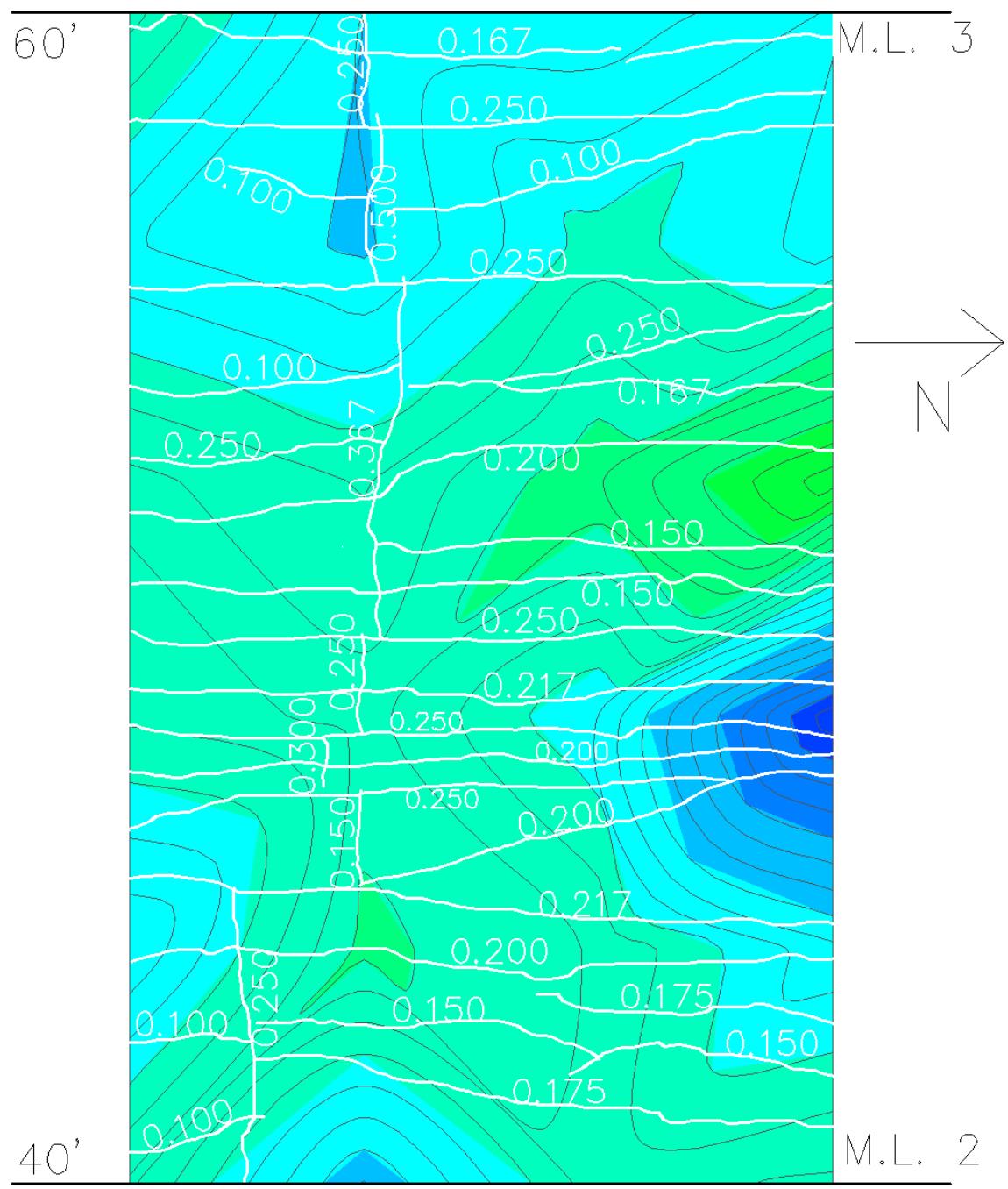


Figure B.24: MRM 411 fall 2010 from 40 to 60 feet

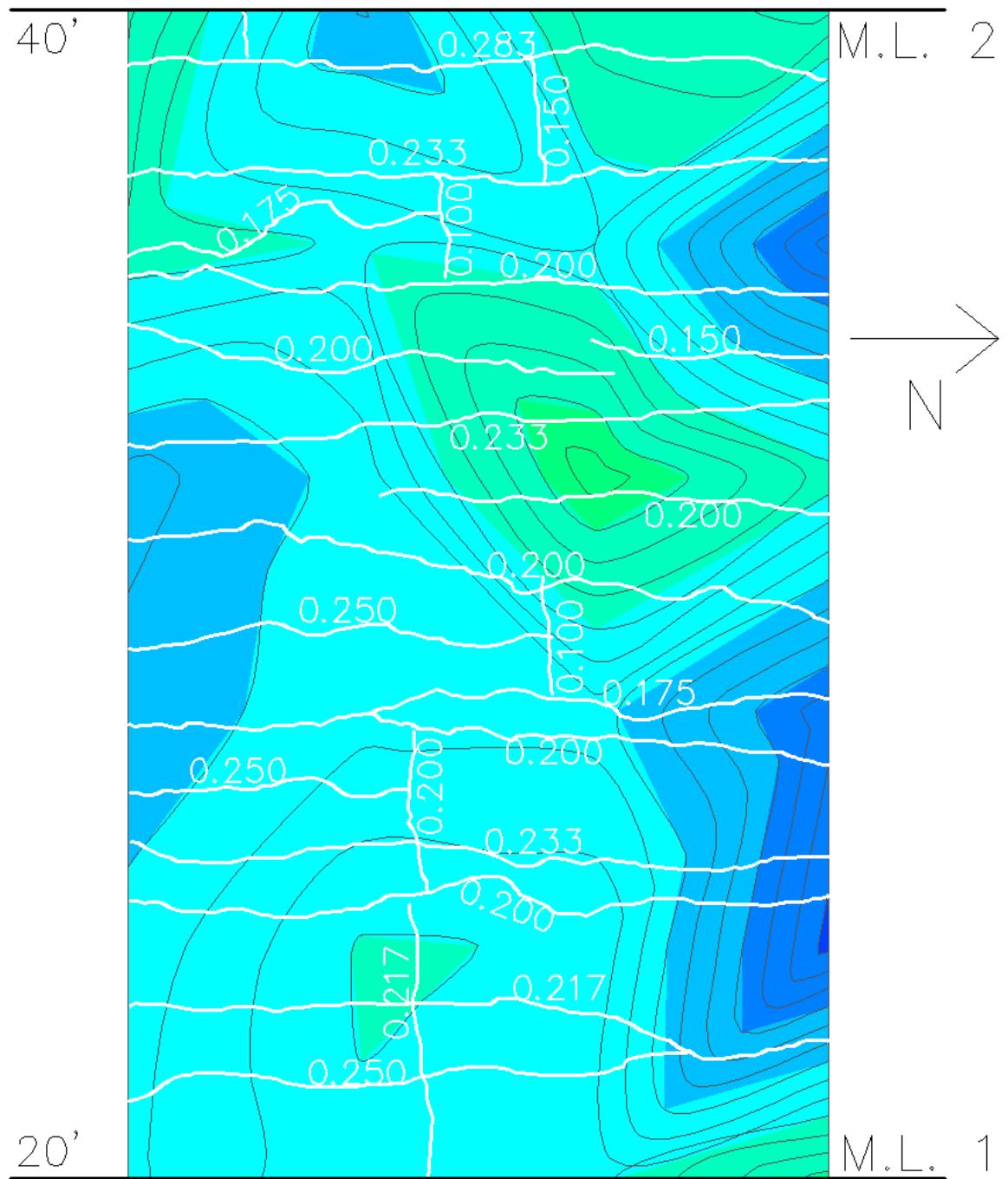


Figure B.25: MRM 411 fall 2010 from 20 to 40 feet

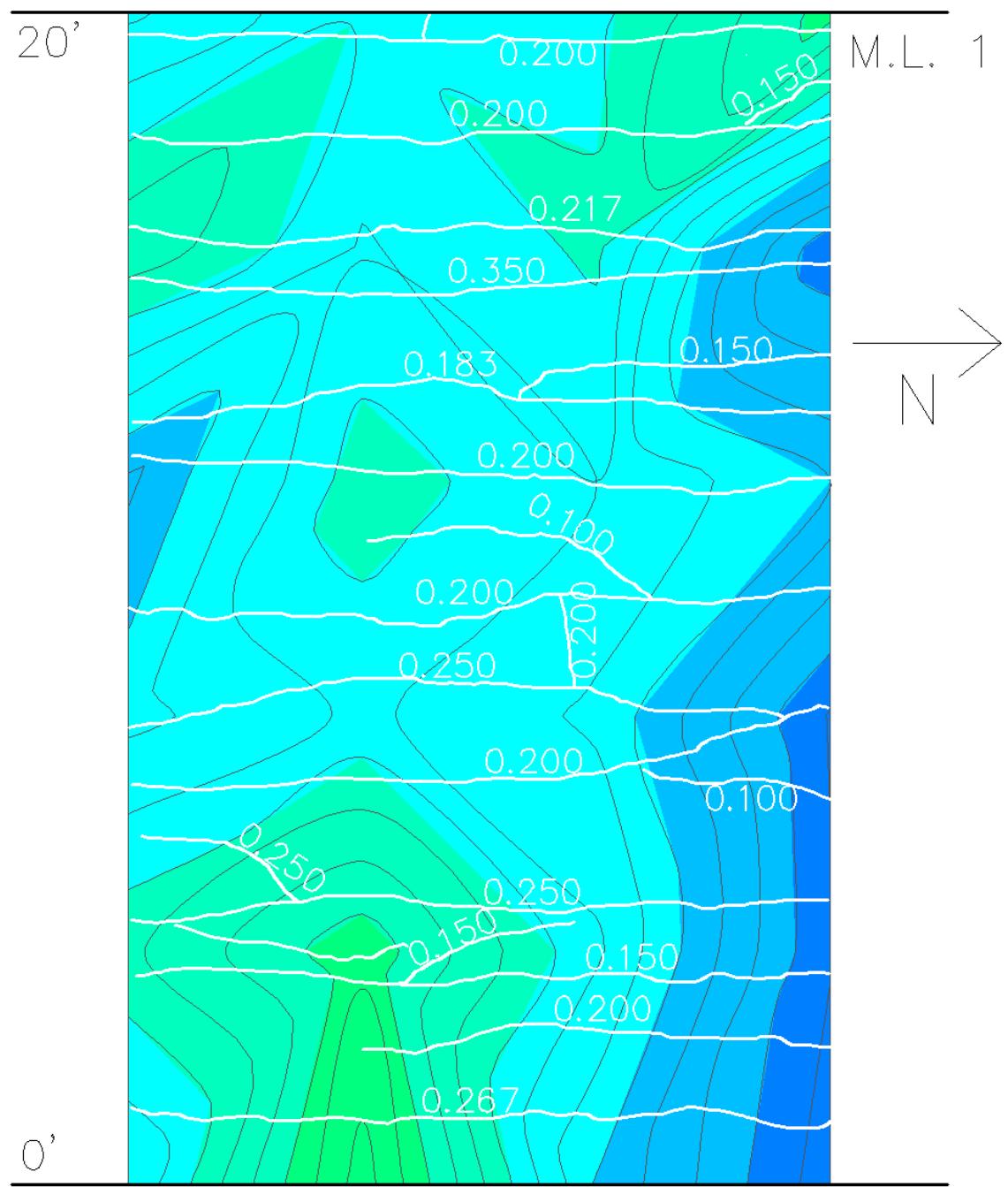


Figure B.26: MRM 411 fall 2010 from 0 to 20 feet

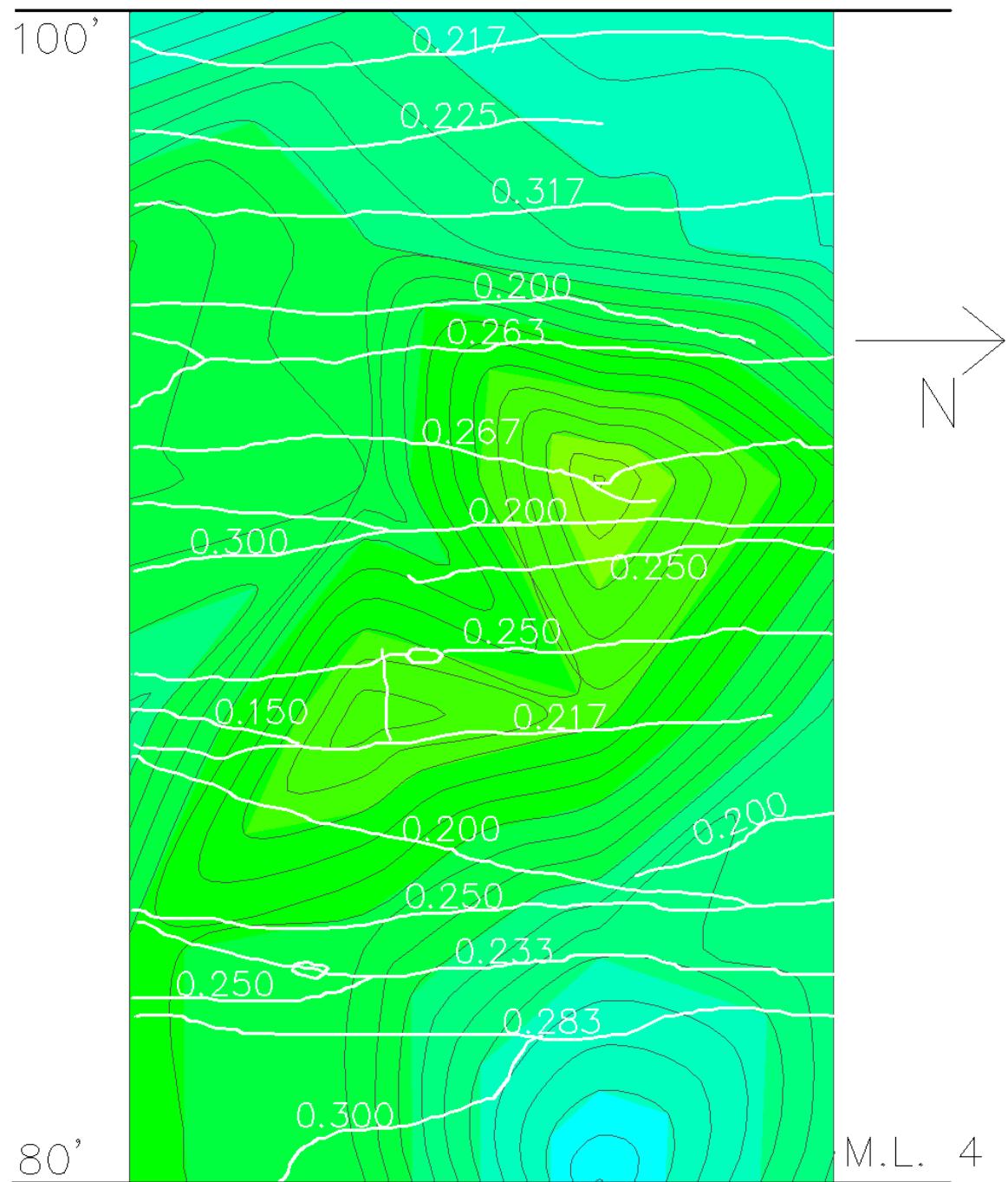


Figure B.27: MRM 411 spring 2011 from 80 to 100 feet

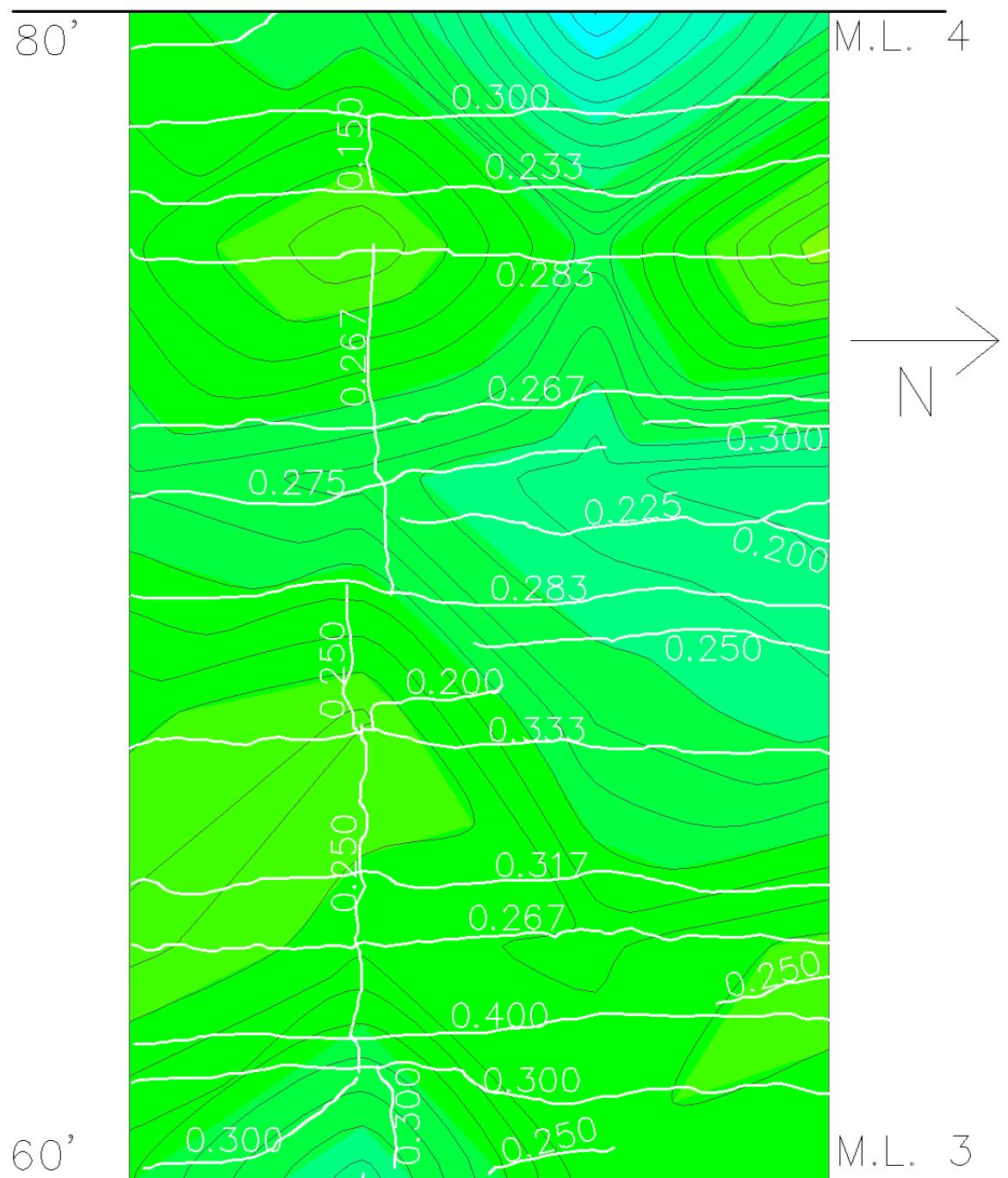


Figure B.28: MRM 411 spring 2011 from 60 to 80 feet

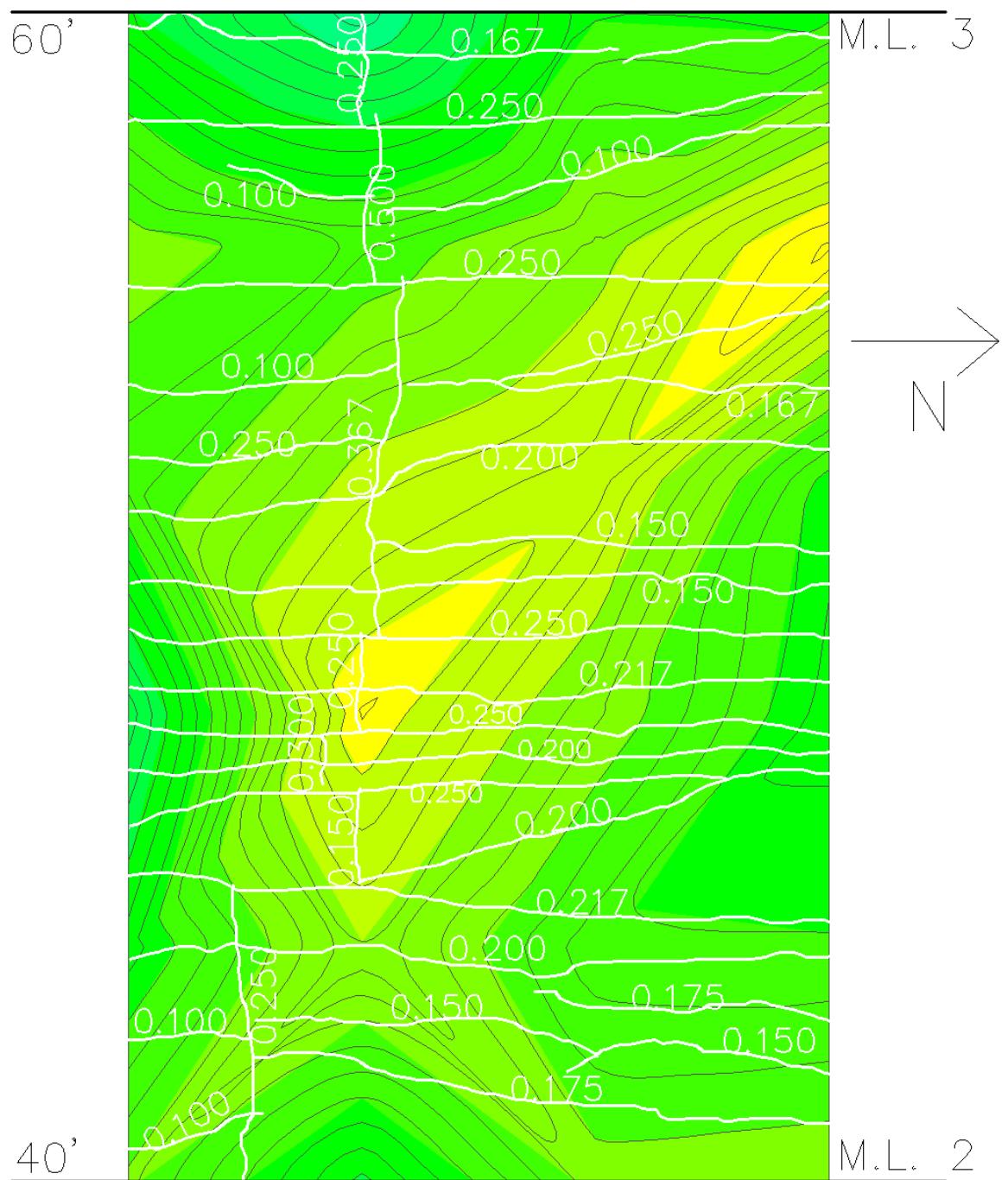


Figure B.29: MRM 411 spring 2011 from 40 to 60 feet

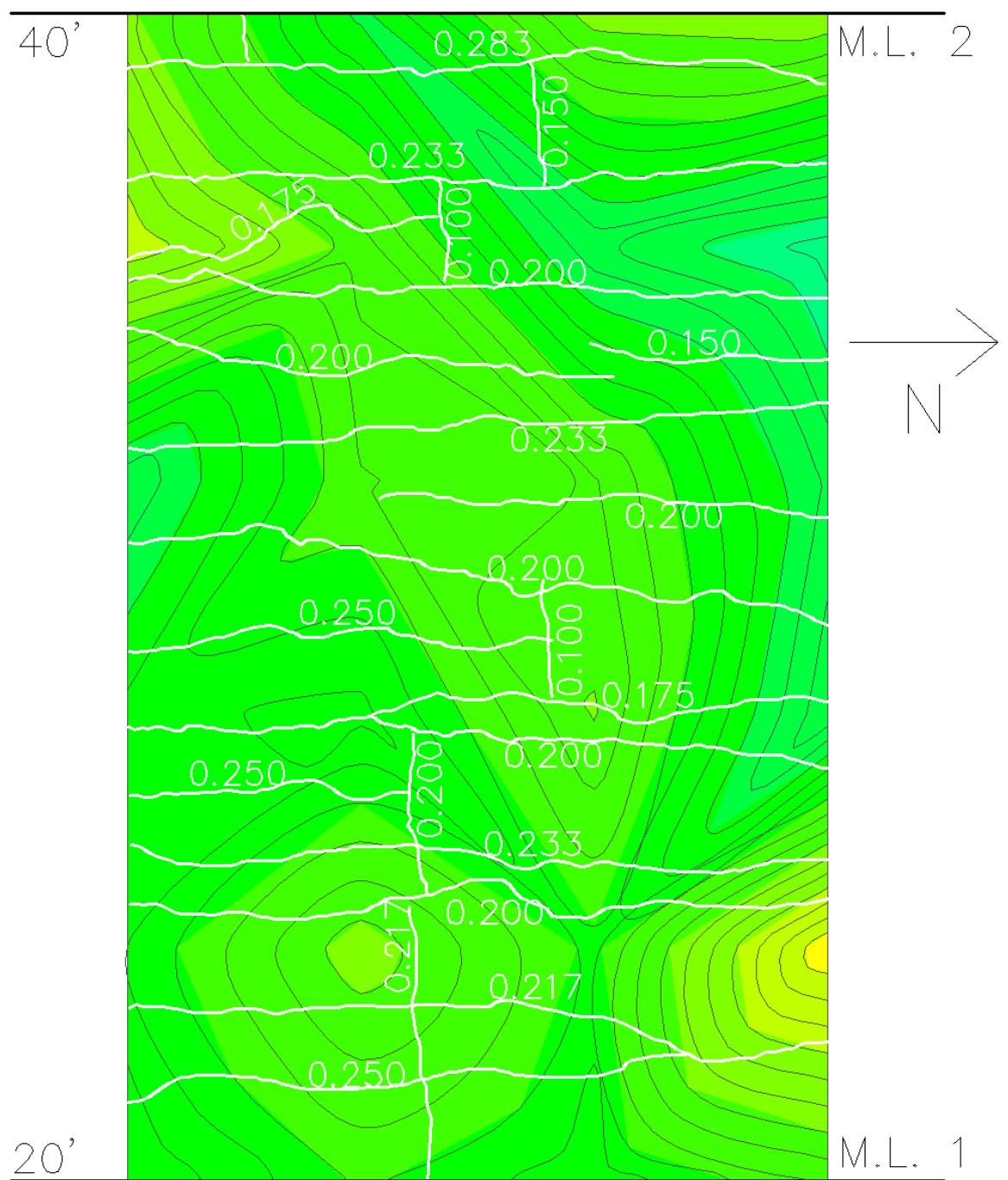


Figure B.30: MRM 411 spring 2011 from 20 to 40 feet

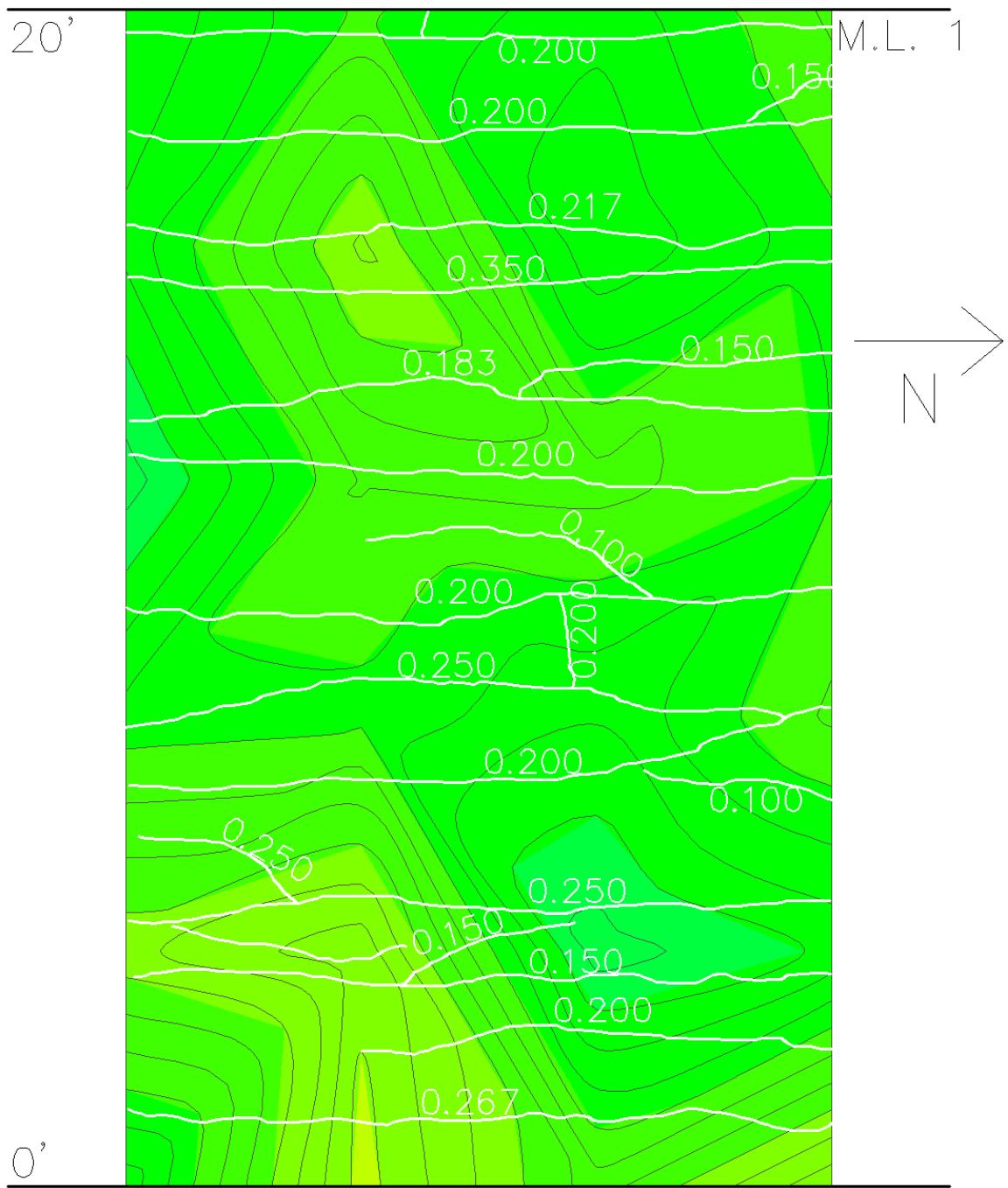


Figure B.31: MRM 411 spring 2011 from 0 to 20 feet

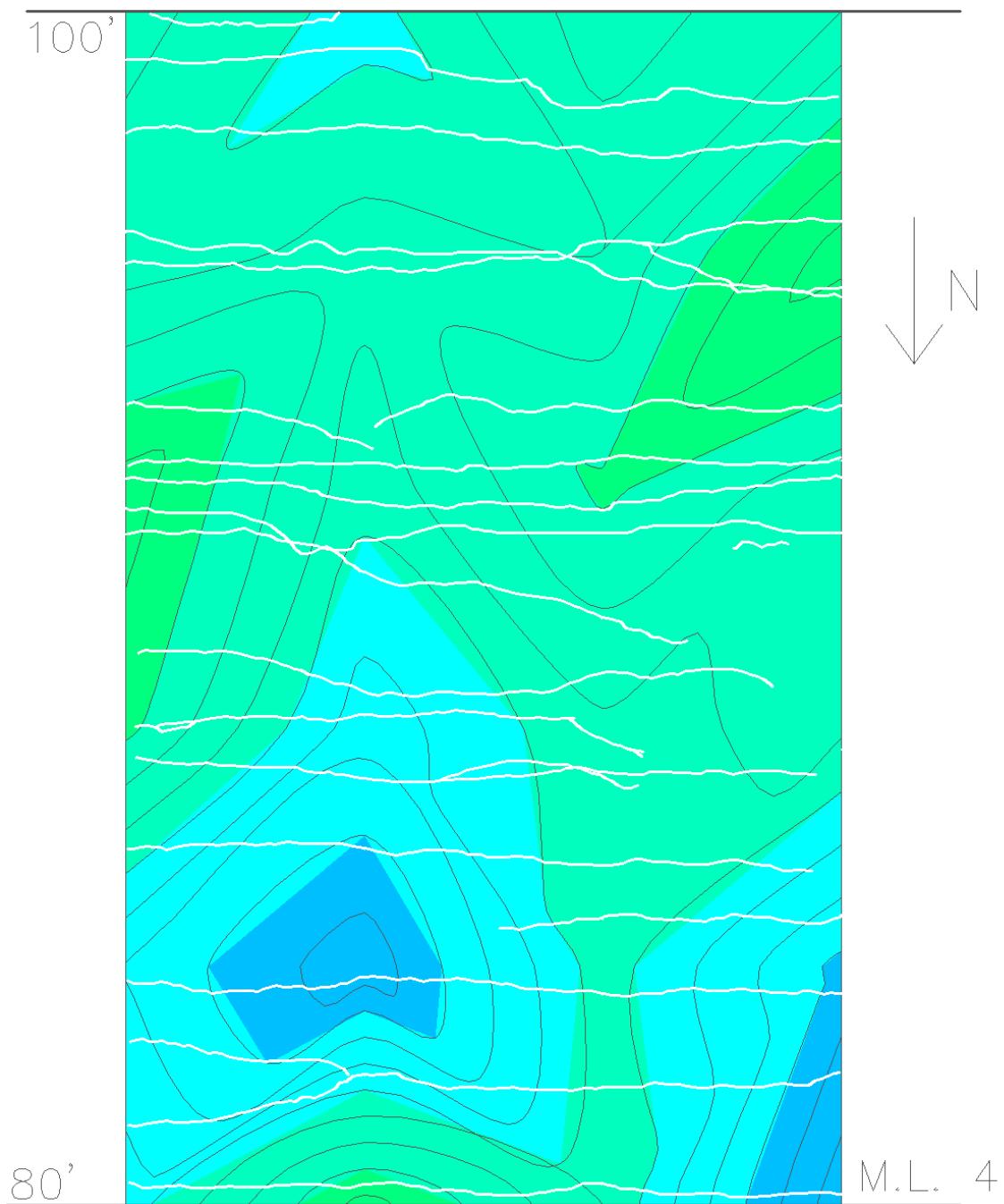


Figure B.32: MRM 33 from 80 to 100 feet

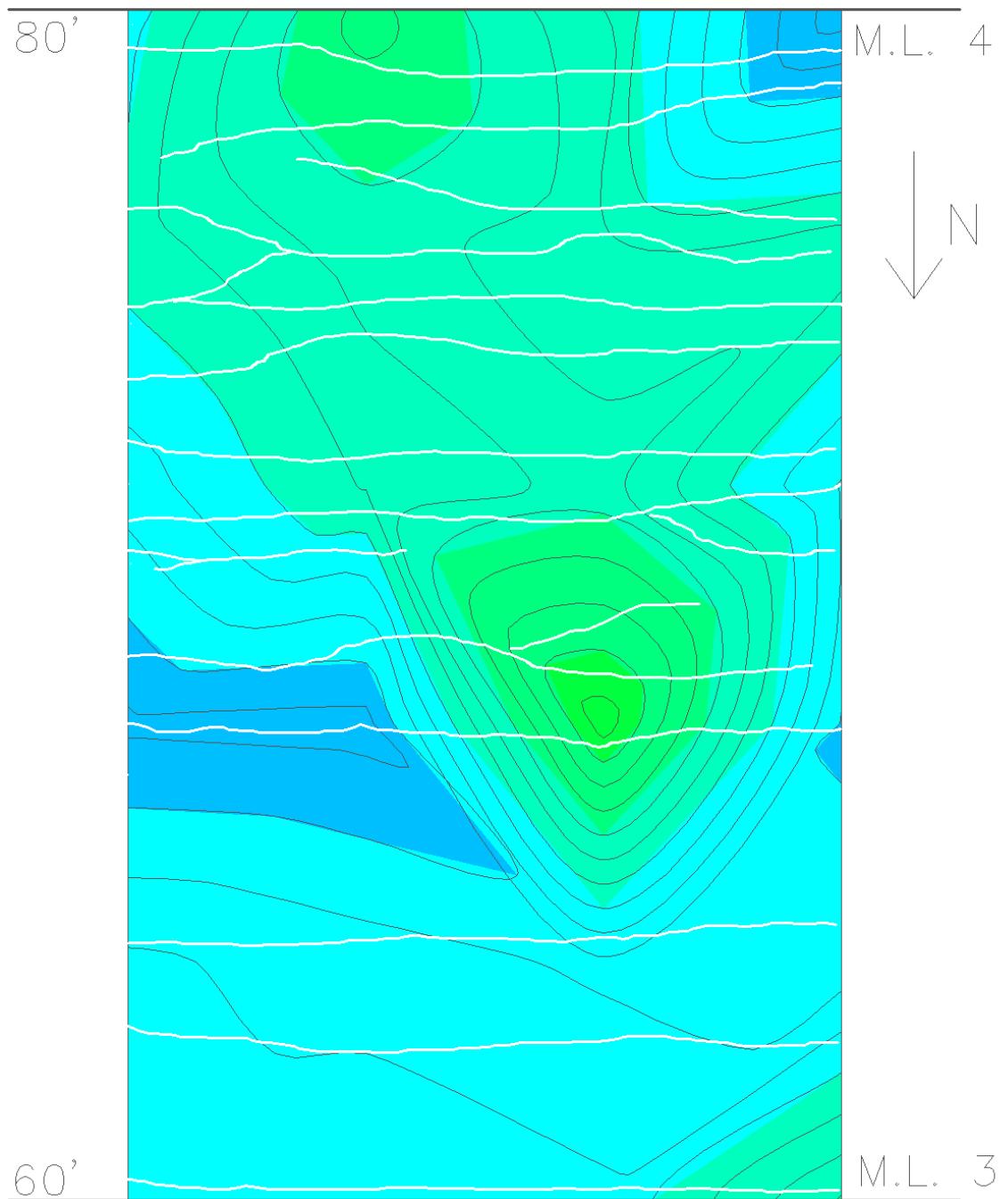


Figure B.33: MRM 33 from 60 to 80 feet

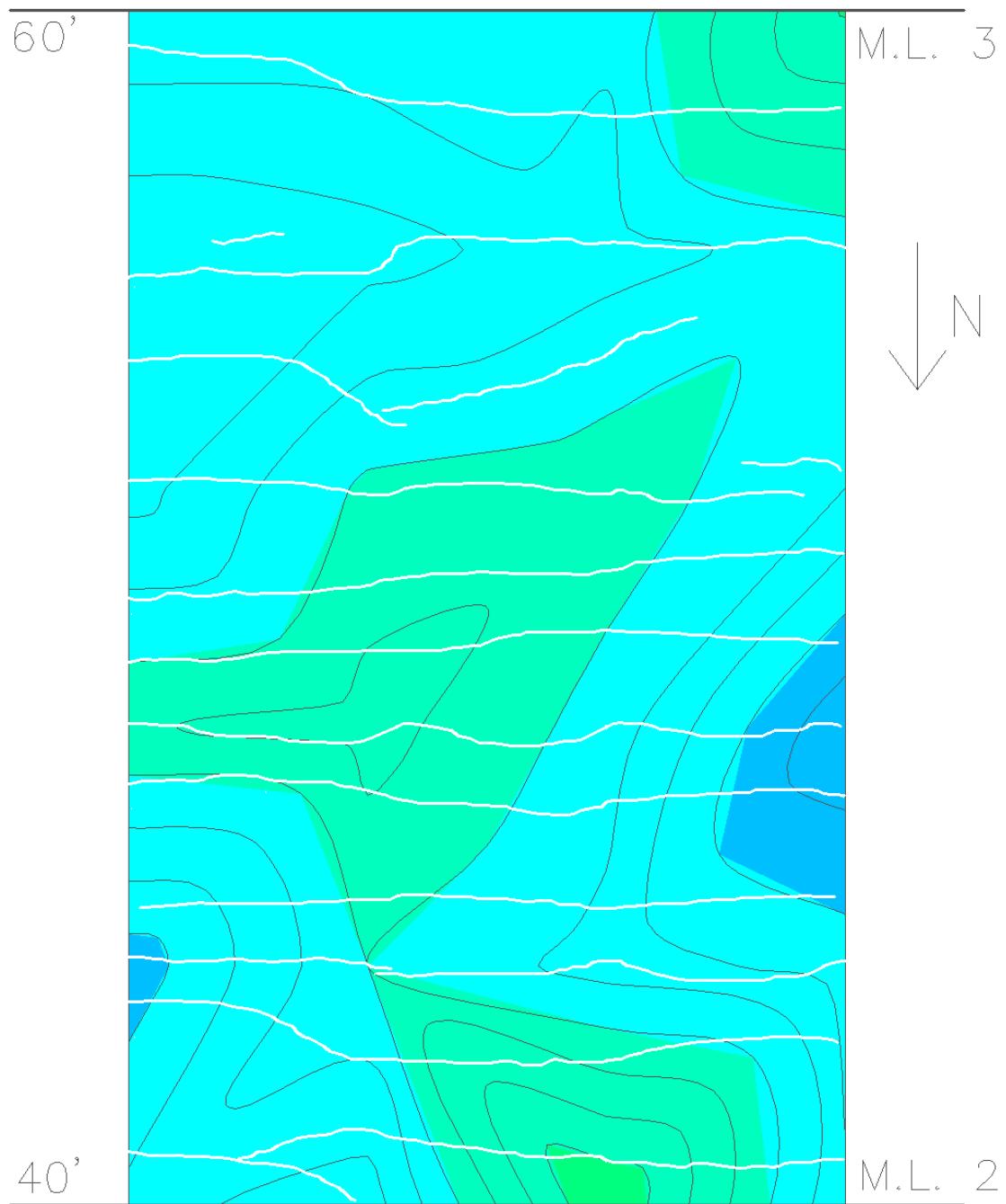


Figure B.34: MRM 33 from 40 to 60 feet

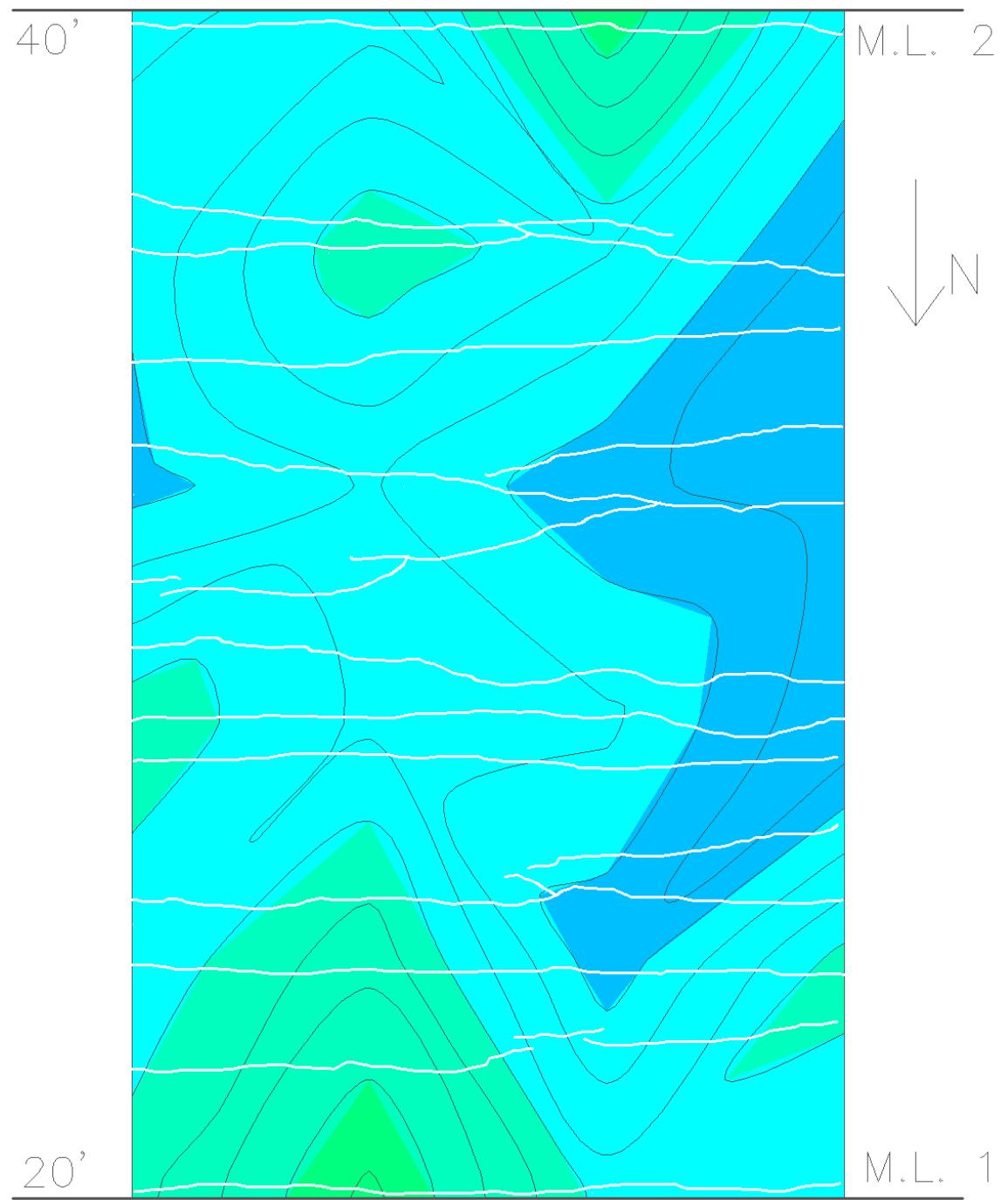


Figure B.35: MRM 33 from 20 to 40 feet

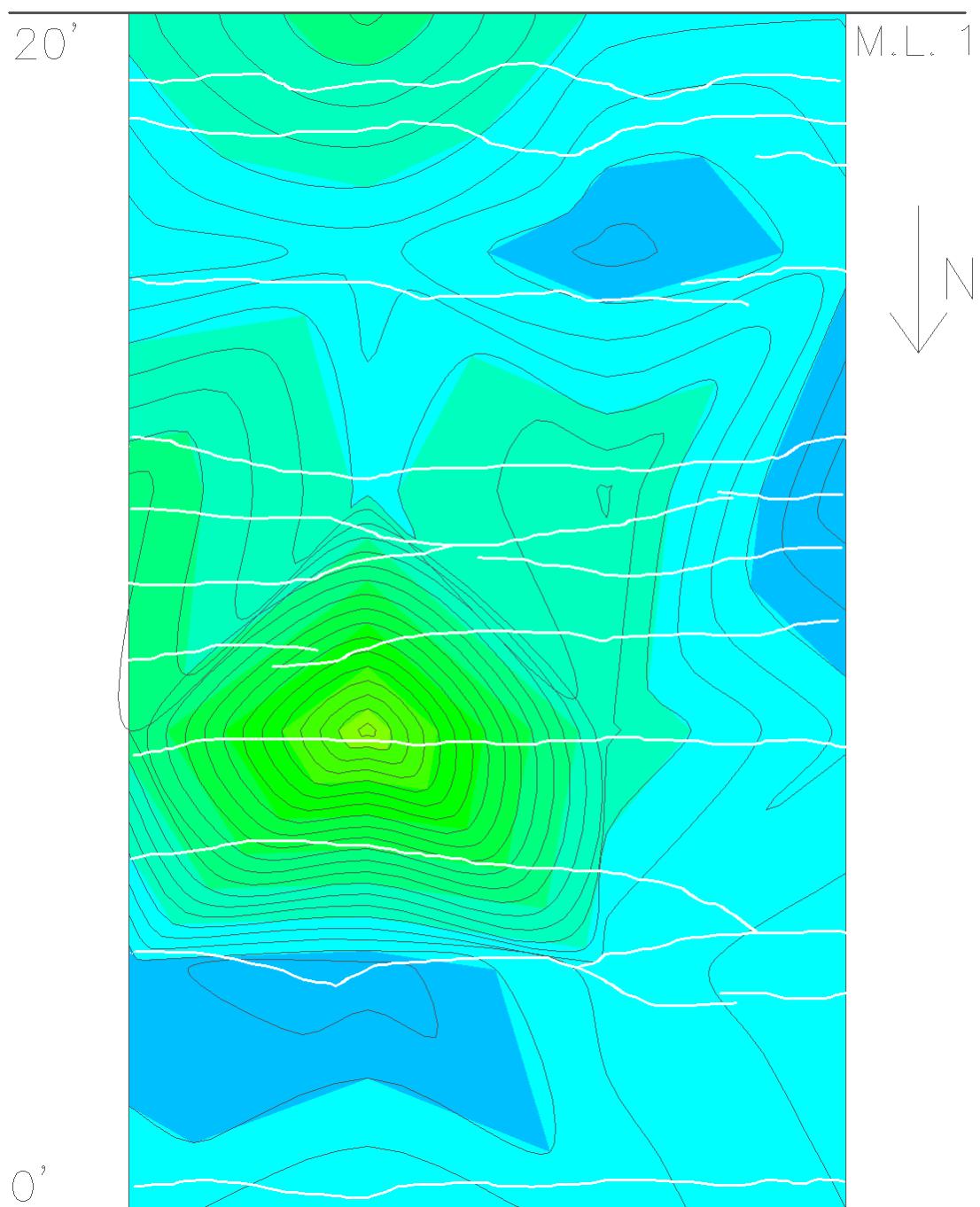


Figure B.36: MRM 33 from 0 to 20 feet

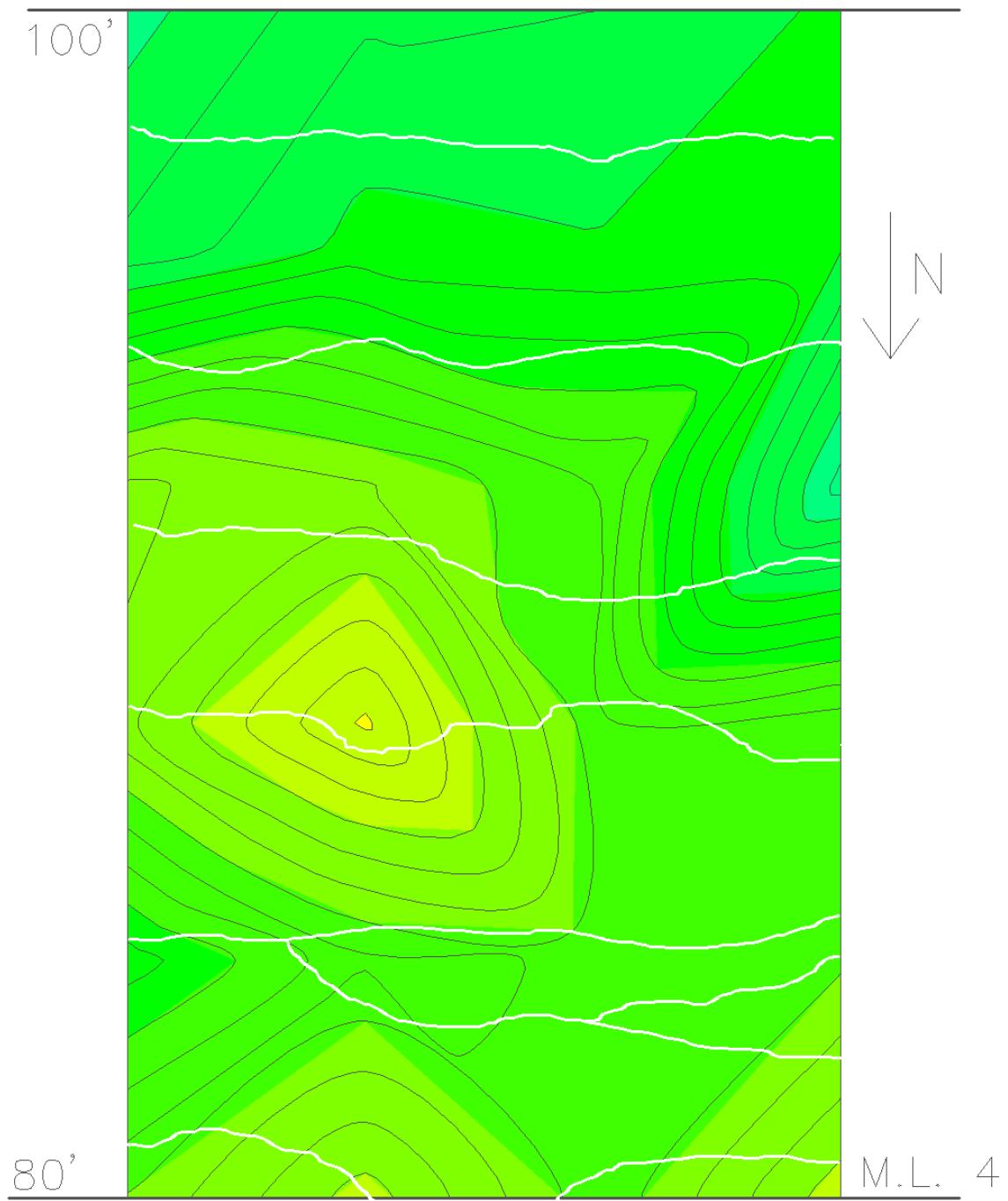


Figure B.37: MRM 44 from 80 to 100 feet

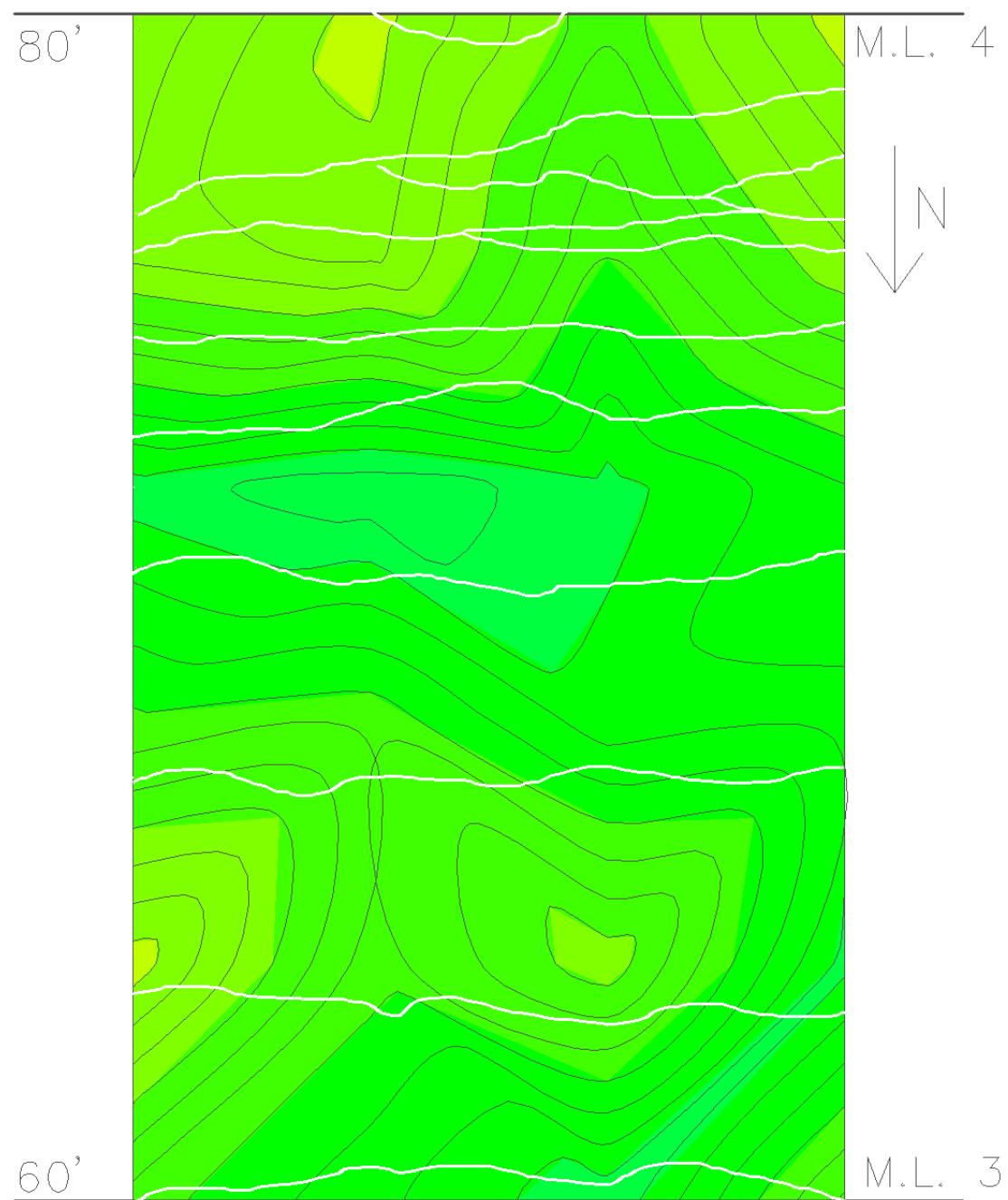


Figure B.38: MRM 44 from 60 to 80 feet

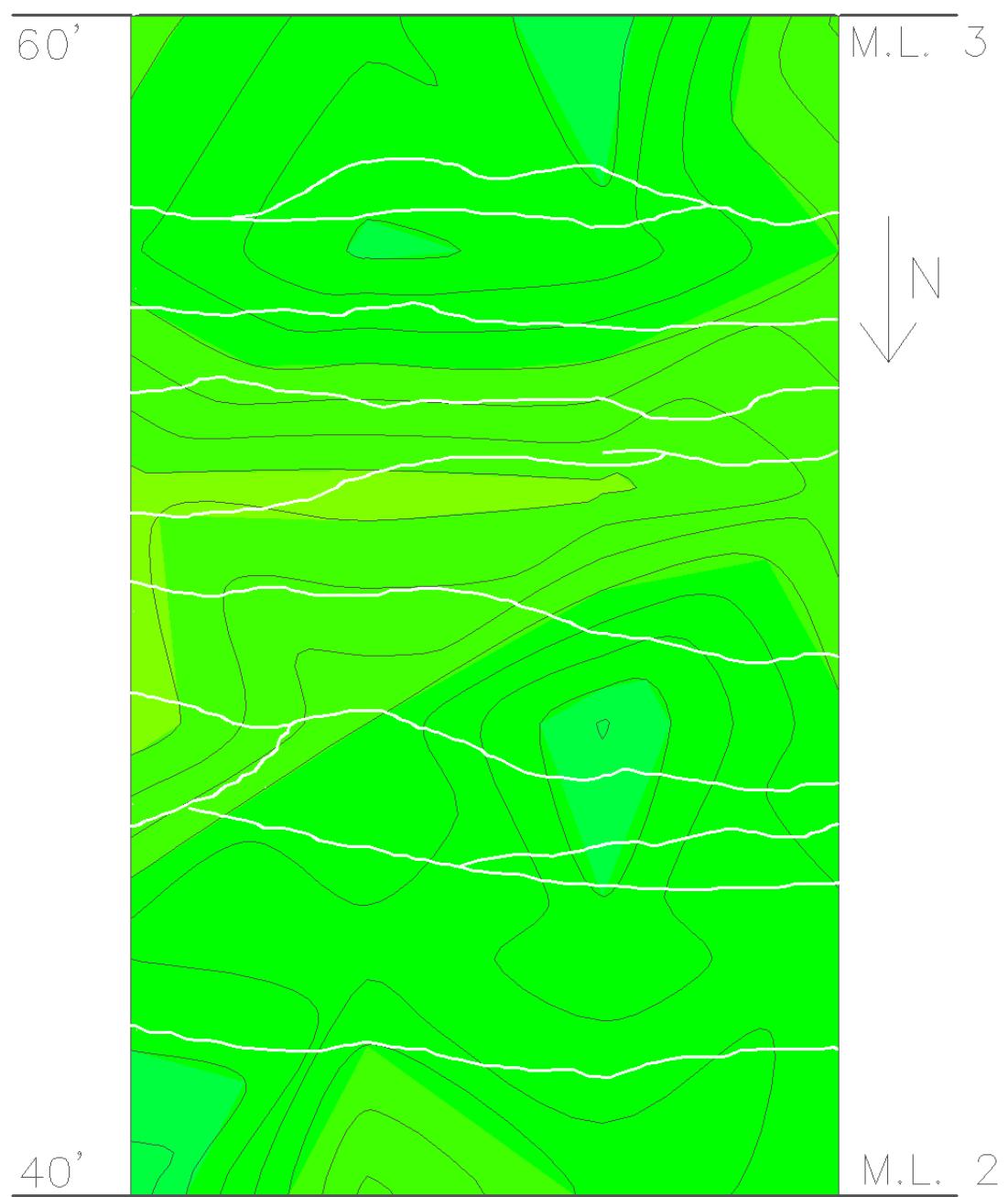


Figure B.39: MRM 44 from 40 to 60 feet

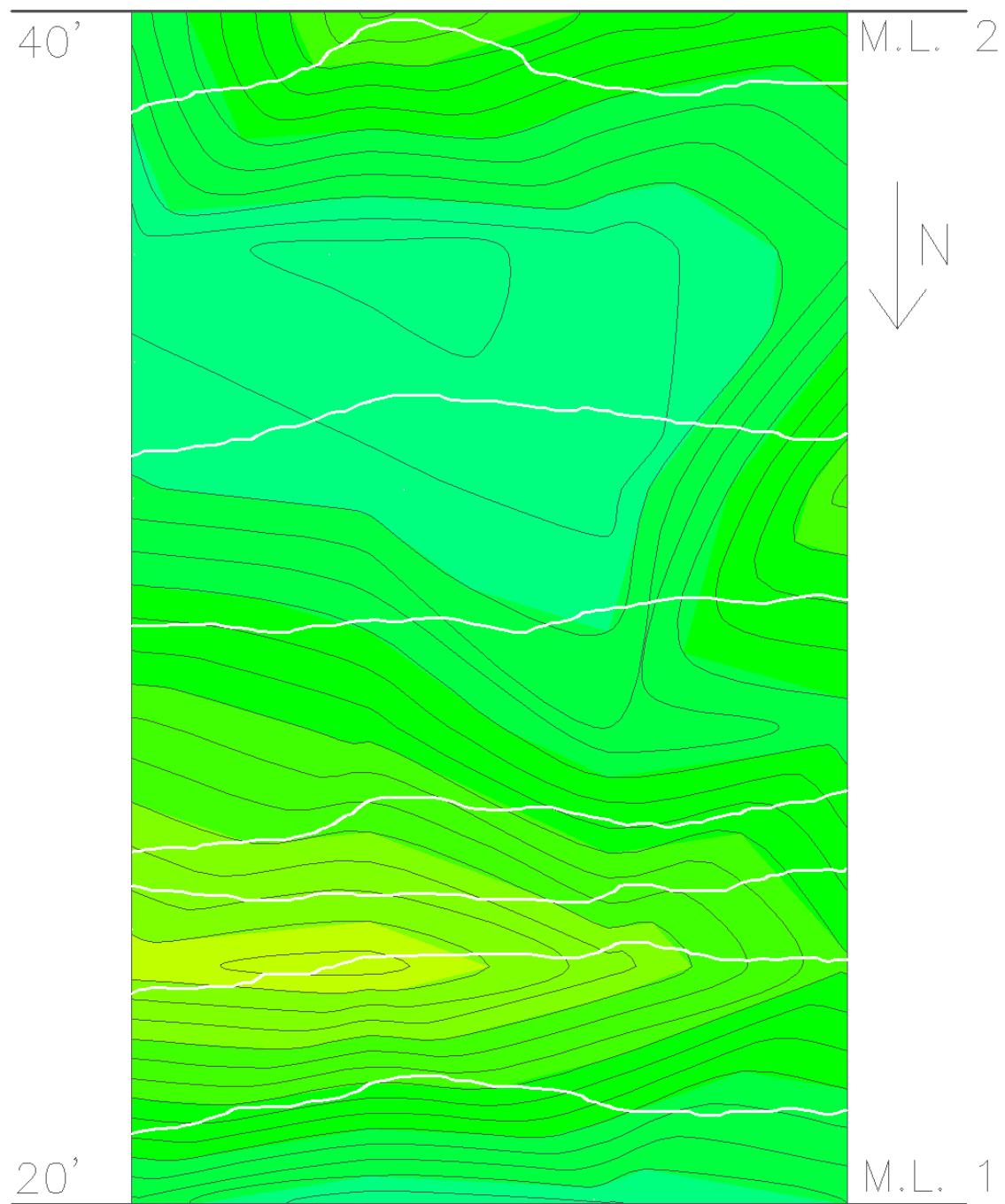


Figure B.40: MRM 44 from 20 to 40 feet

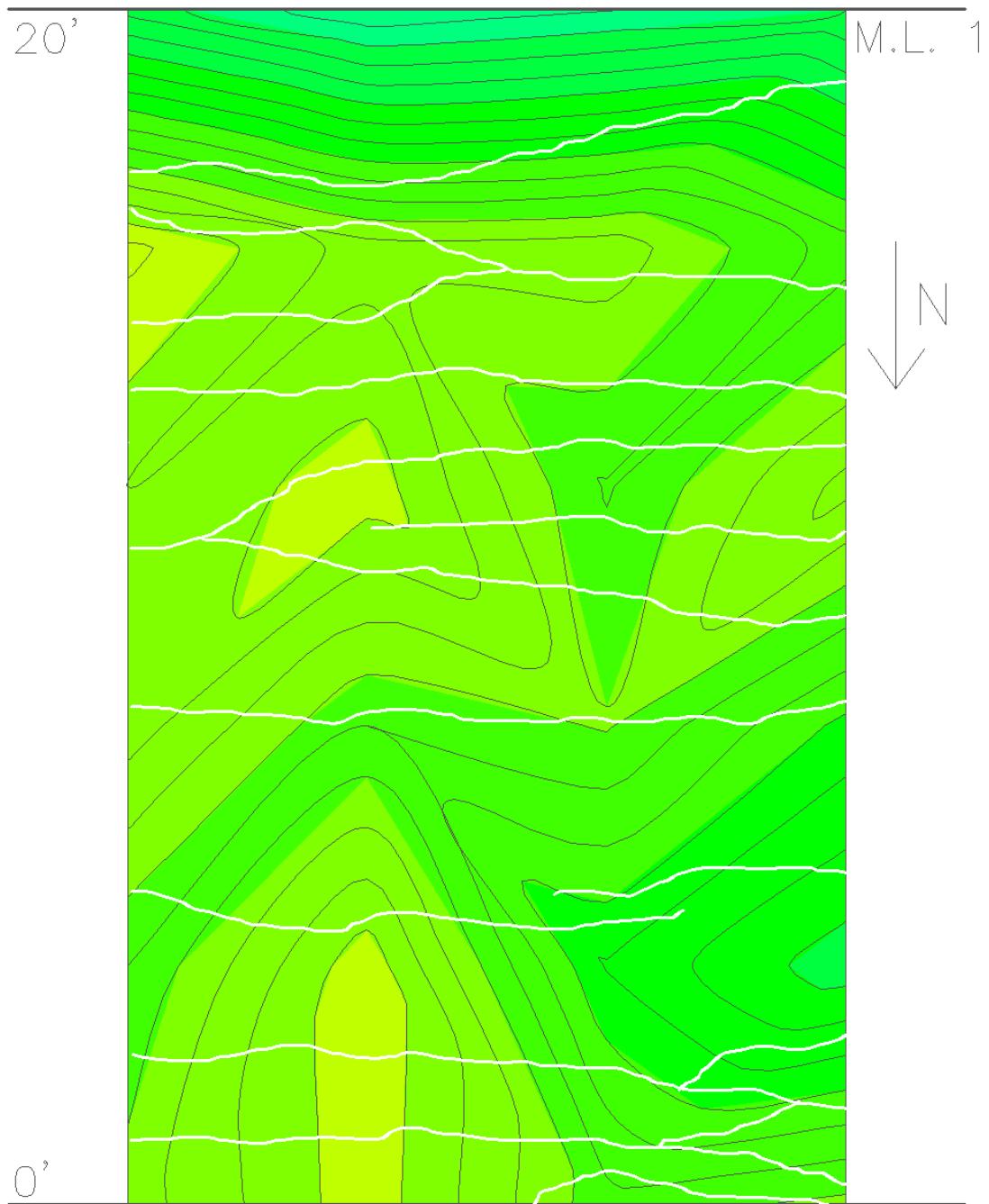


Figure B.41: MRM 44 from 0 to 20 feet

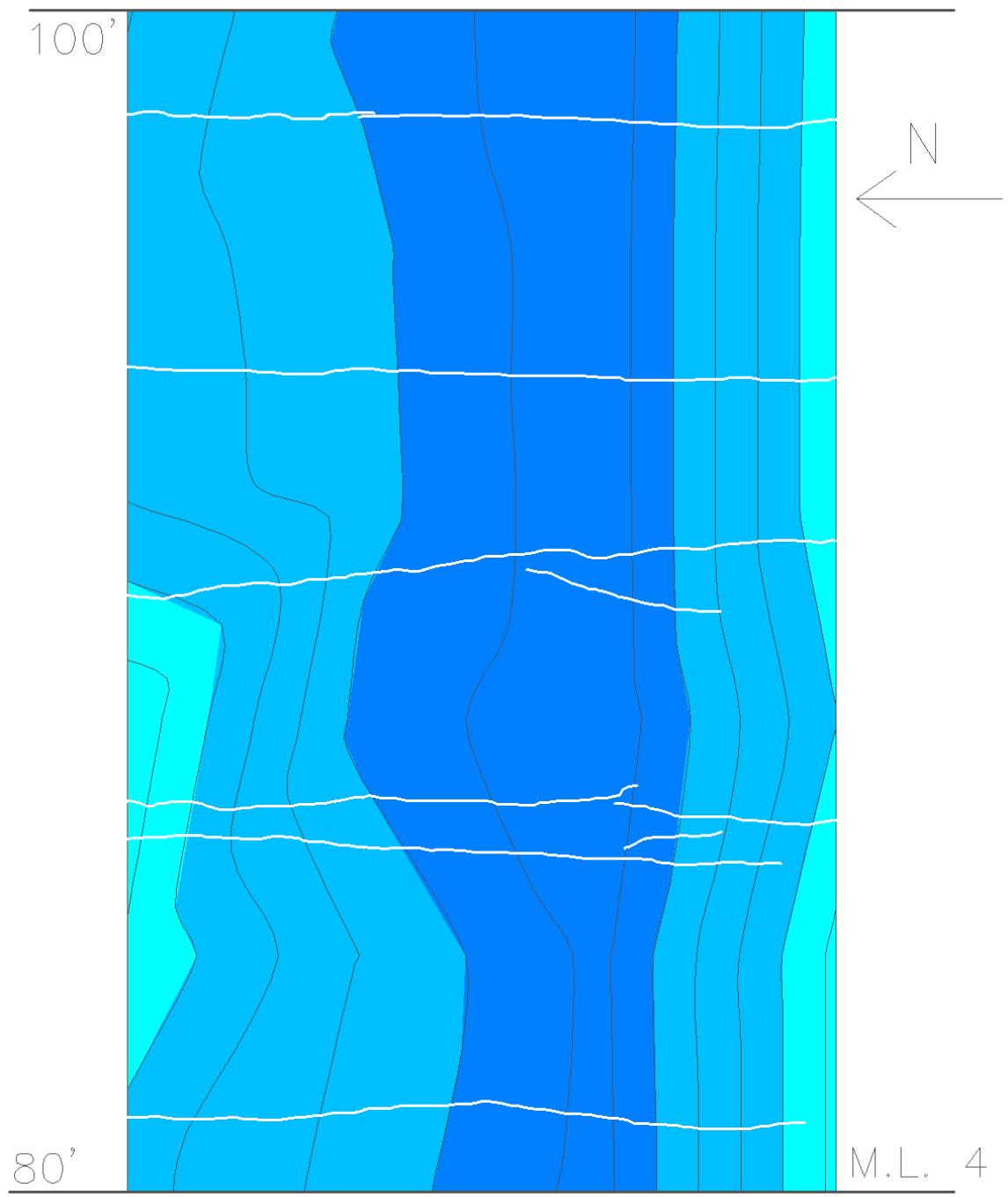


Figure B.42: MRM 25 from 80 to 100 feet

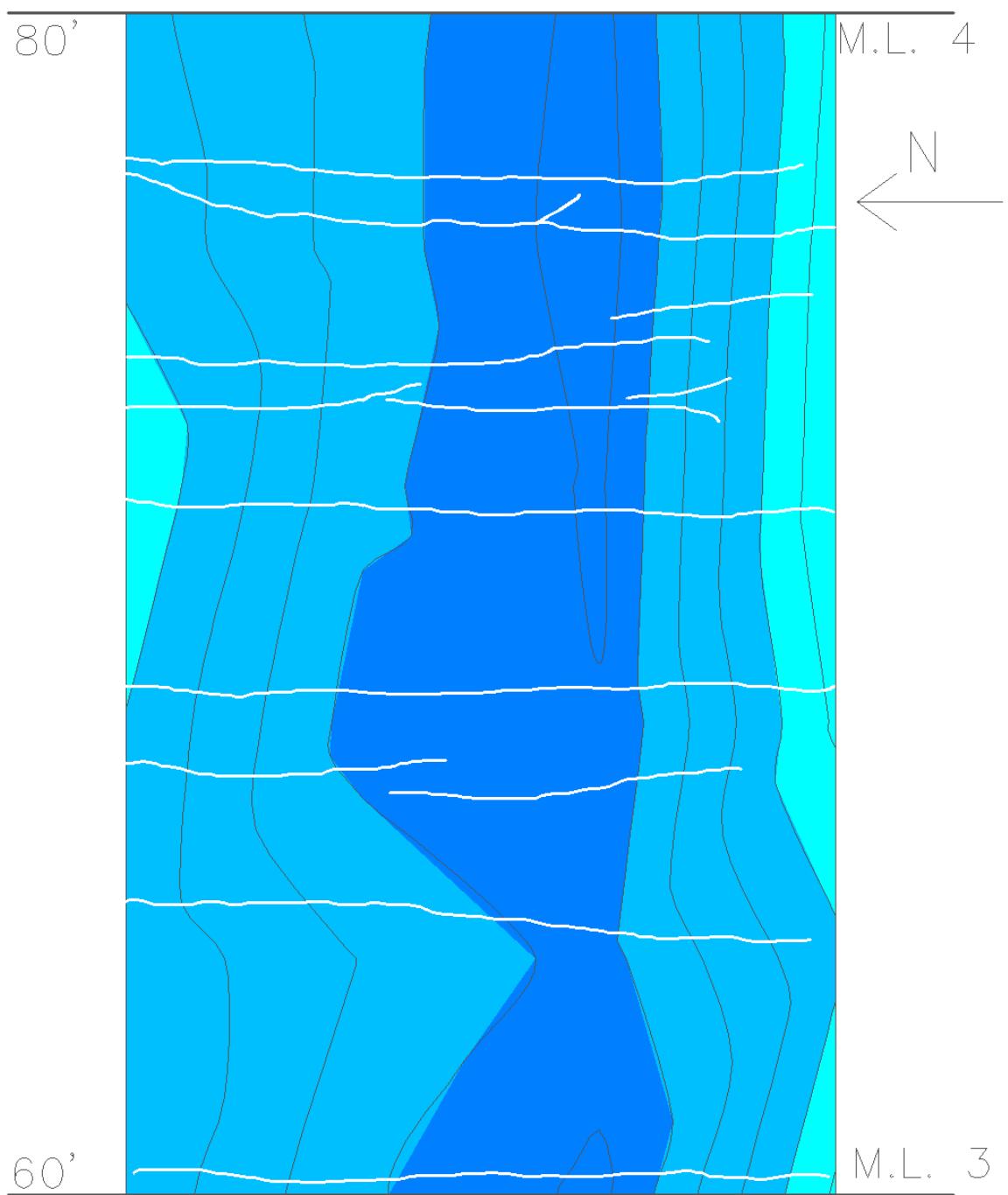


Figure B.43: MRM 25 from 60 to 80 feet

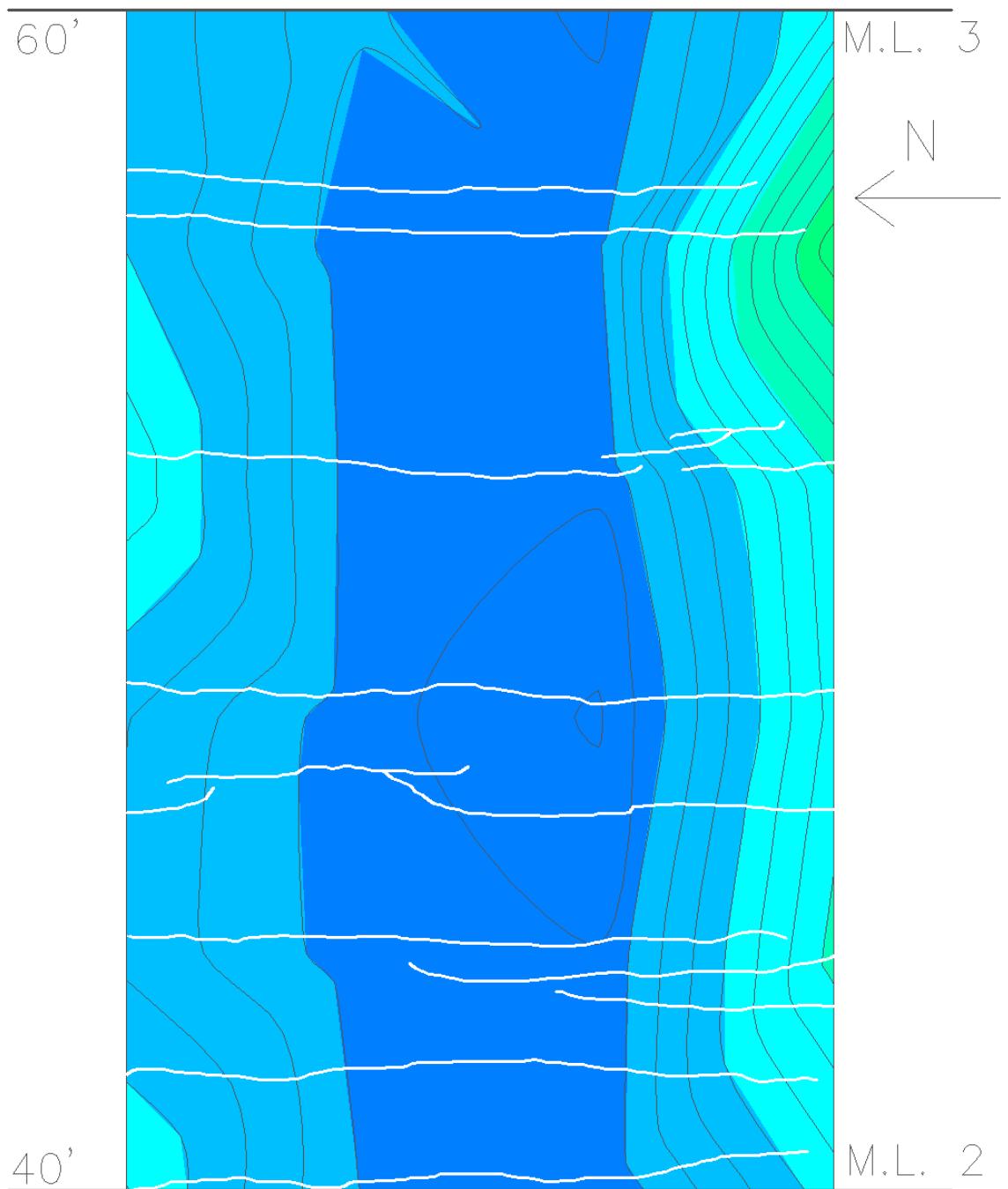


Figure B.44: MRM 25 from 40 to 60 feet

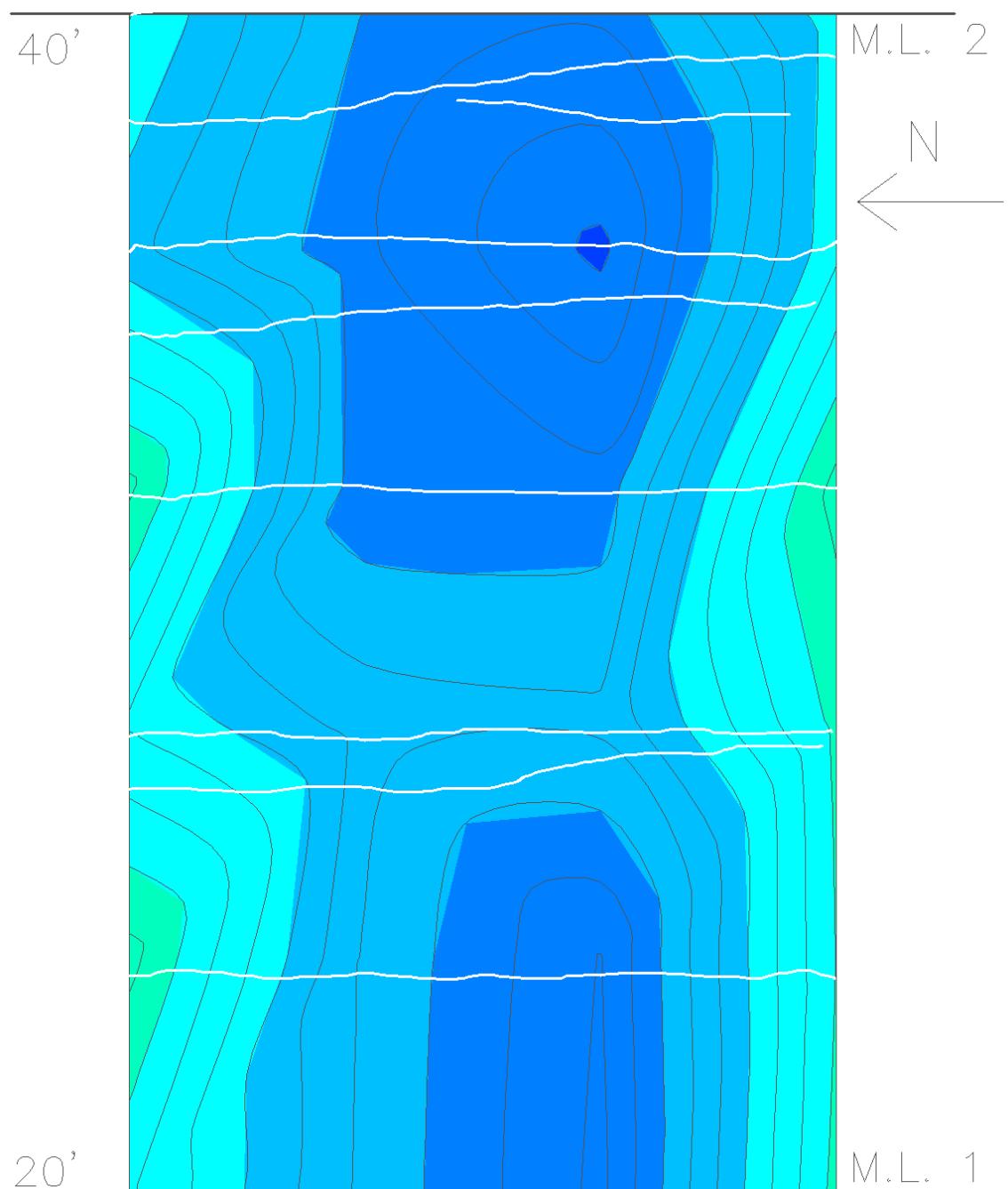


Figure B.45: MRM 25 from 20 to 40 feet

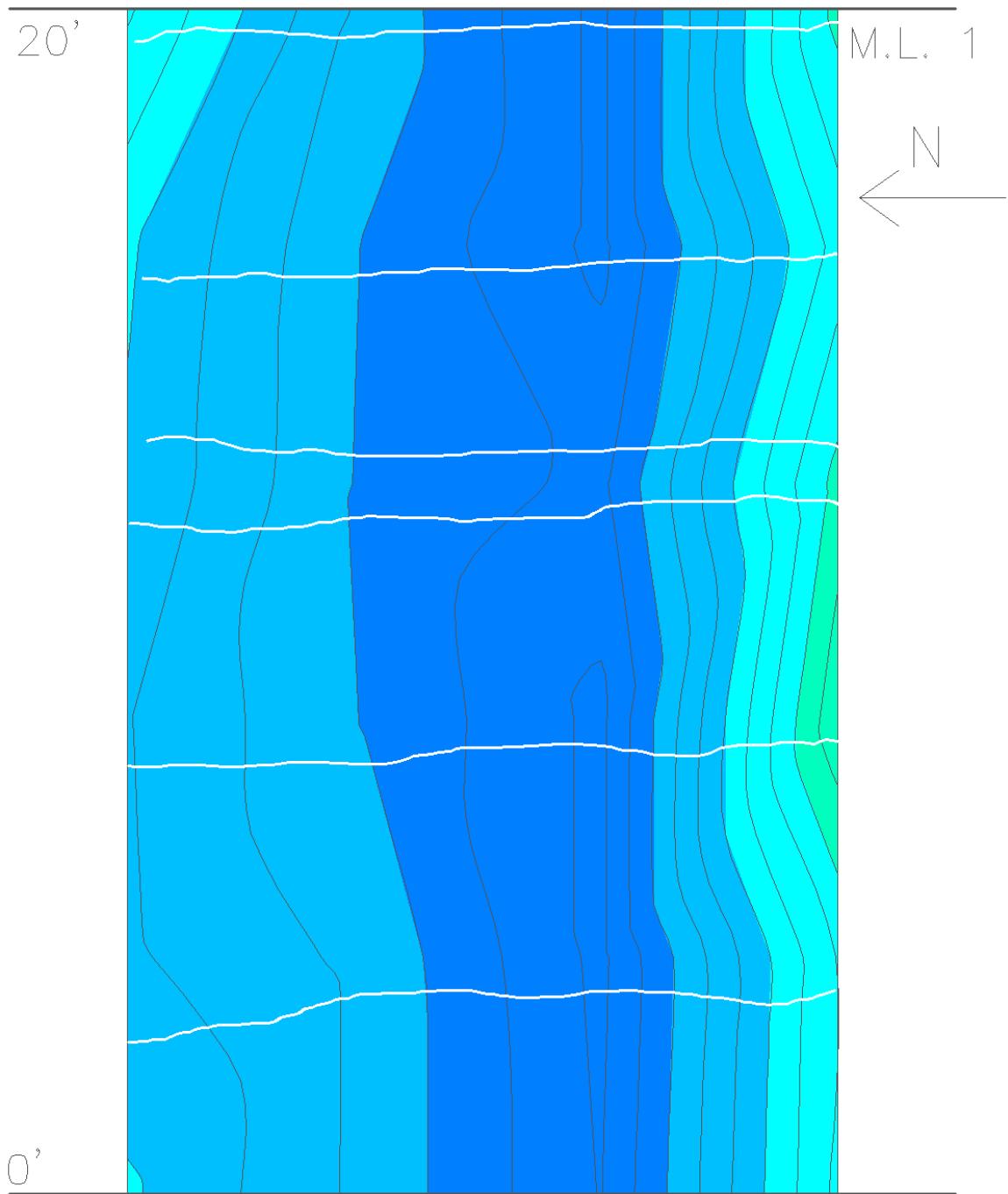


Figure B.46: MRM 25 from 0 to 20 feet

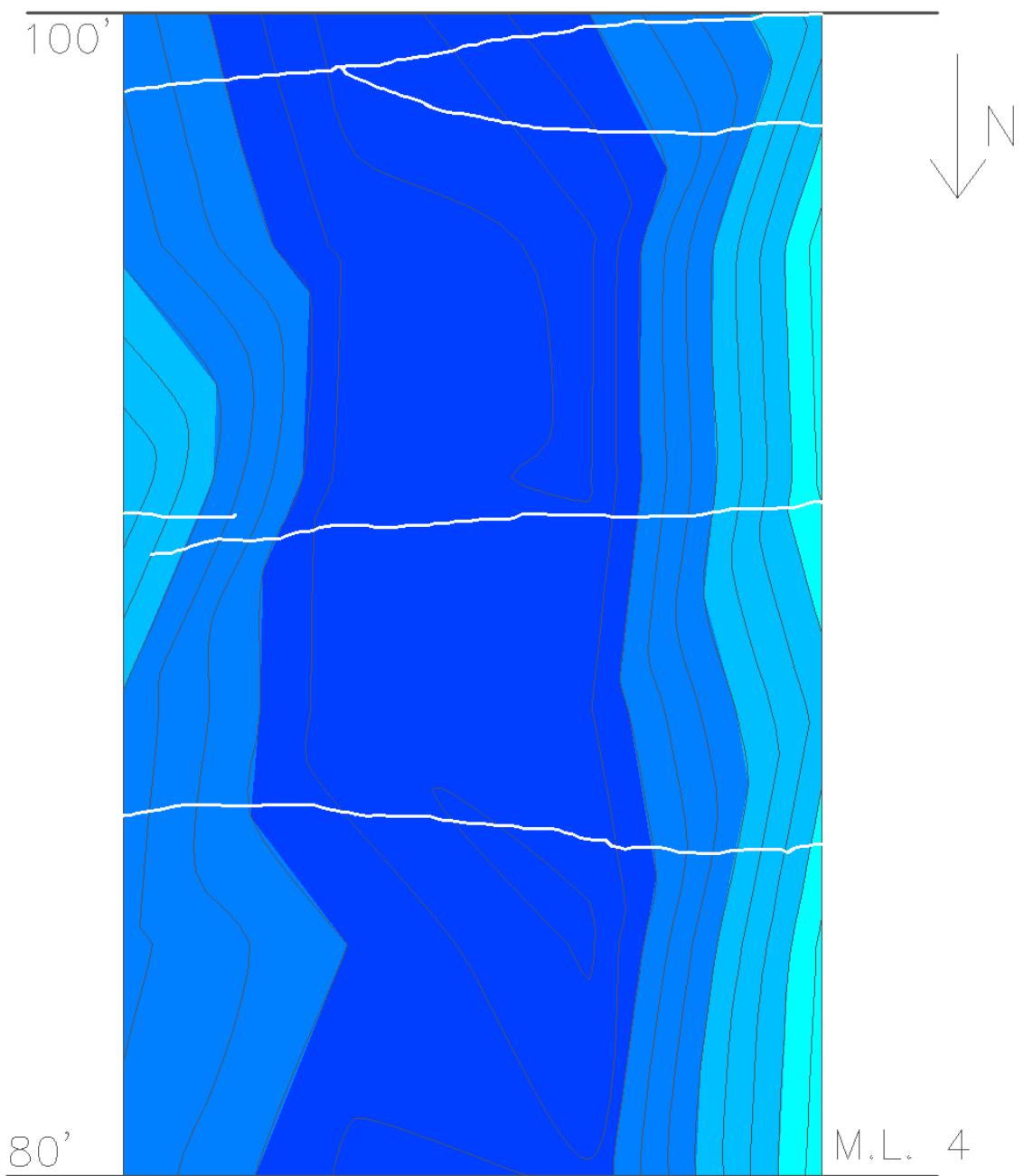


Figure B.47: MRM 54 from 80 to 100 feet

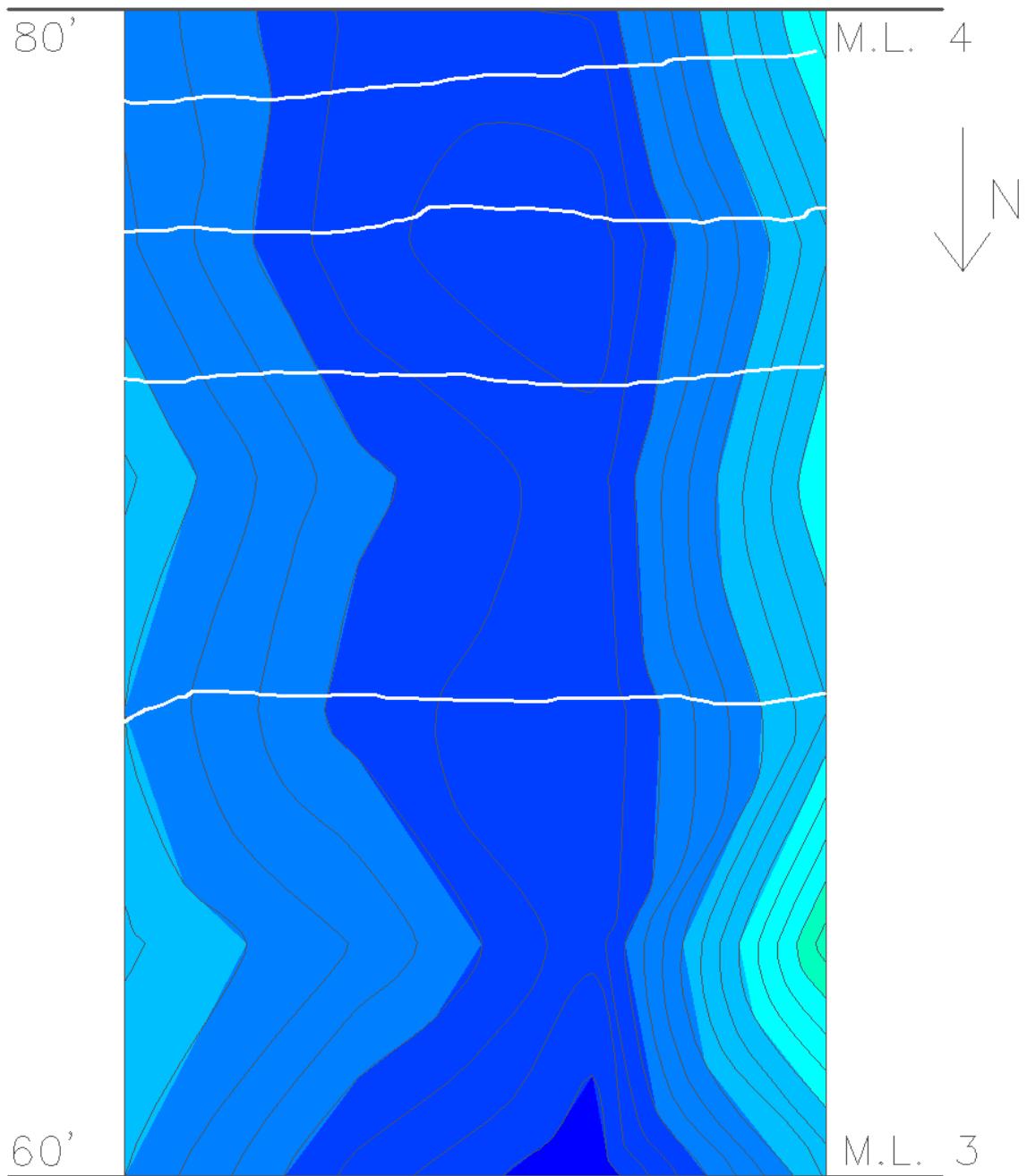


Figure B.48: MRM 54 from 60 to 80 feet

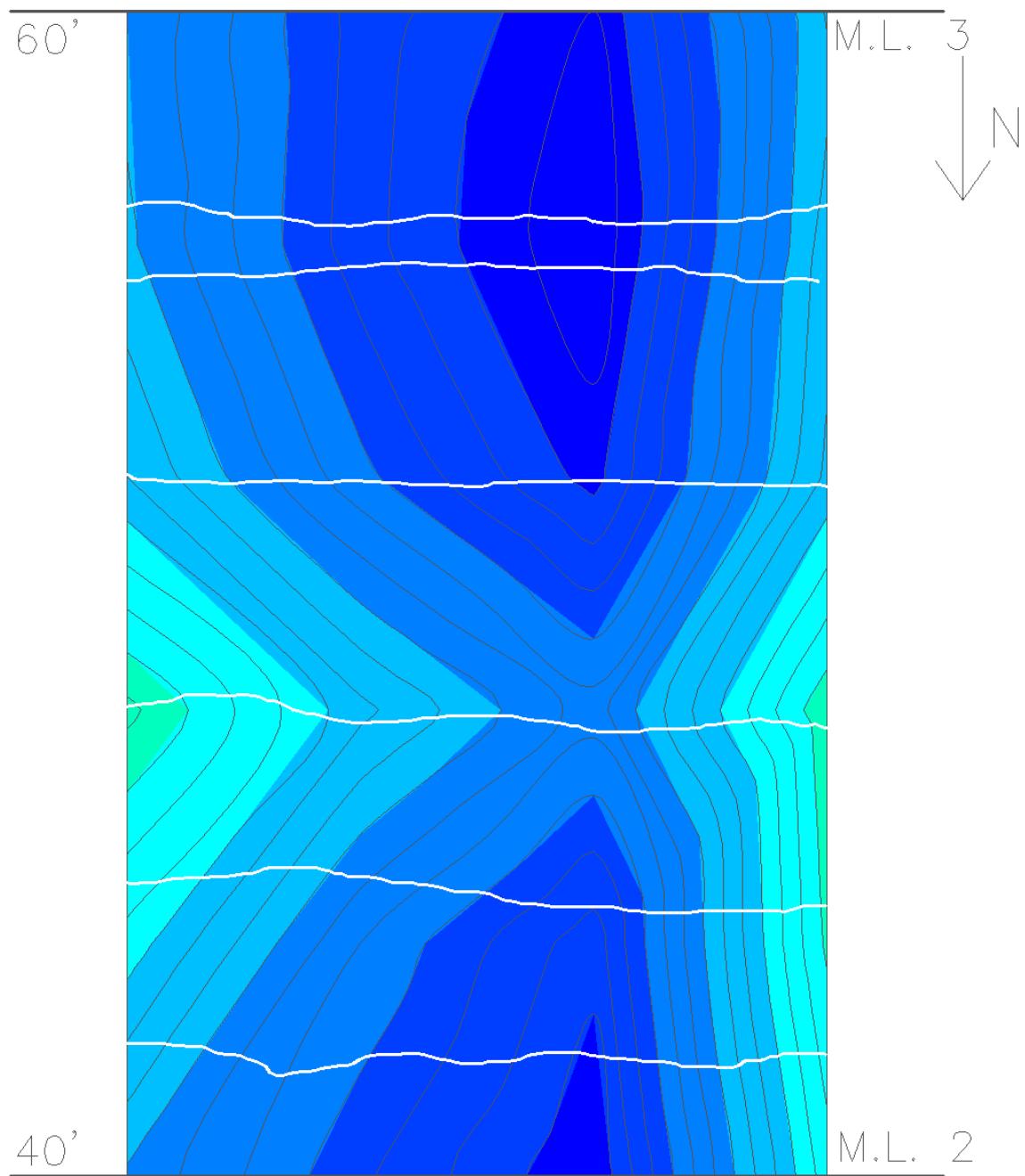


Figure B.49: MRM 54 from 40 for 60 feet

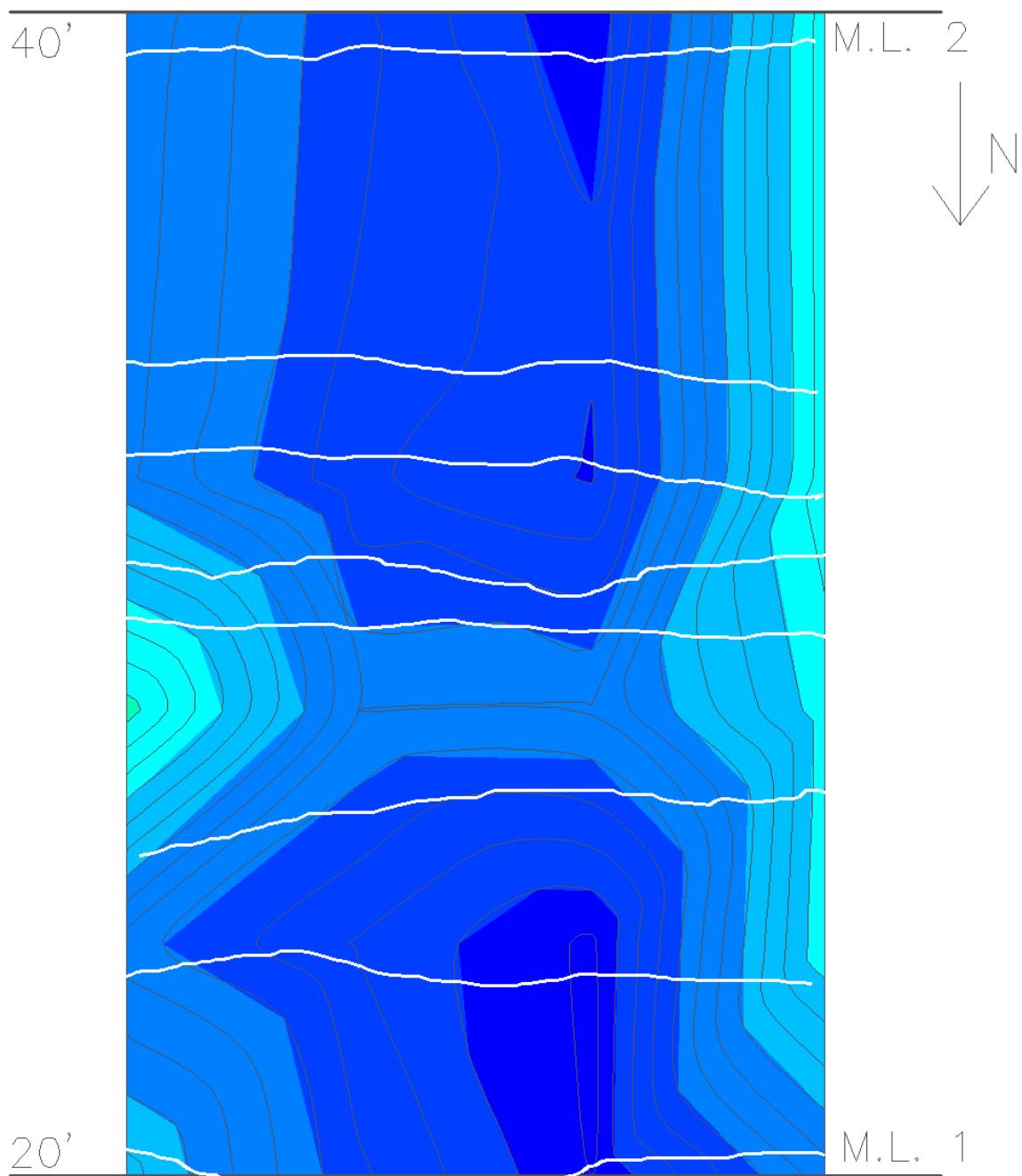


Figure B.50: MRM 54 from 20 to 40 feet

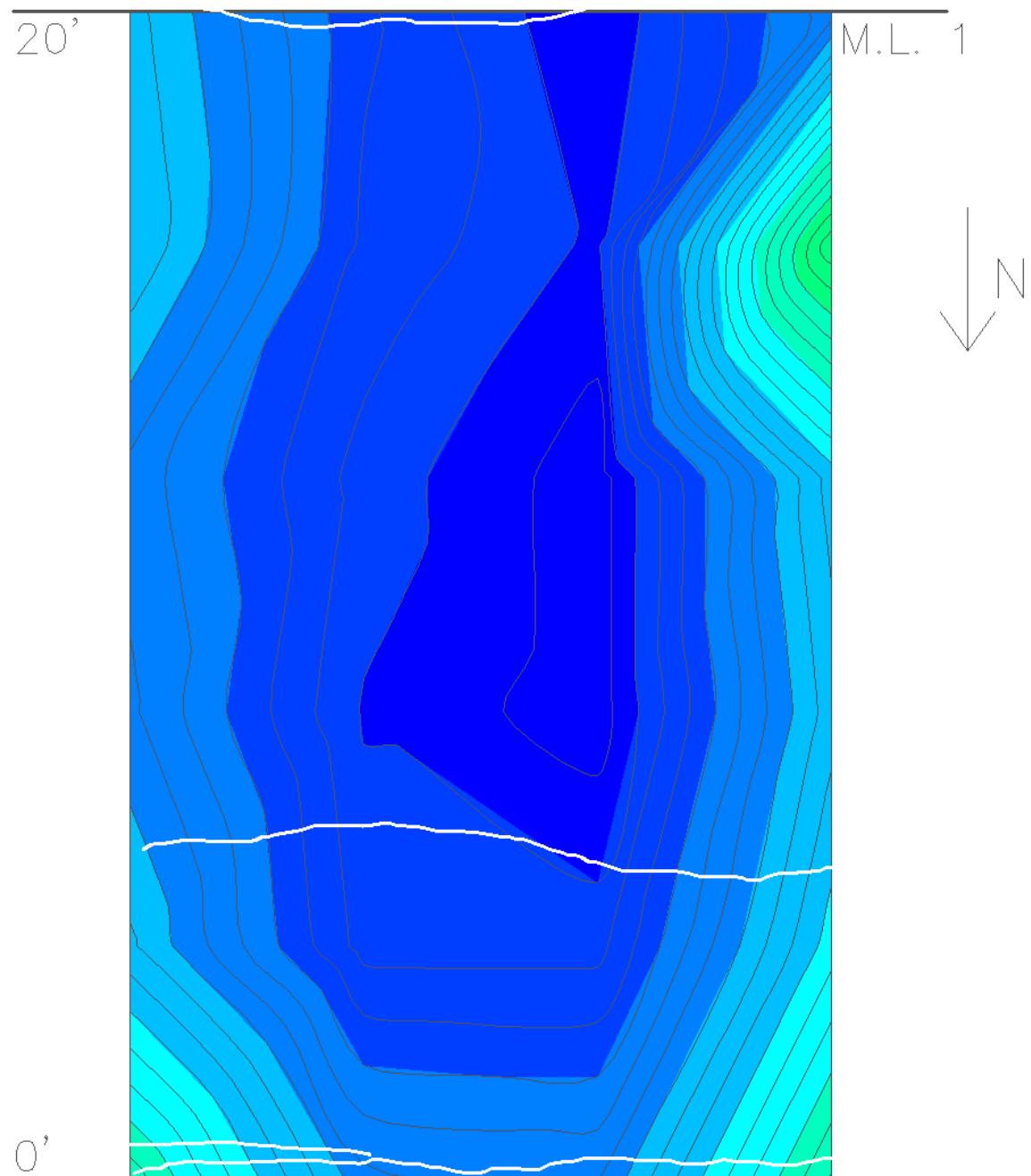


Figure B.51: MRM 54 from 0 to 20 feet

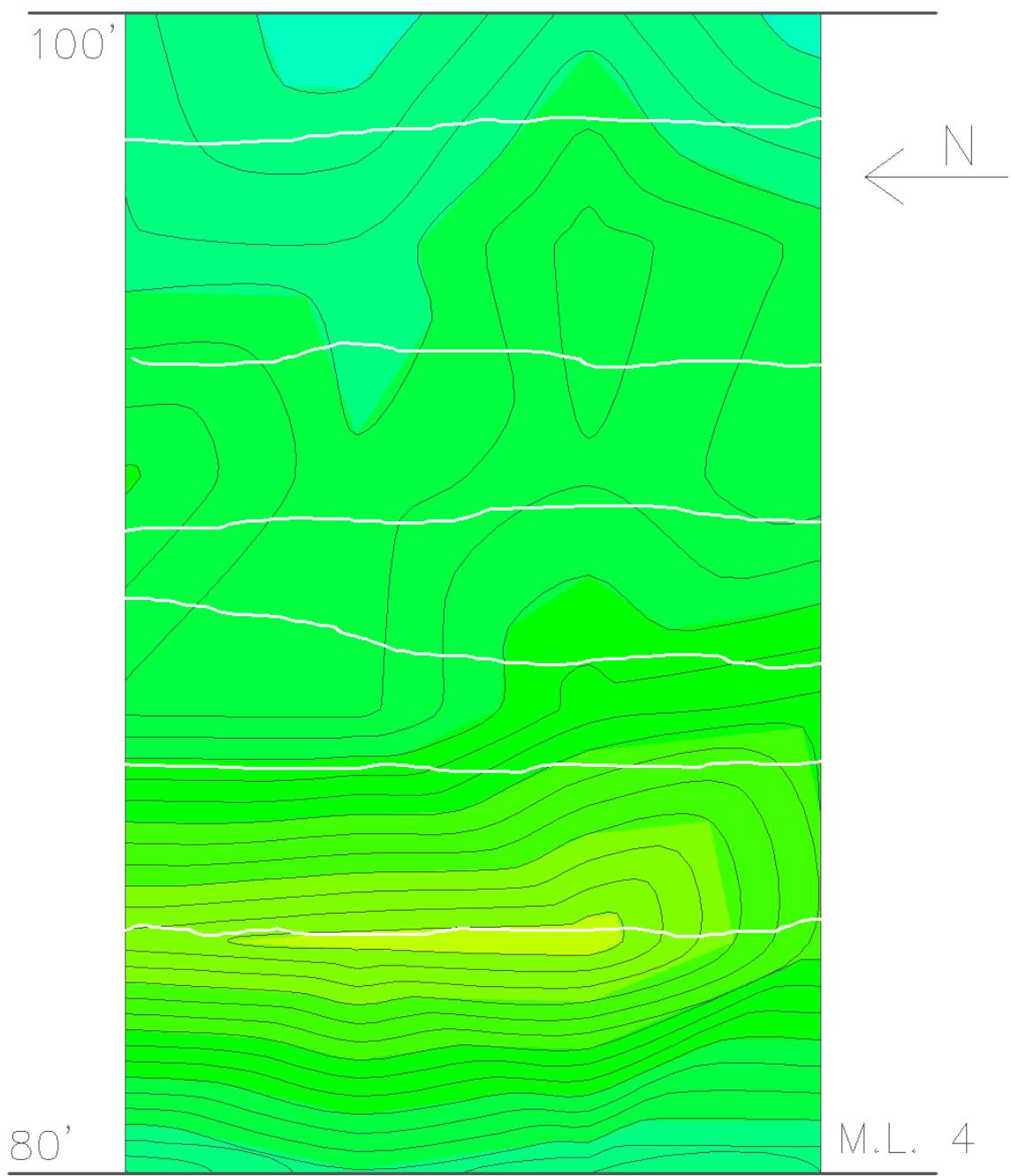


Figure B.52: MRM 222 from 80 to 100 feet

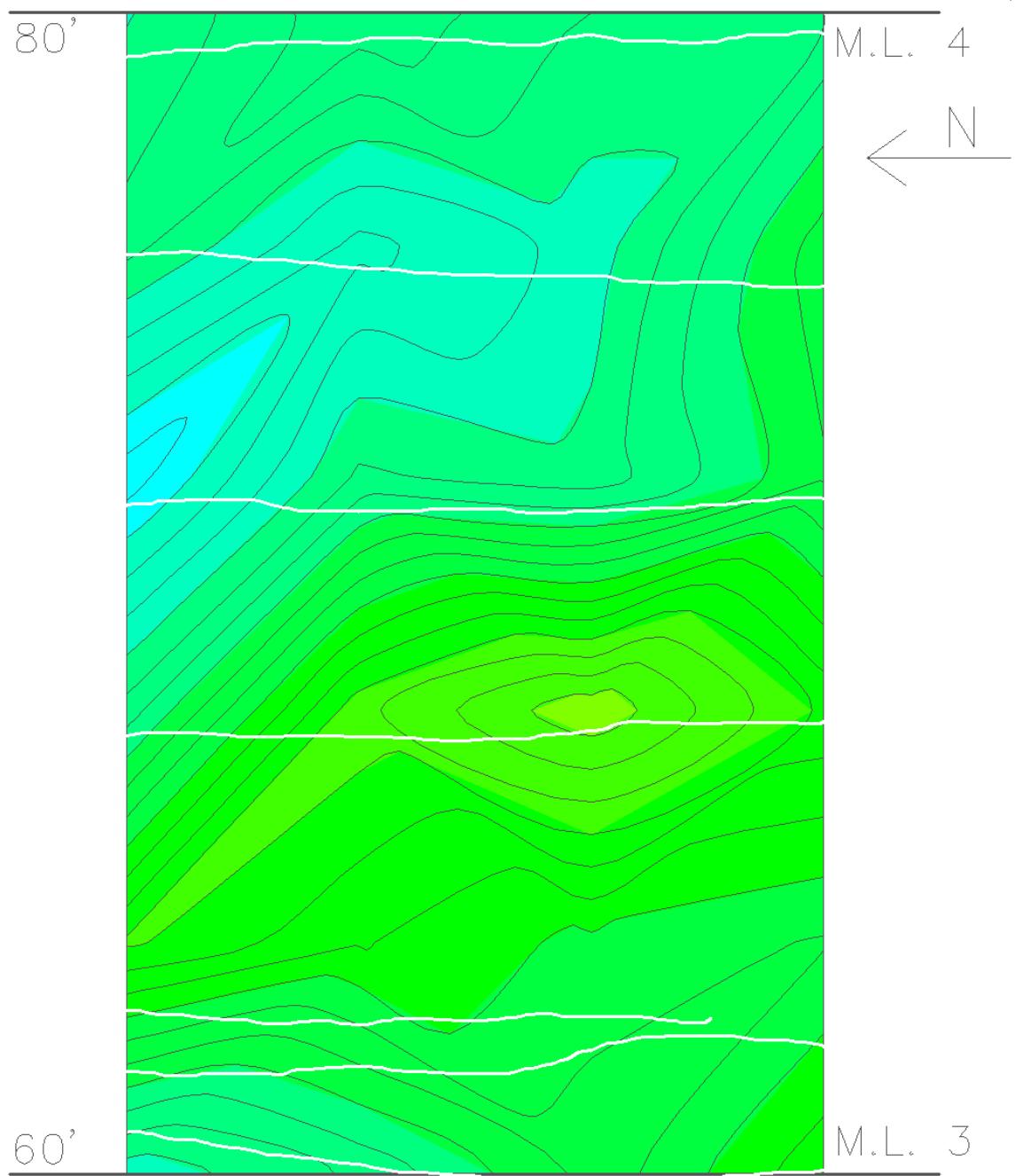


Figure B.53: MRM 222 from 60 to 80 feet

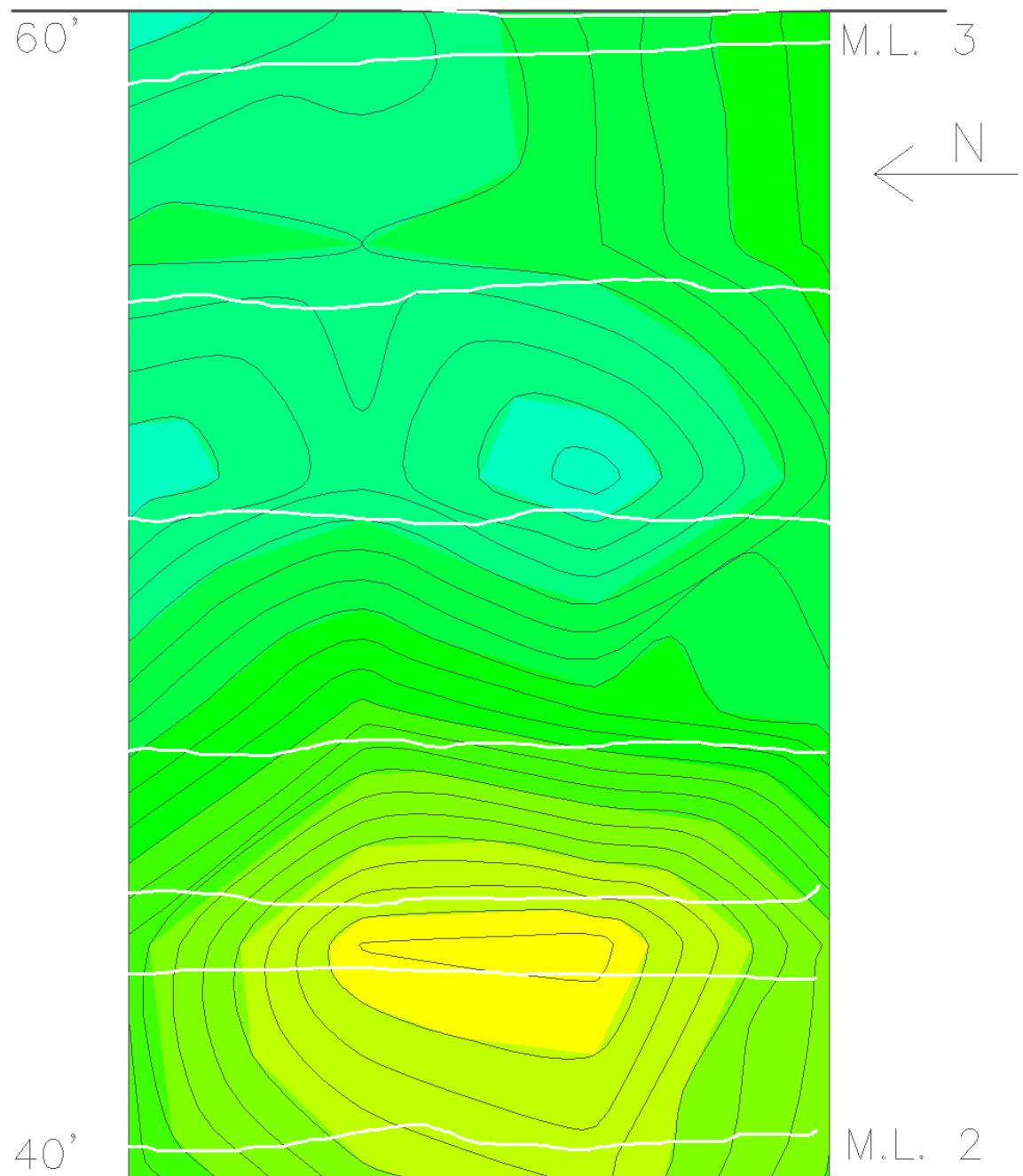


Figure B.54: MRM 222 from 40 to 60 feet

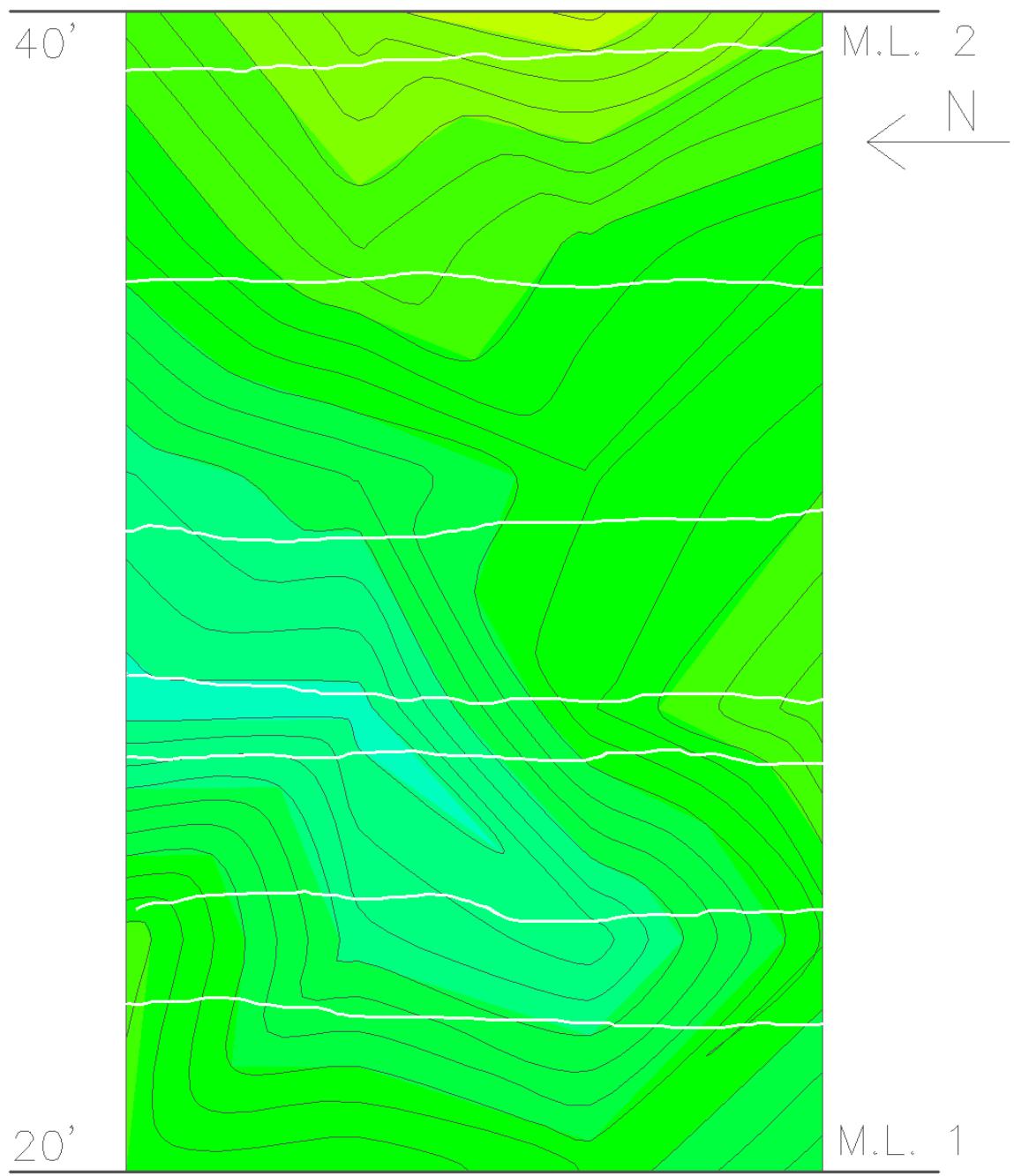


Figure B.55: MRM 222 from 20 to 40 feet

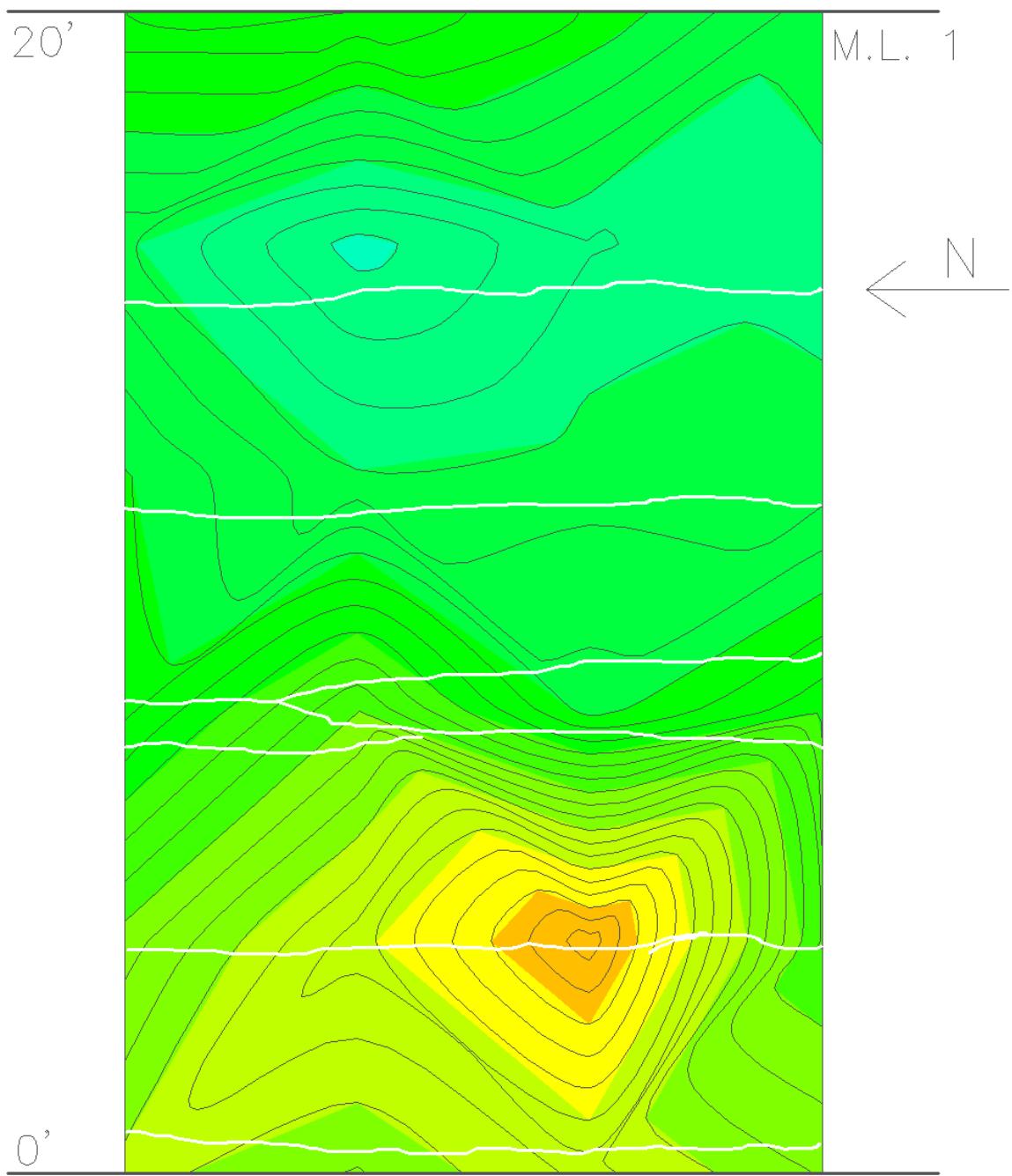


Figure B.56: MRM 222 from 0 to 20 feet

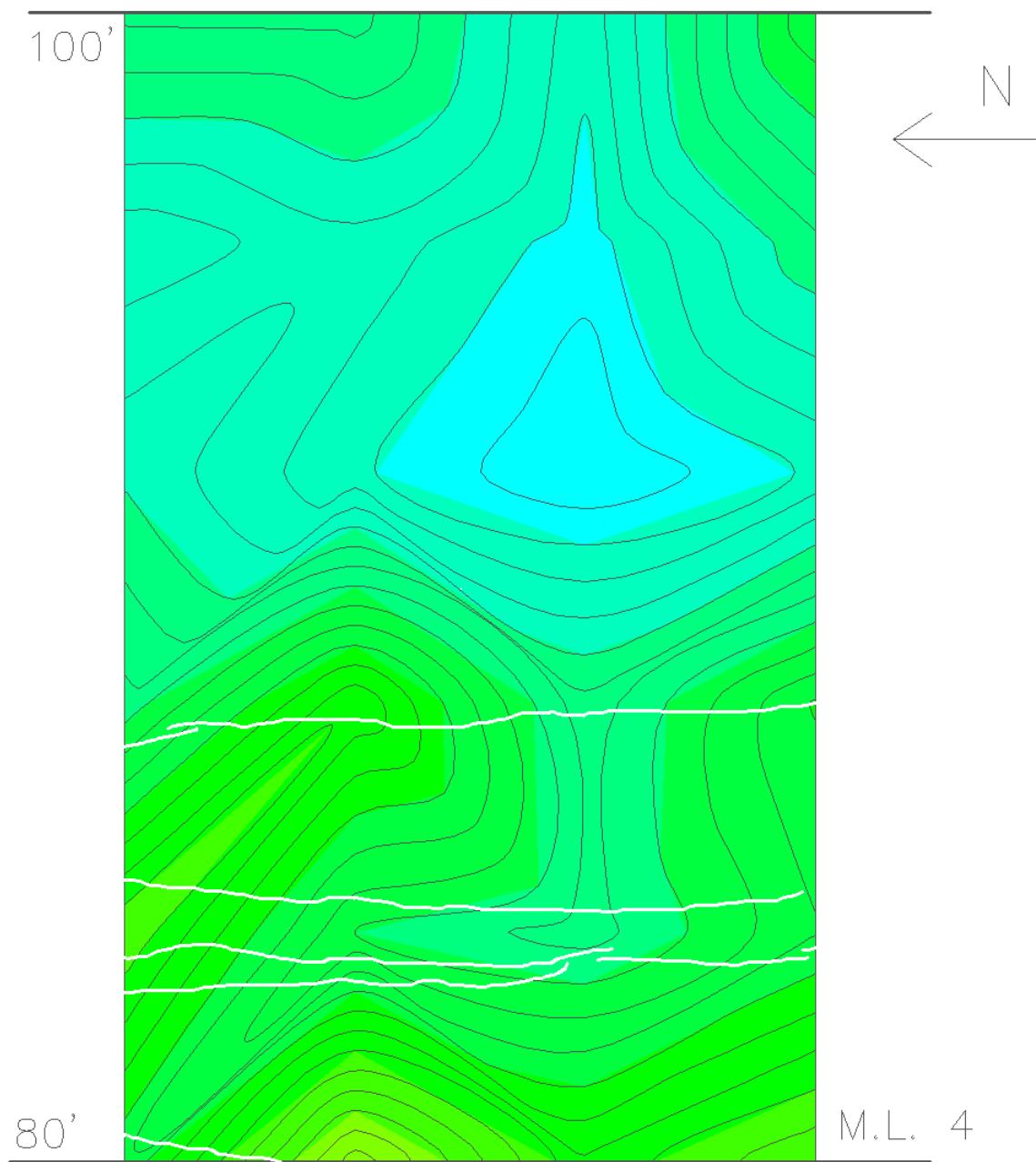


Figure B.57: MRM 246 from 80 to 100 feet

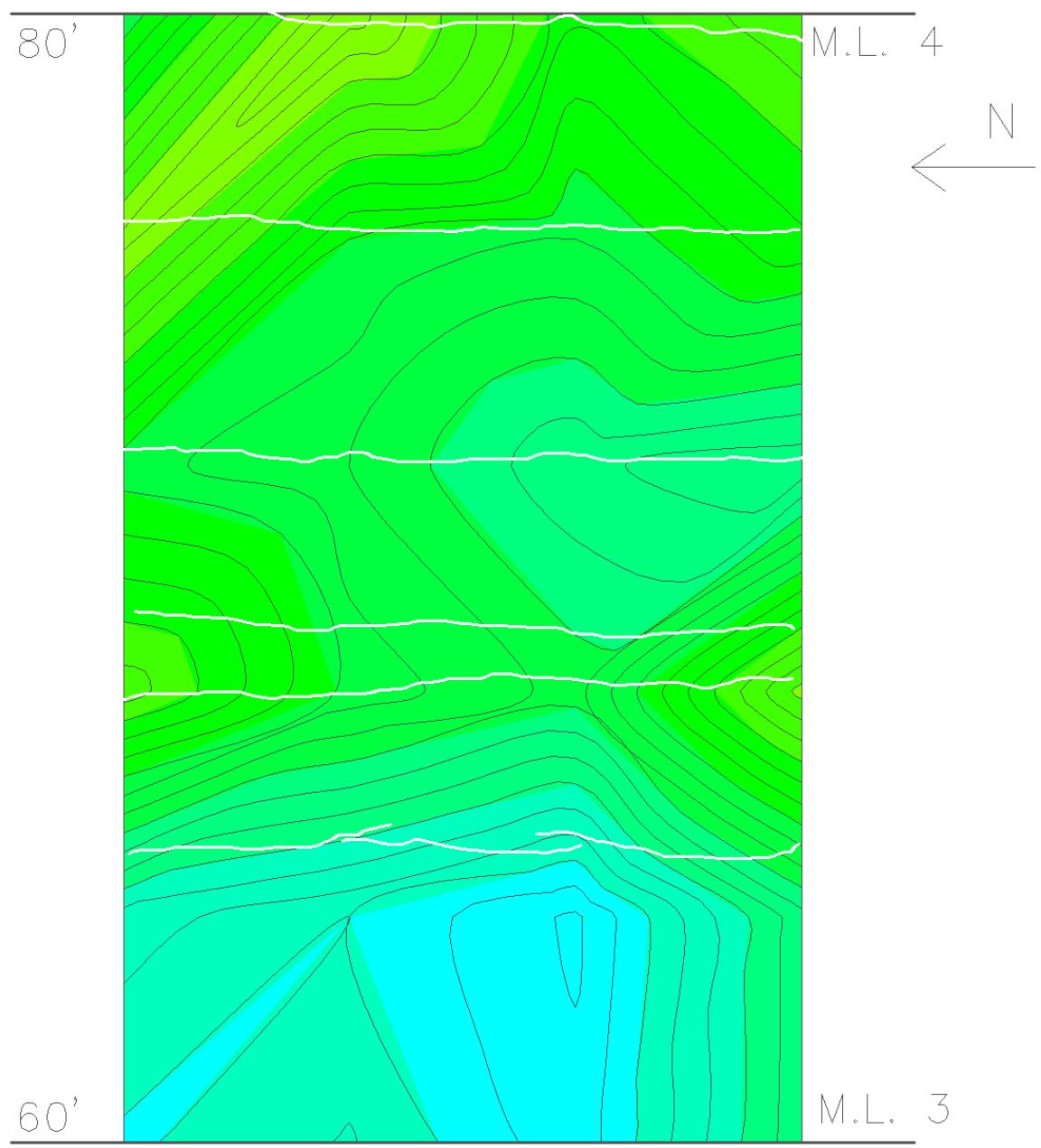


Figure B.58: MRM 246 from 60 to 80 feet

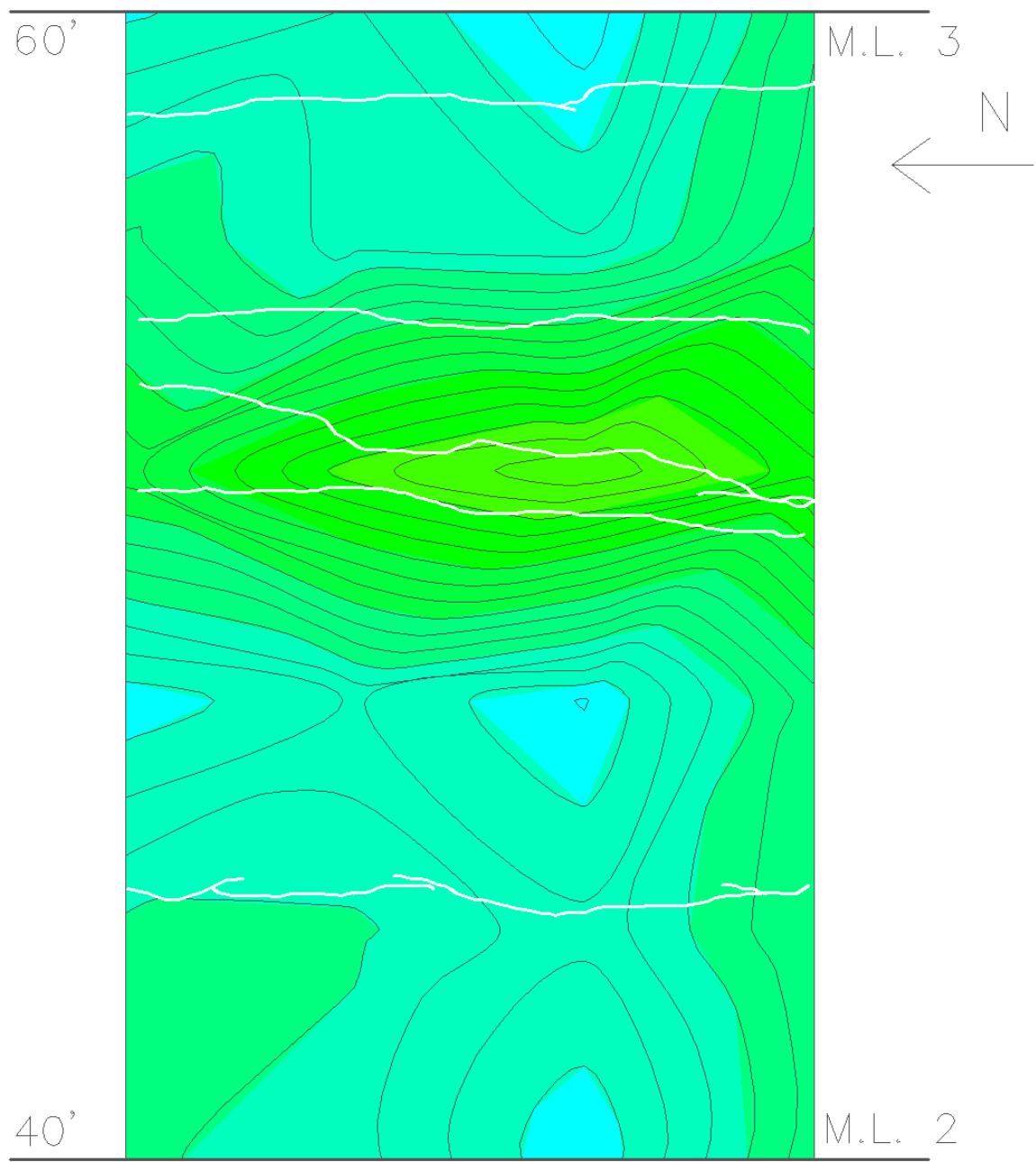


Figure B.59: MRM 246 from 40 to 60 feet

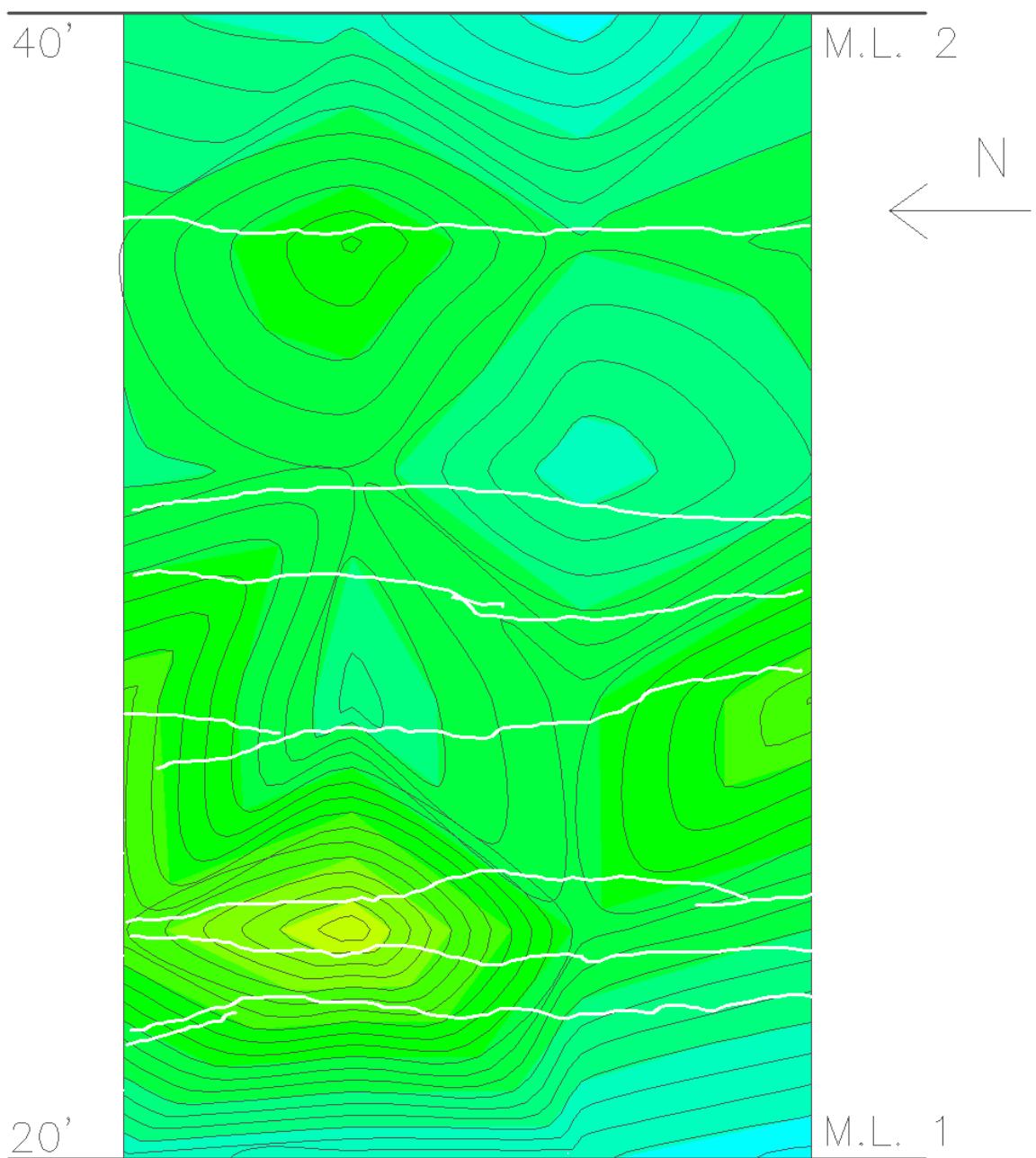


Figure B.60: MRM 246 from 20 to 40 feet

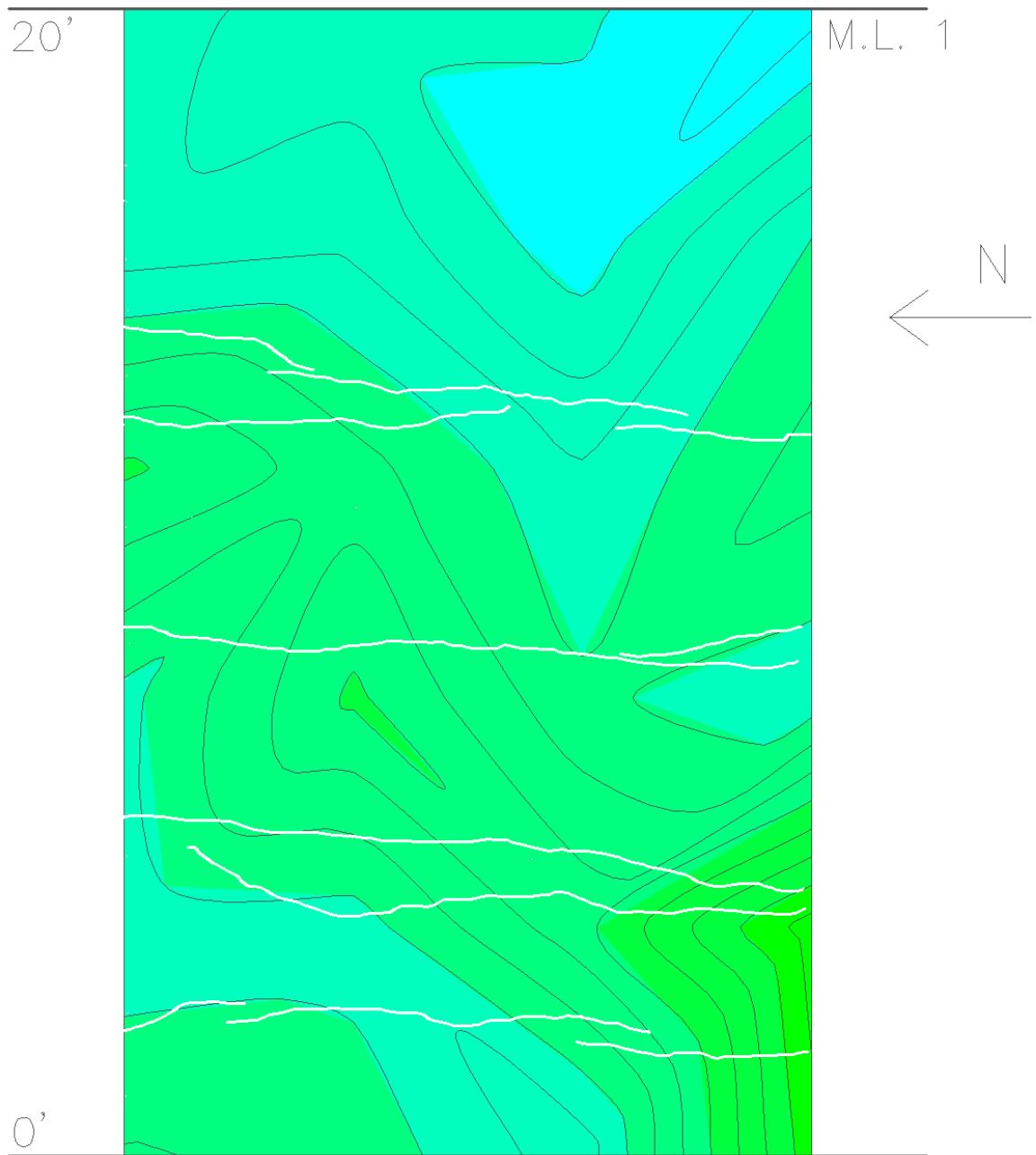


Figure B.61: MRM 246 from 0 to 20 feet

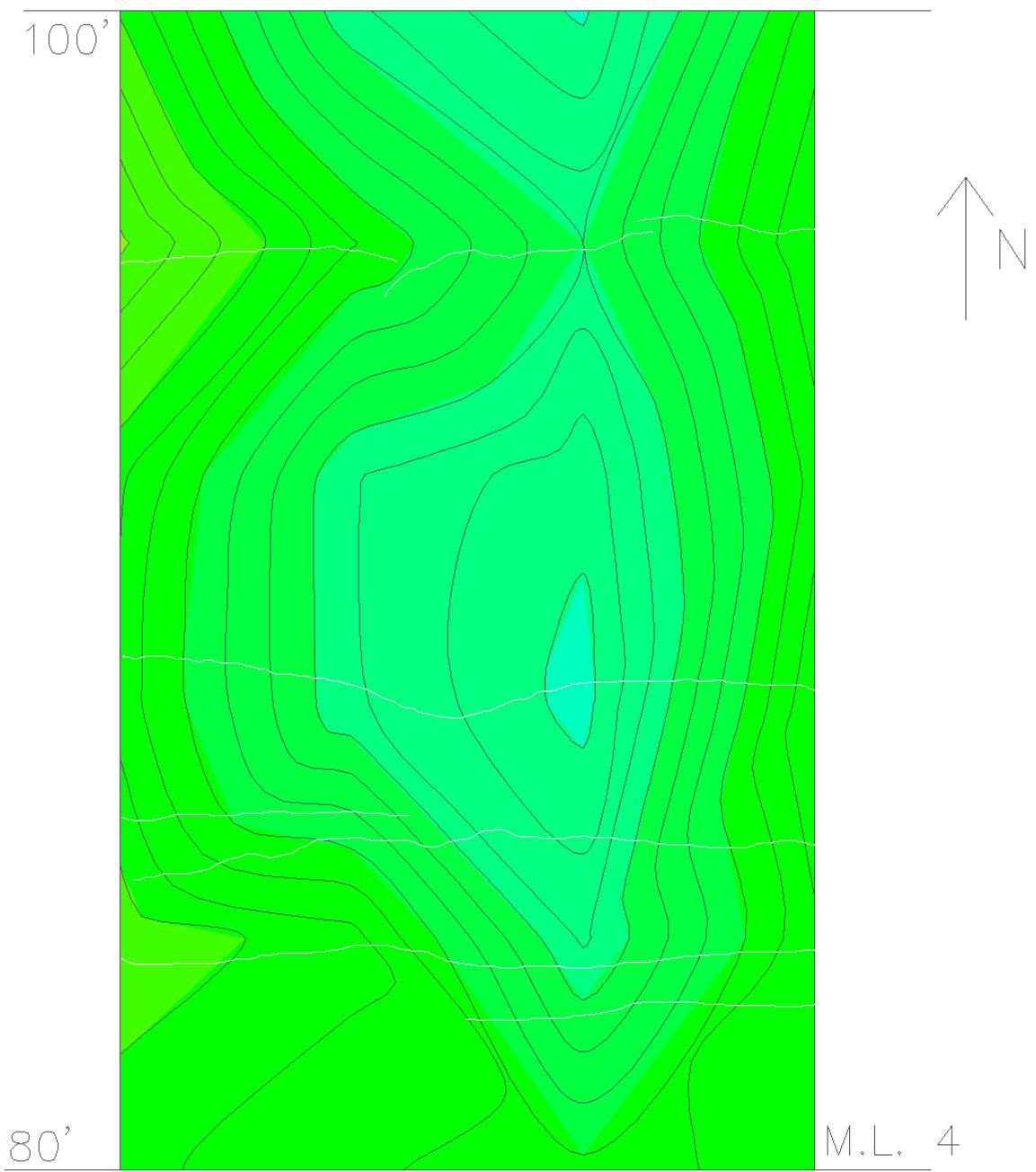


Figure B.62: MRM 168 NB from 80 to 100 feet

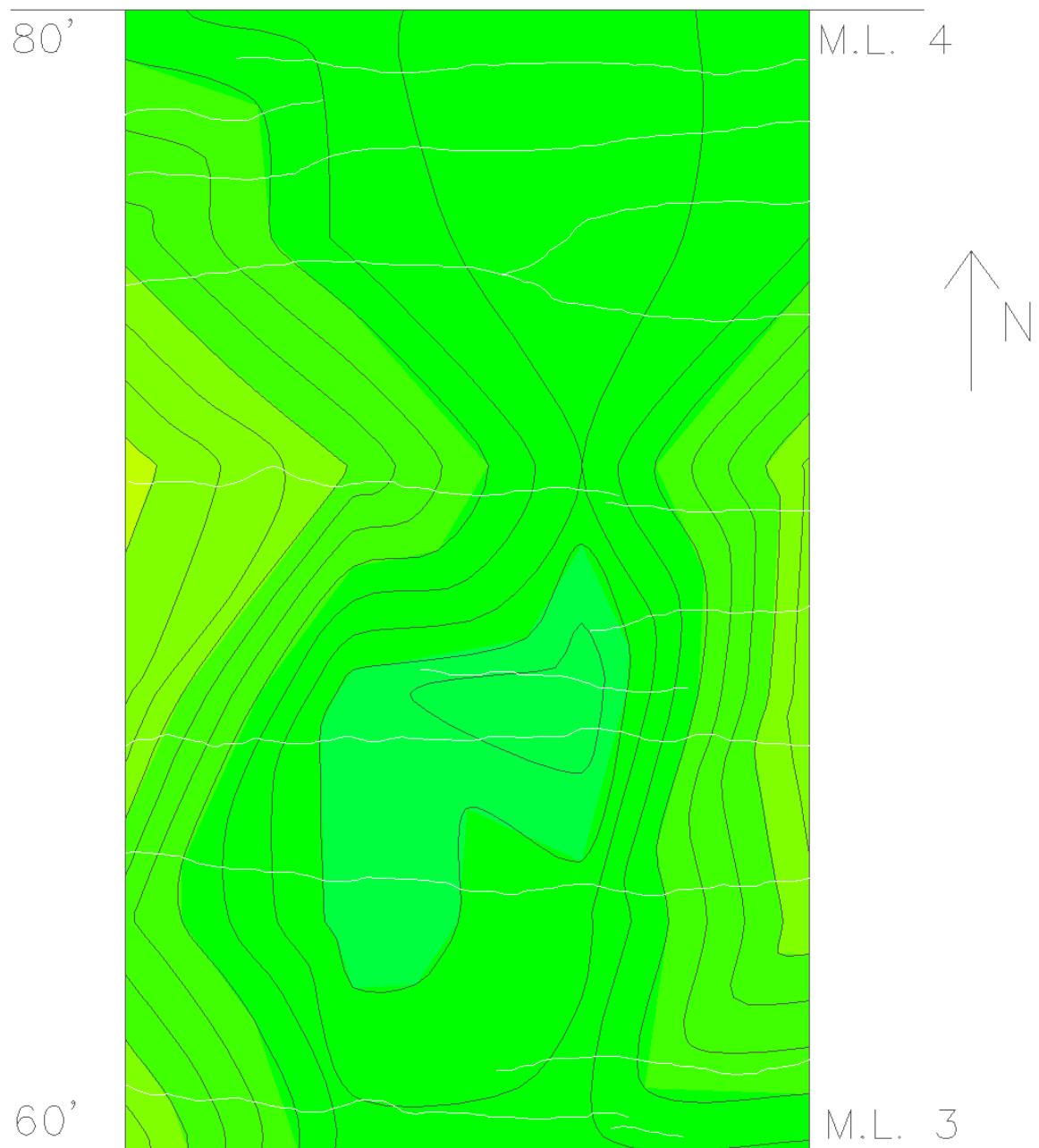


Figure B.63: MRM 168 NB from 60 to 80 feet

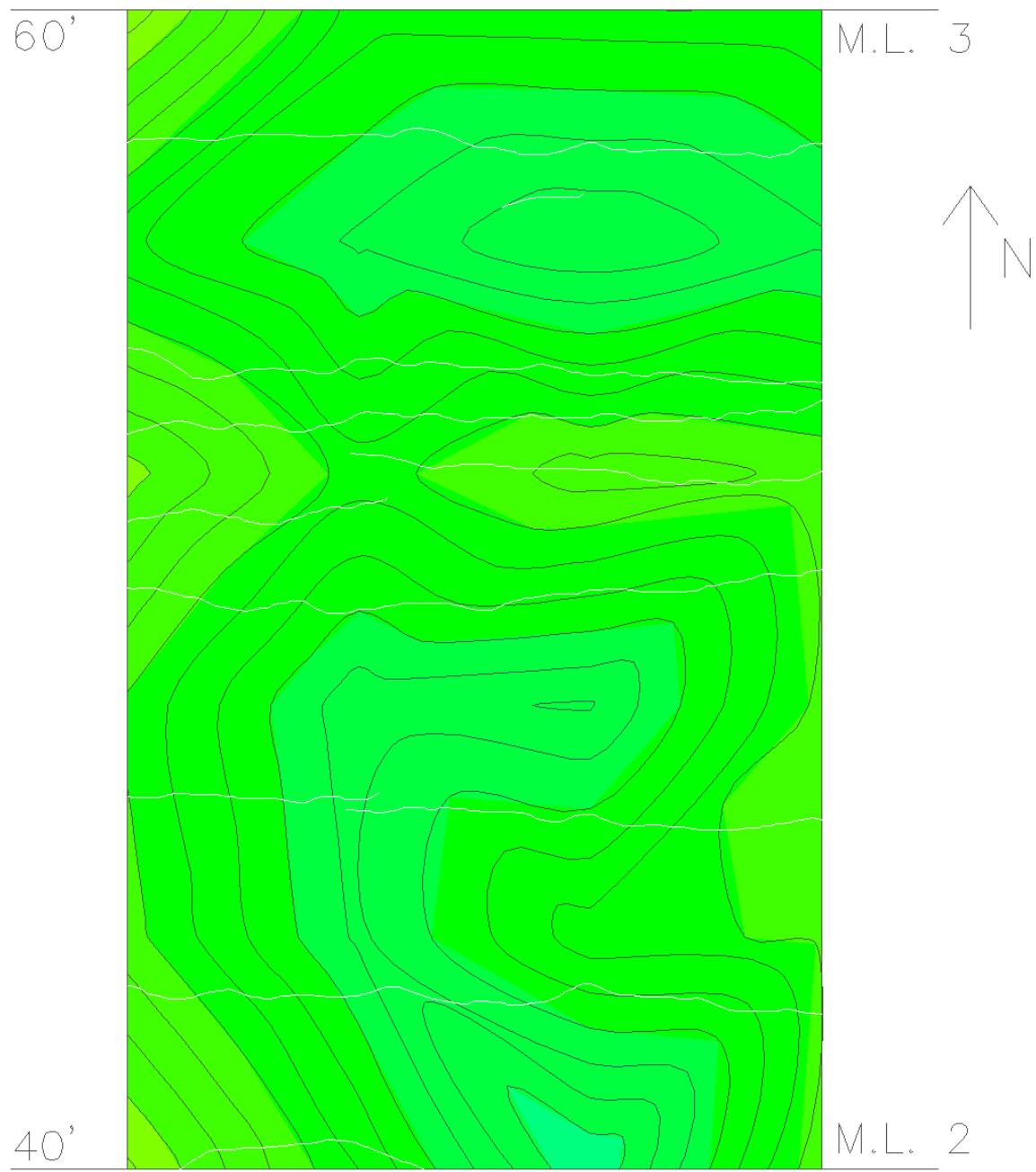


Figure B.64: MRM 168 NB from 40 to 60 feet

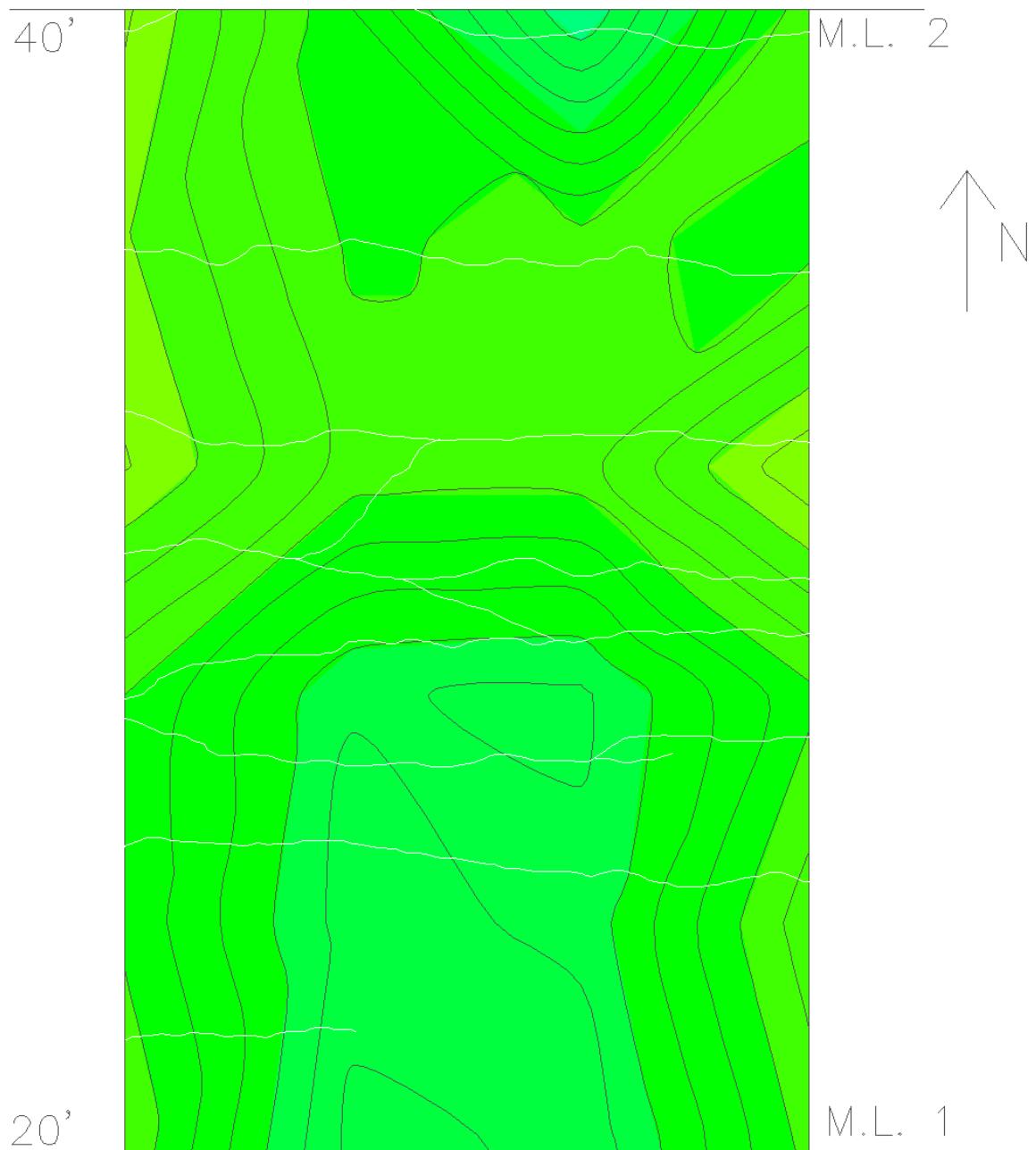


Figure B.65: MRM 168 NB from 20 to 40 feet

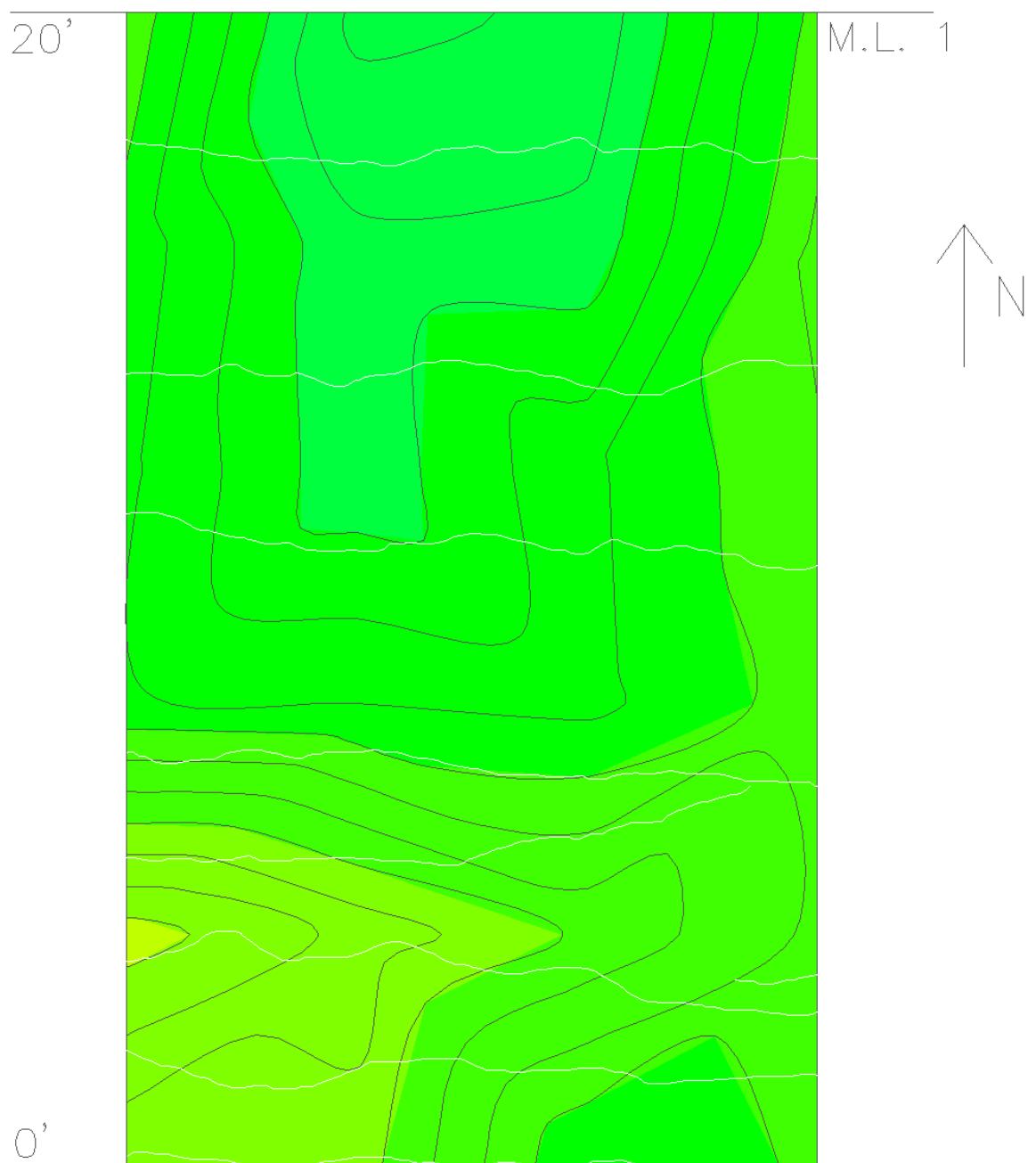


Figure B.66: MRM 168 NB from 0 to 20 feet

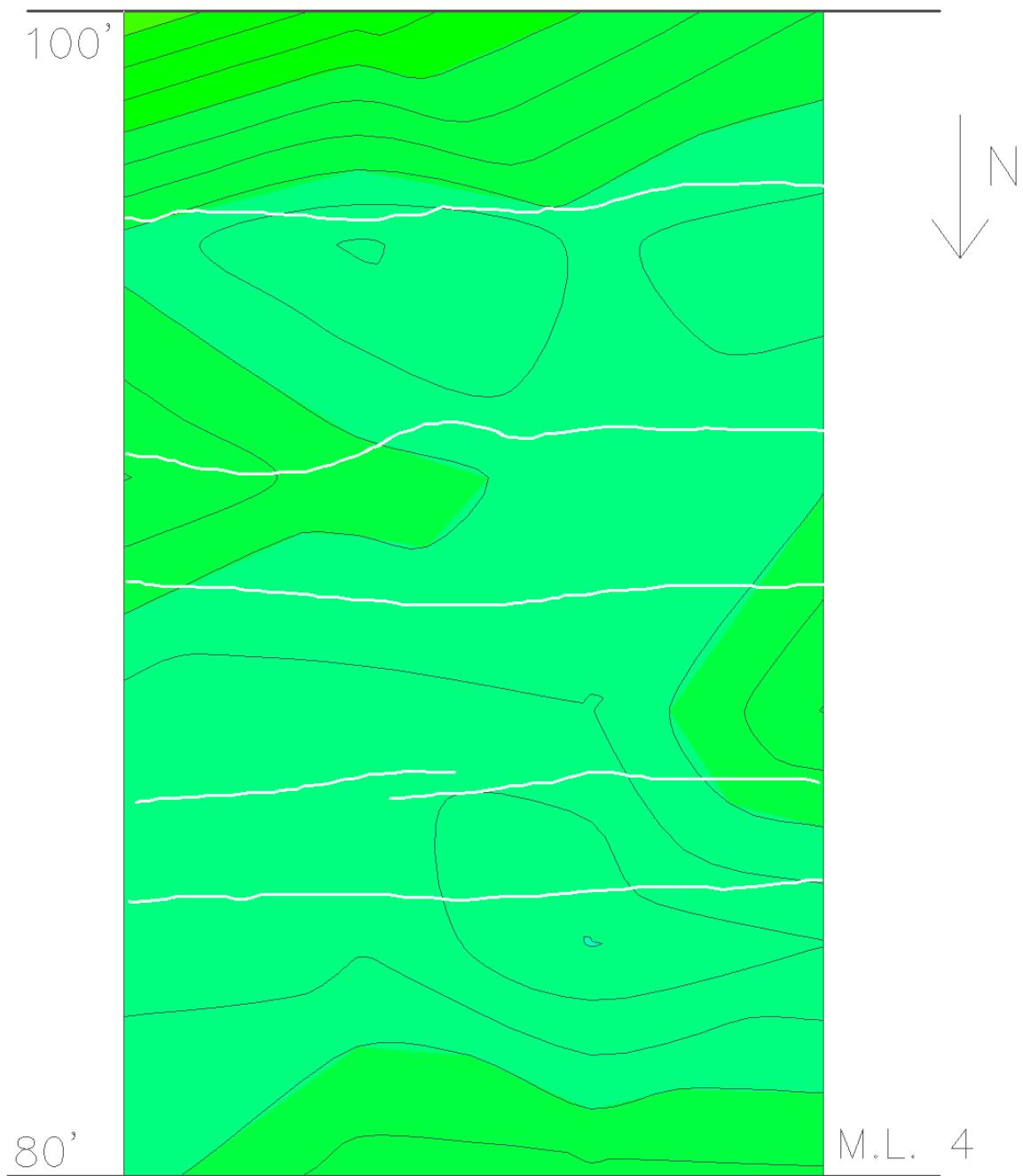


Figure B.67: MRM 168 SB from 80 to 100 feet

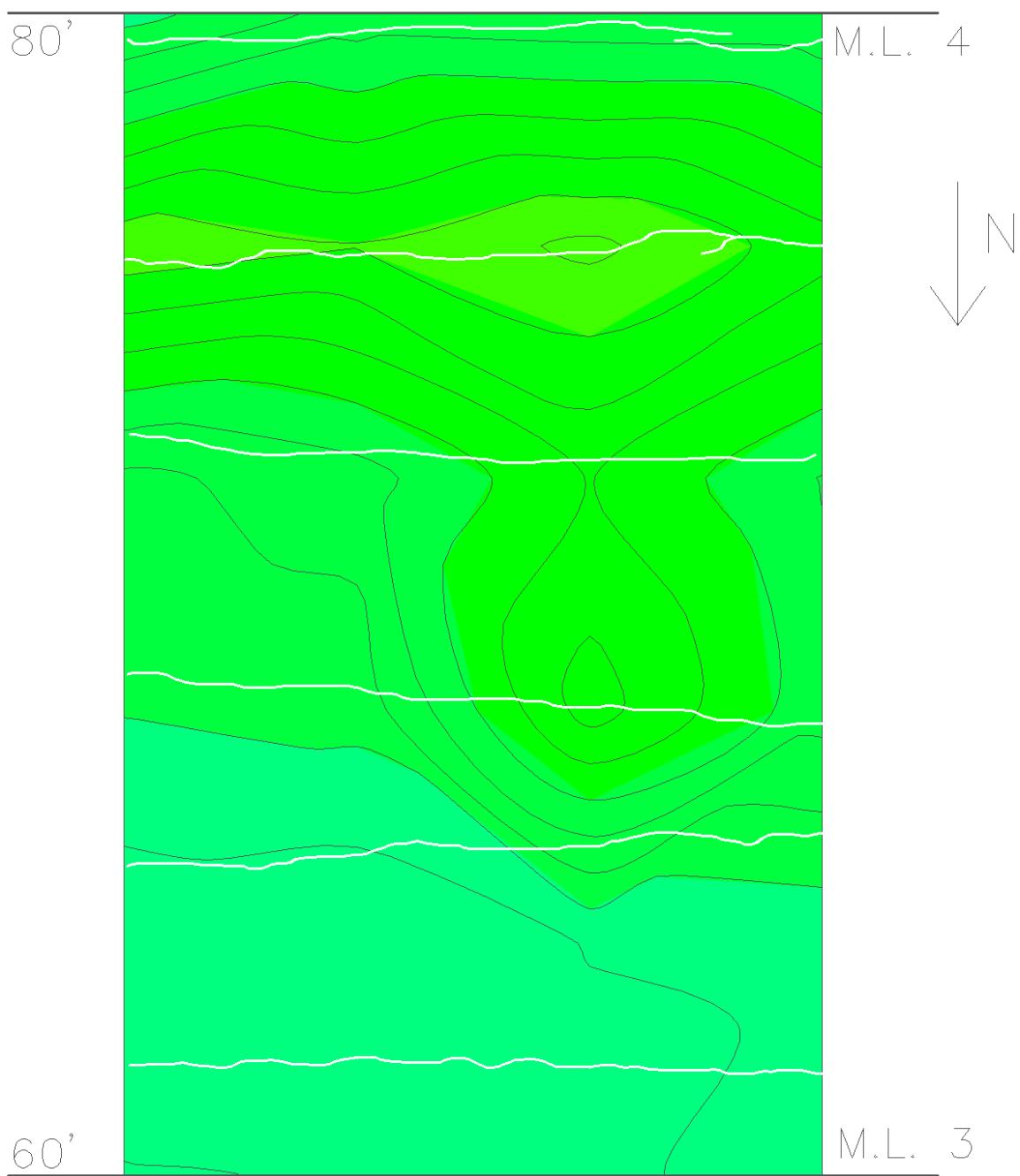


Figure B.68: MRM 168 SB from 60 to 80 feet

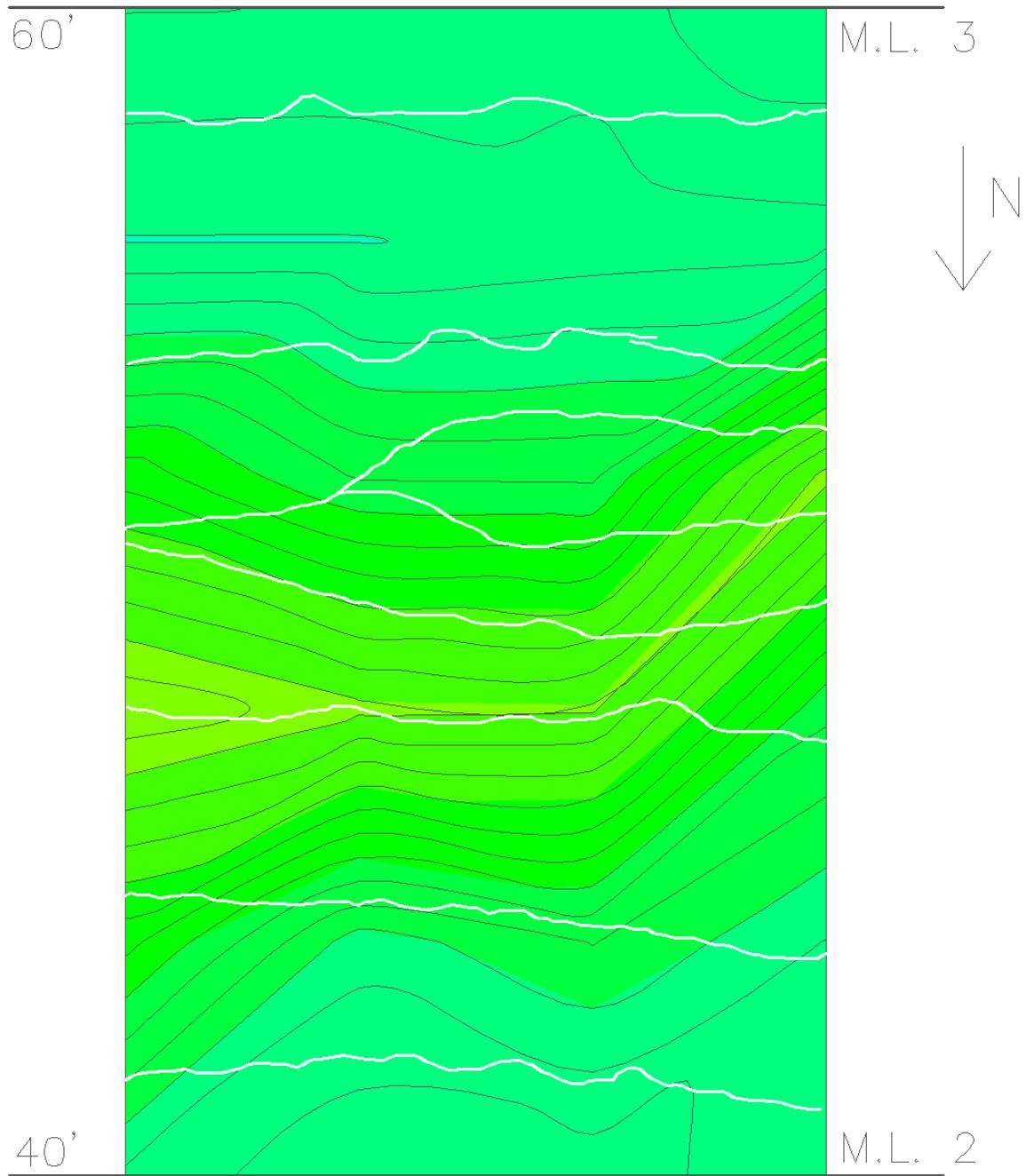


Figure B.69: MRM 168 SB from 40 to 60 feet

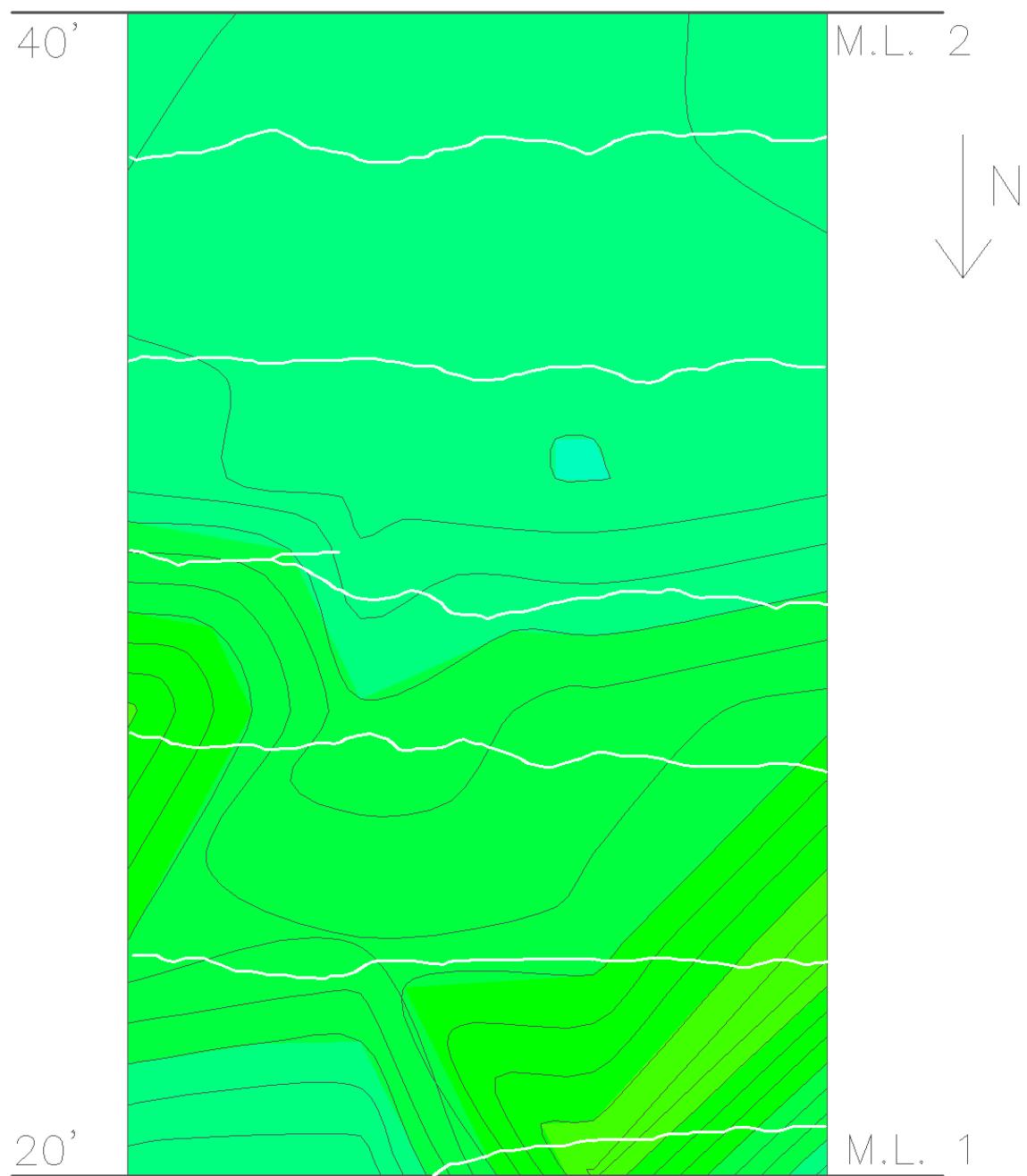


Figure B.70: MRM 168 SB from 20 to 40 feet

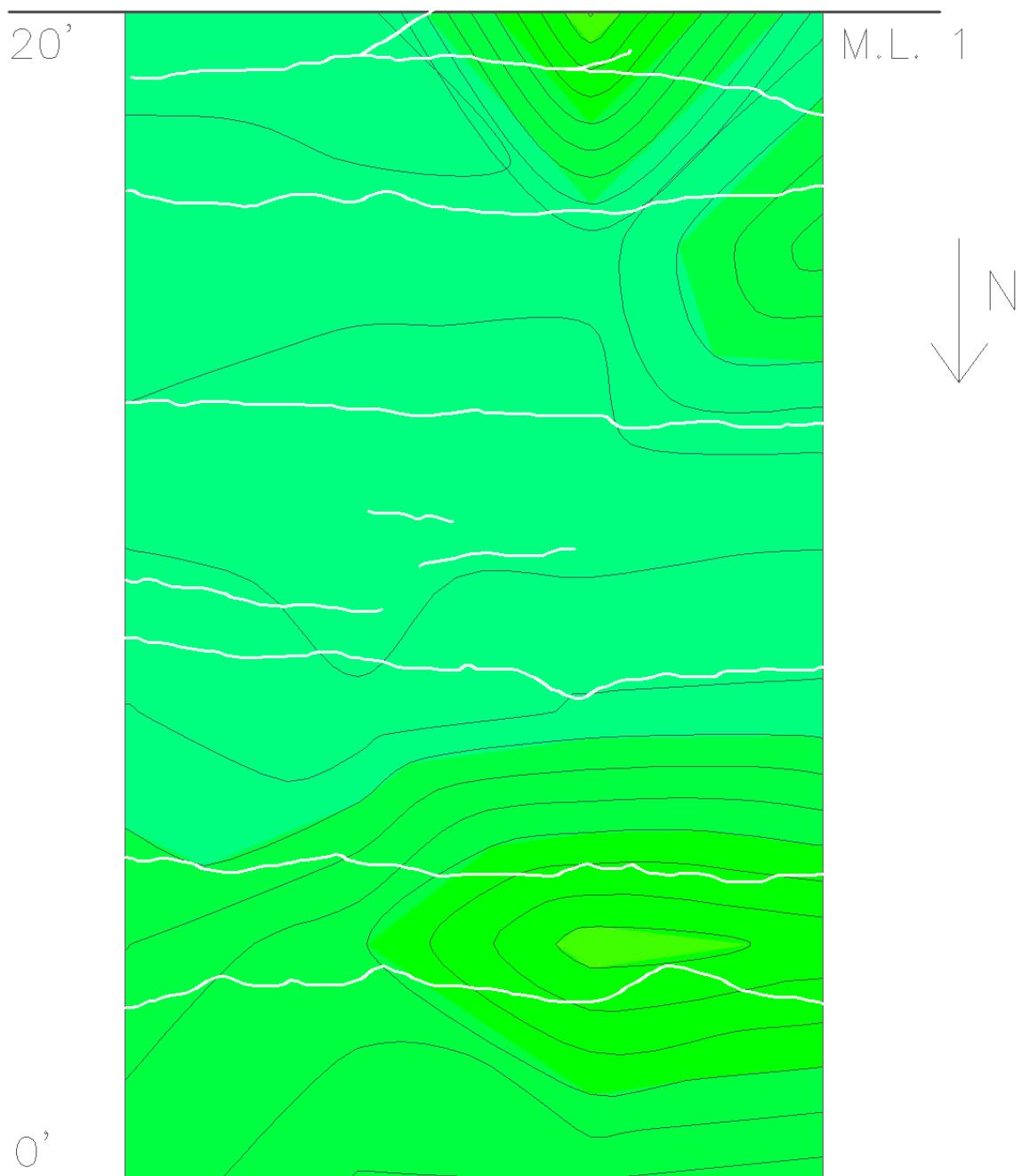


Figure B.71: MRM 168 SB from 0 to 20 feet

APPENDIX C. CHLORIDE PROFILES FOR INITIAL AND STATEWIDE ASSESSMENTS

Vertical chloride profiles

MRM 87

MRM 68

MRM 411

MRM 33

MRM 44

MRM 25

MRM 54

MRM 222

MRM 246

MRM 168NB

MRM 168SB

Horizontal chloride profiles

MRM 87

MRM 68

MRM 411

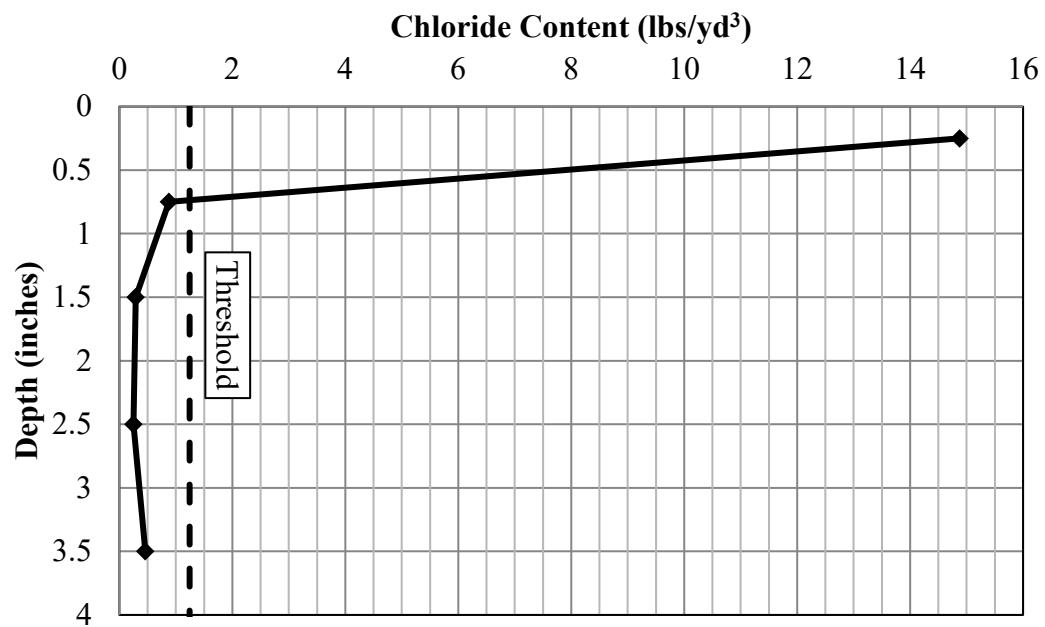


Figure C.1: Vertical chloride profile of dust sample 1 at MRM 87

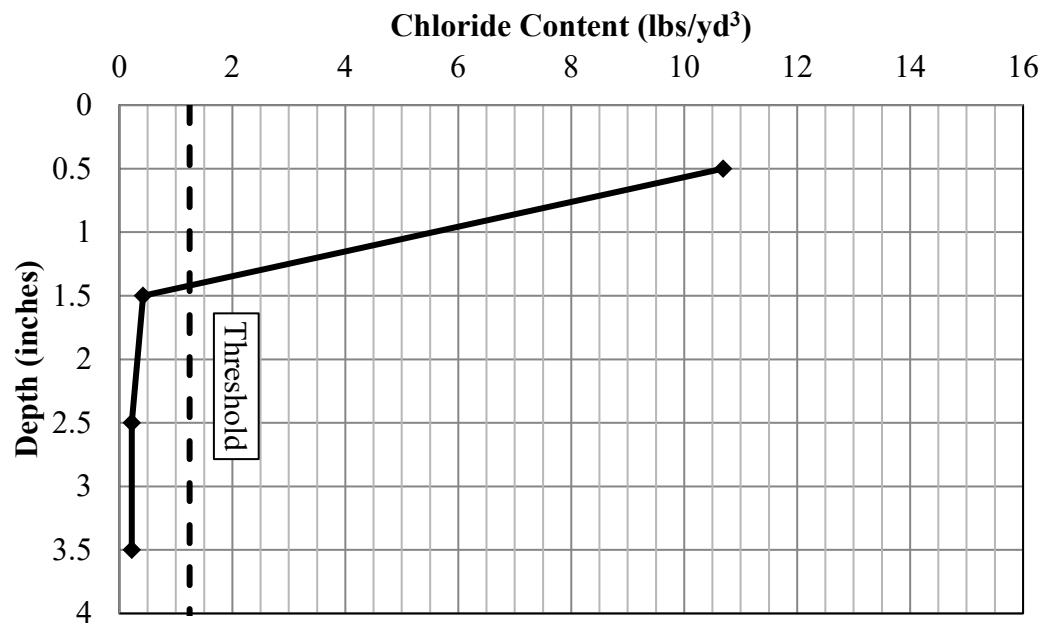


Figure C.2: Vertical chloride profile of dust sample 2 at MRM 87

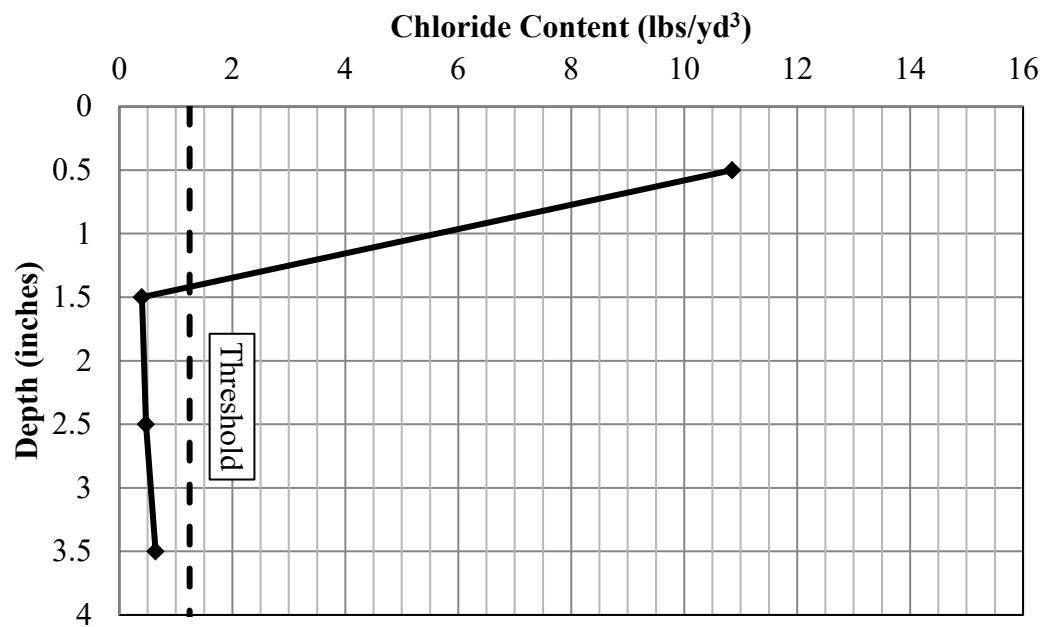


Figure C.3: Vertical chloride profile of dust sample 3 at MRM 87

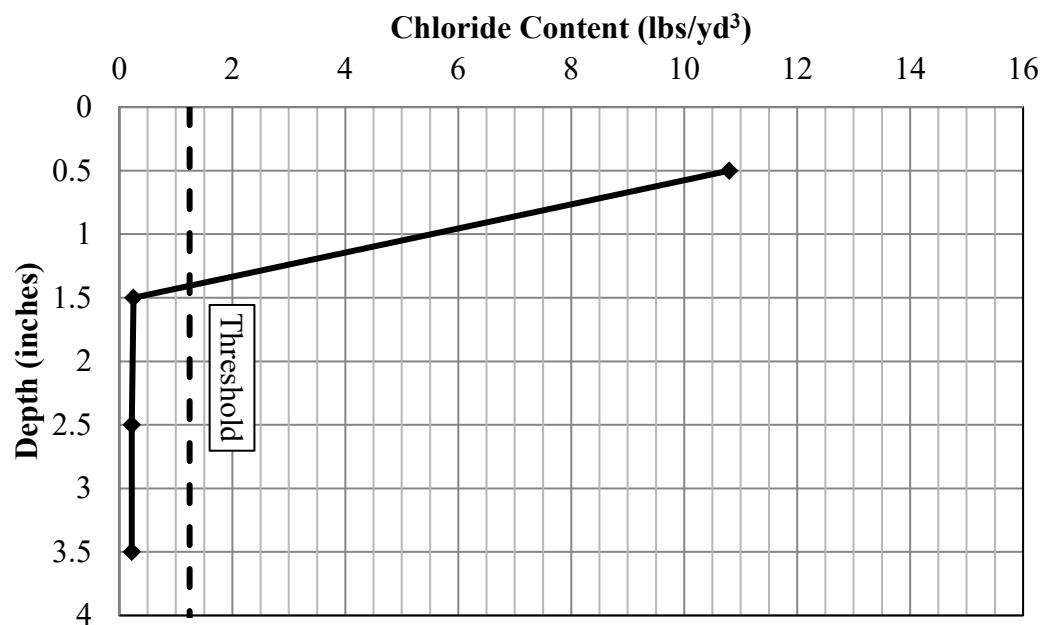


Figure C.4: Vertical chloride profile of dust sample 4 at MRM 87

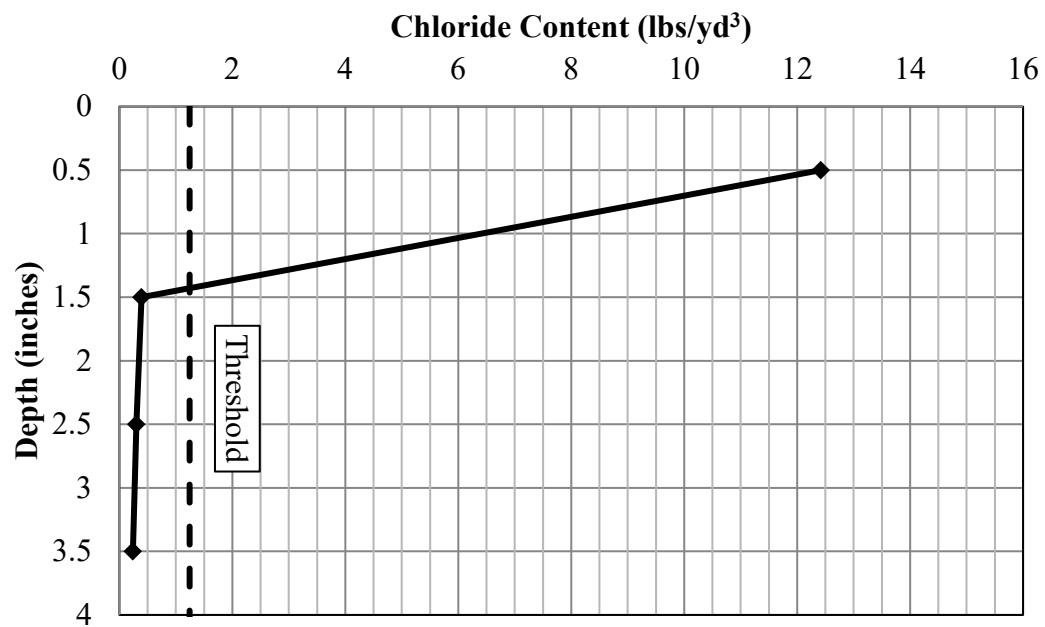


Figure C.5: Vertical chloride profile of dust sample 1 at MRM 68

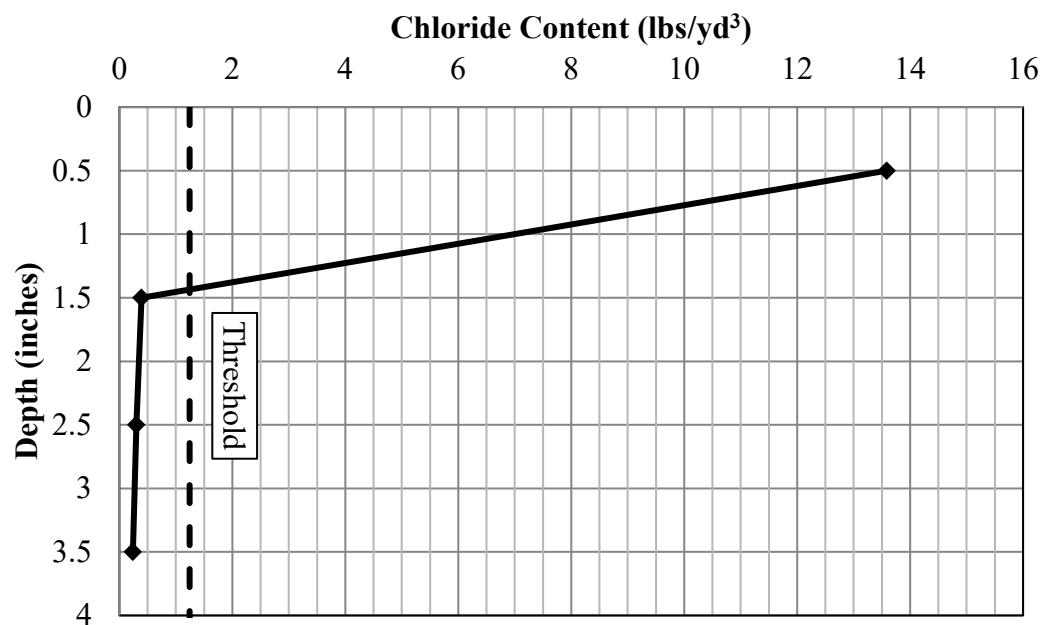


Figure C.6: Vertical chloride profile of dust sample 2 at MRM 68

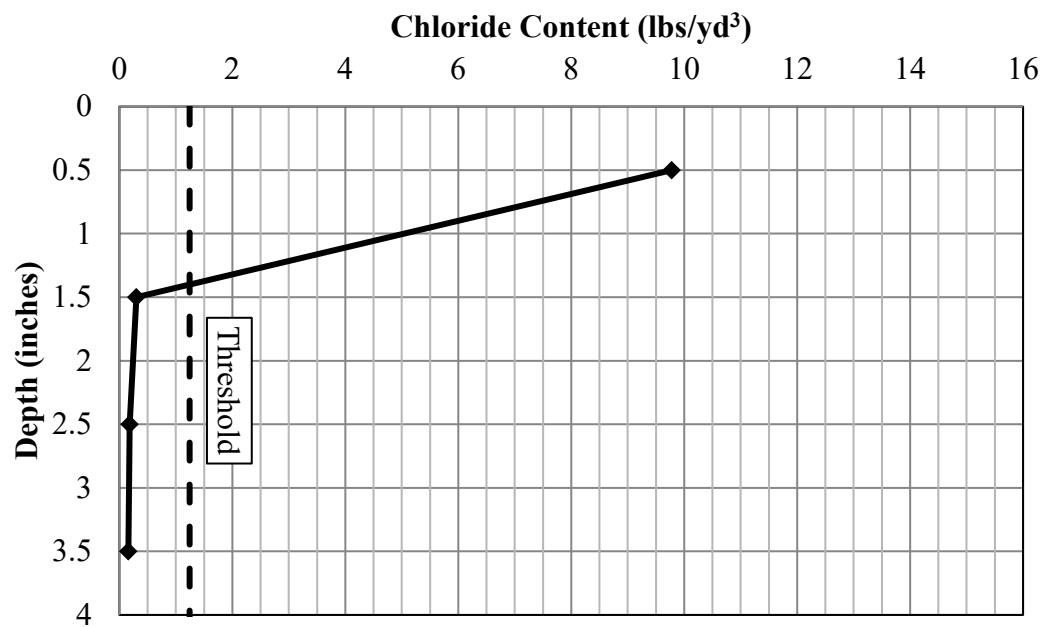


Figure C.7: Vertical chloride profile of dust sample 3 at MRM 68

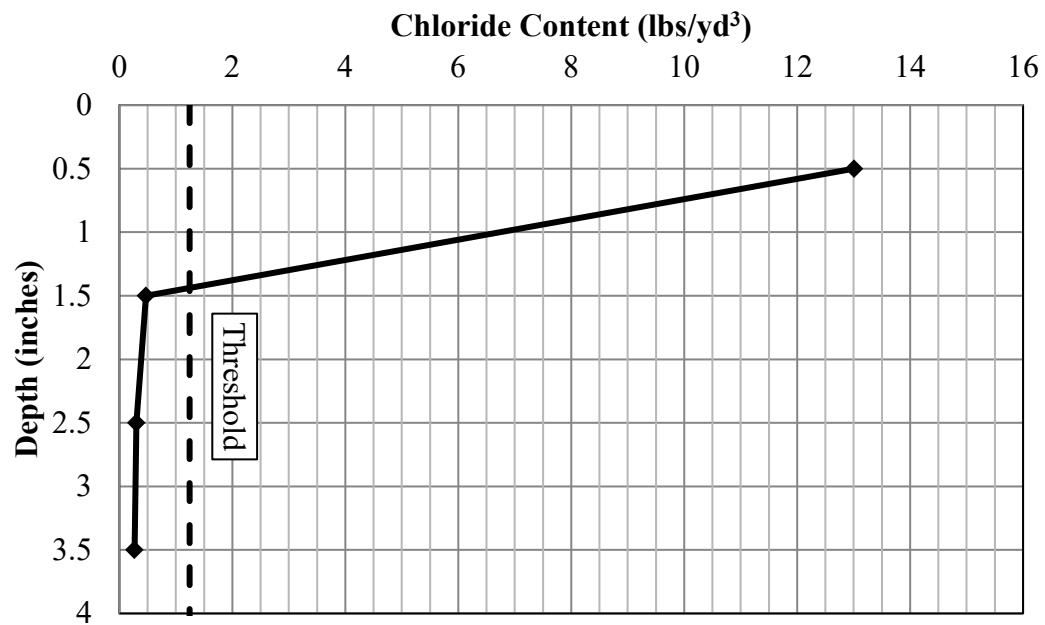


Figure C.8: Vertical chloride profile of dust sample 4 at MRM 68

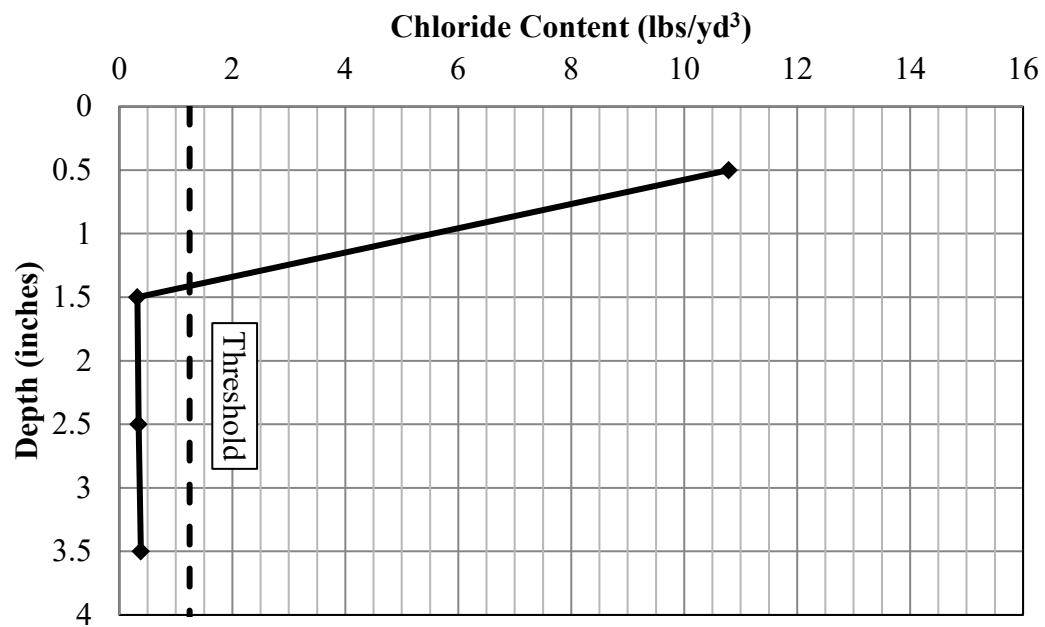


Figure C.9: Vertical chloride profile of dust sample 1 at MRM 411

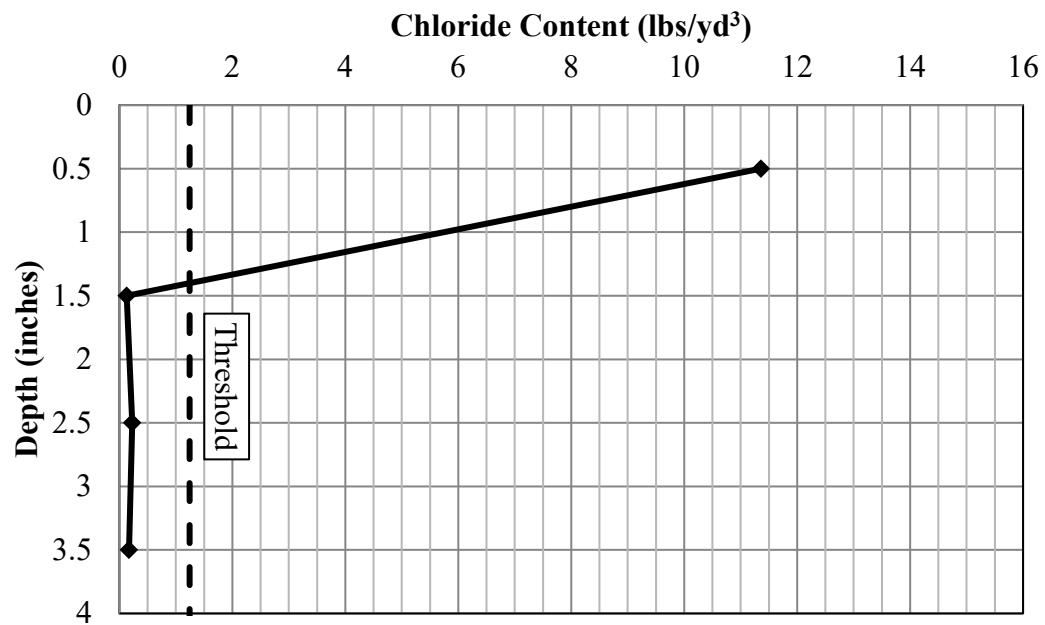


Figure C.10: Vertical chloride profile of dust sample 2 at MRM 411

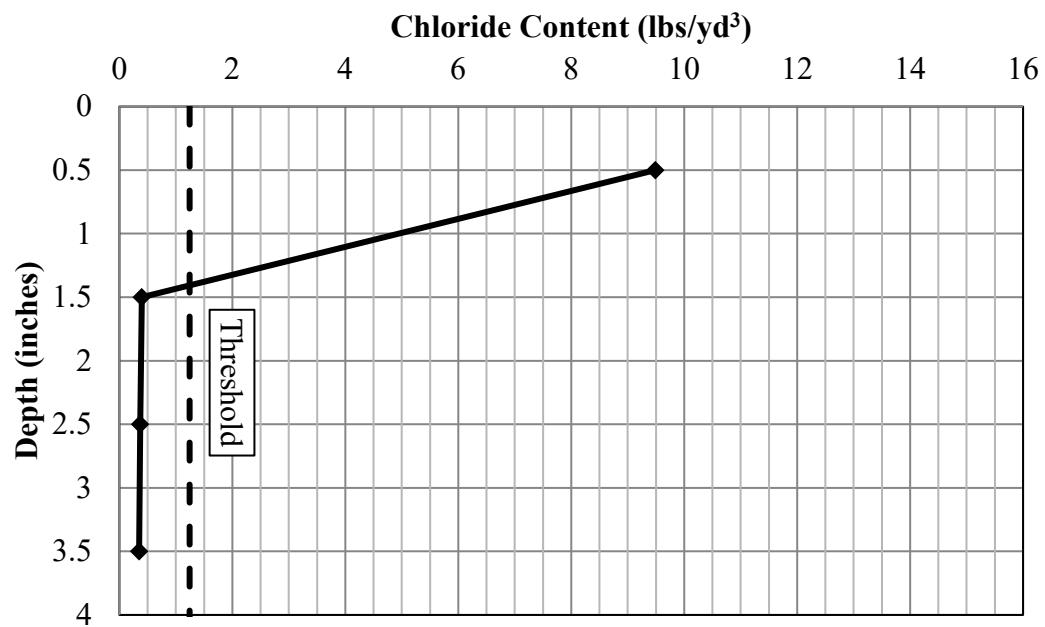


Figure C.11: Vertical chloride profile of dust sample 3 at MRM 411

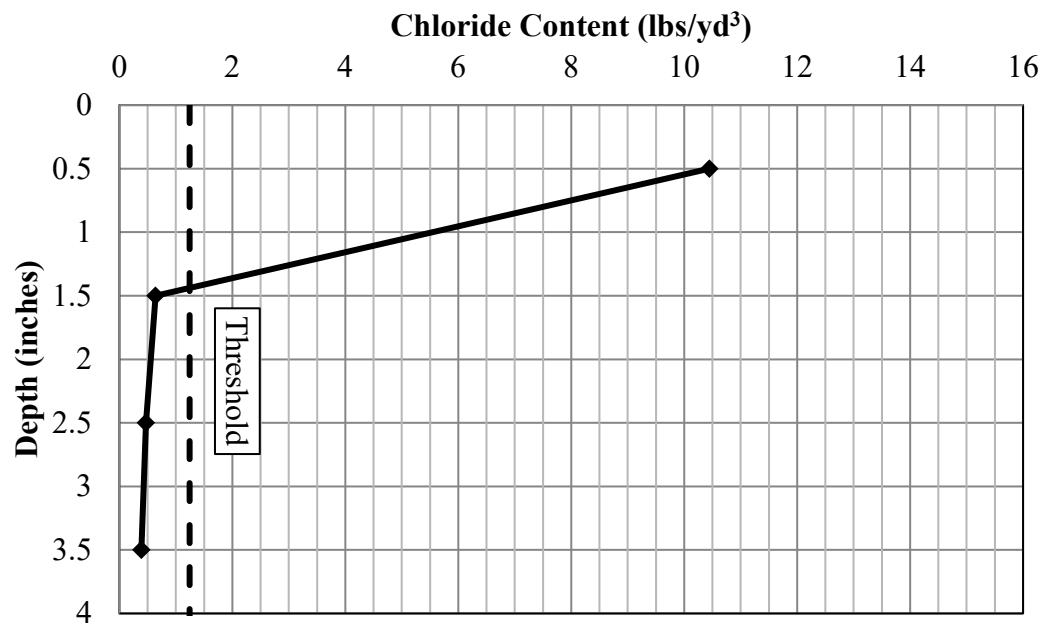


Figure C.12: Vertical chloride profile of dust sample 4 at MRM 411

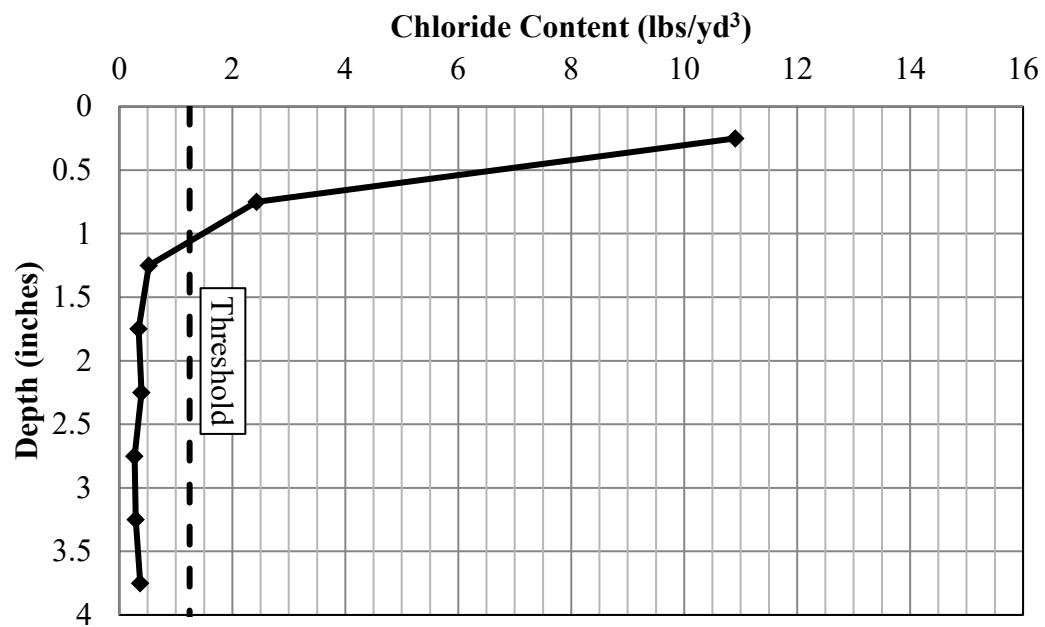


Figure C.13: Vertical chloride profile of dust sample 1 at MRM 33

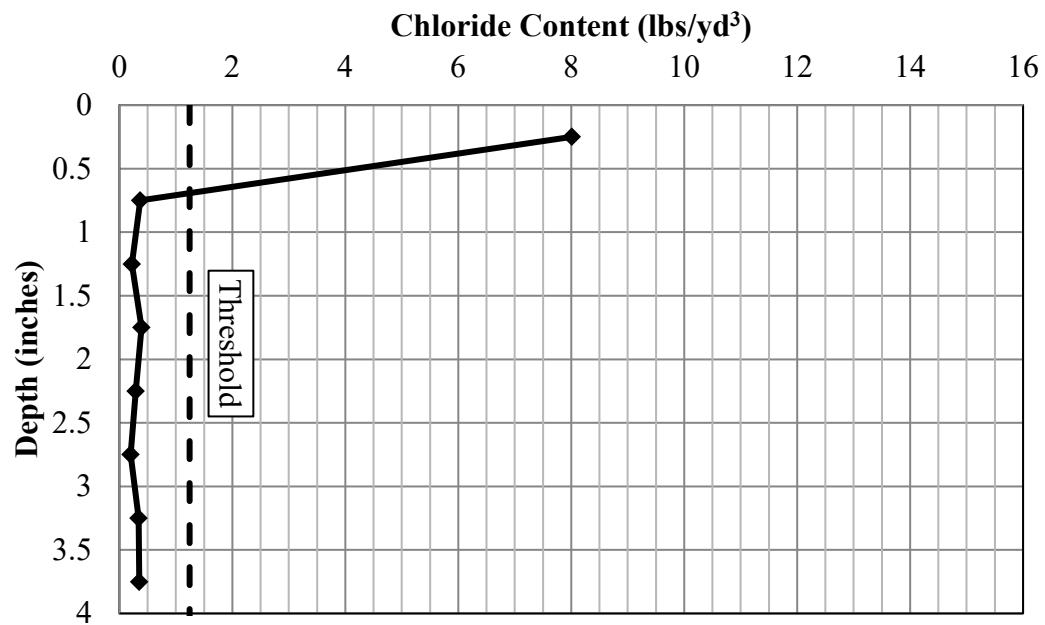


Figure C.14: Vertical chloride profile of dust sample 2 at MRM 33

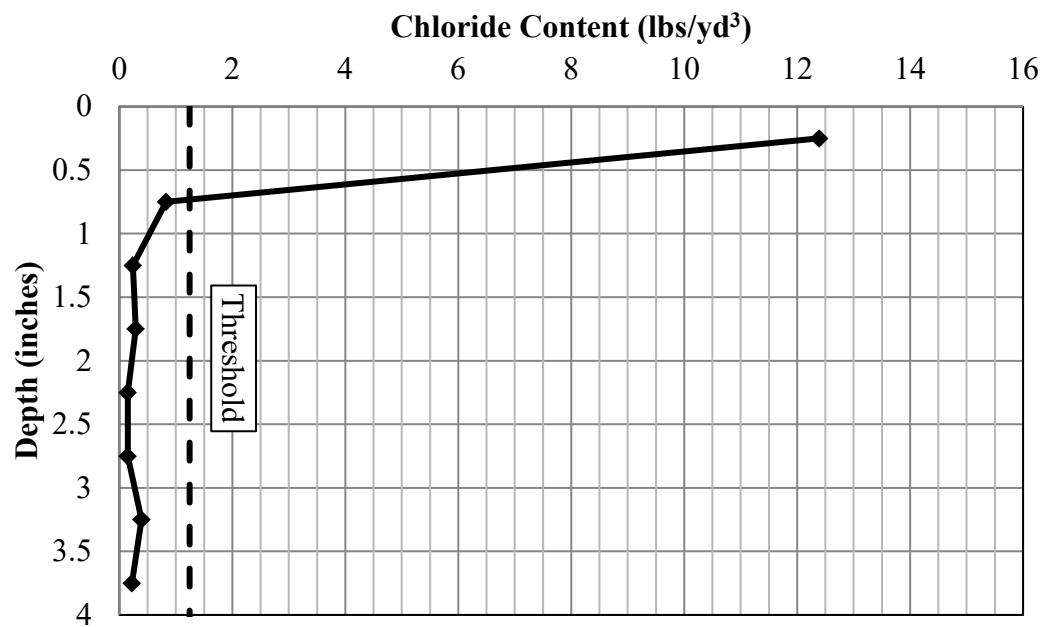


Figure C.15: Vertical chloride profile of dust sample 1 at MRM 44

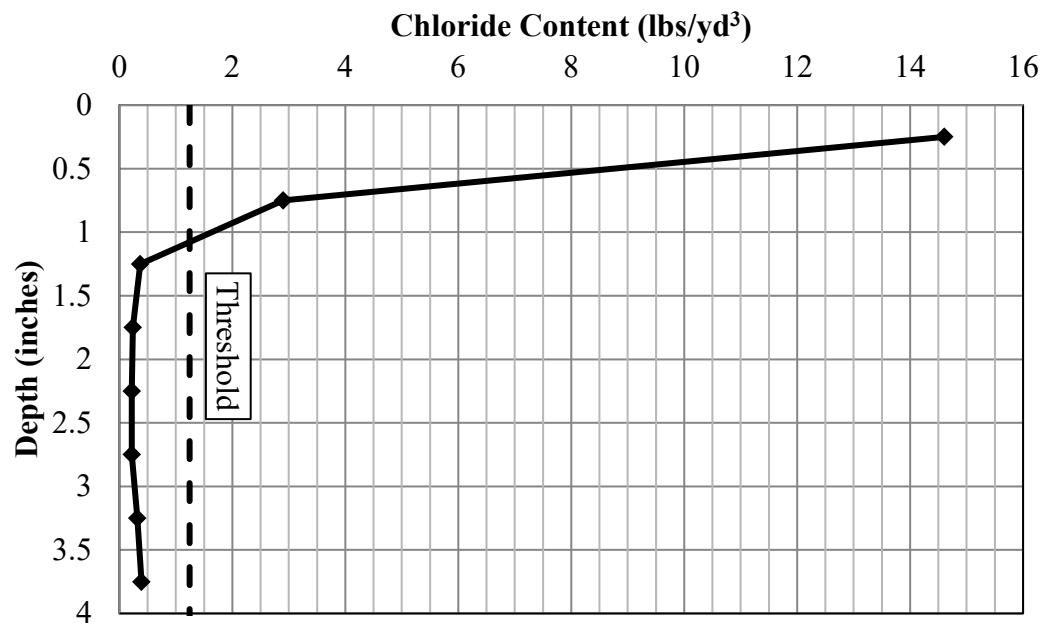


Figure C.16: Vertical chloride profile of dust sample 2 at MRM 44

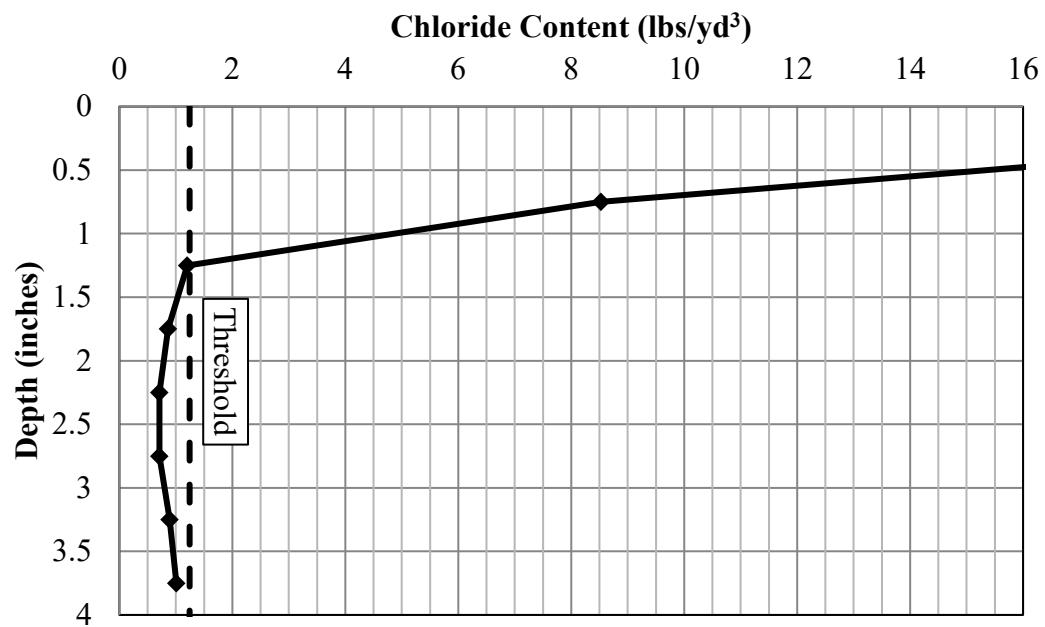


Figure C.17: Vertical chloride profile of dust sample 1 at MRM 25

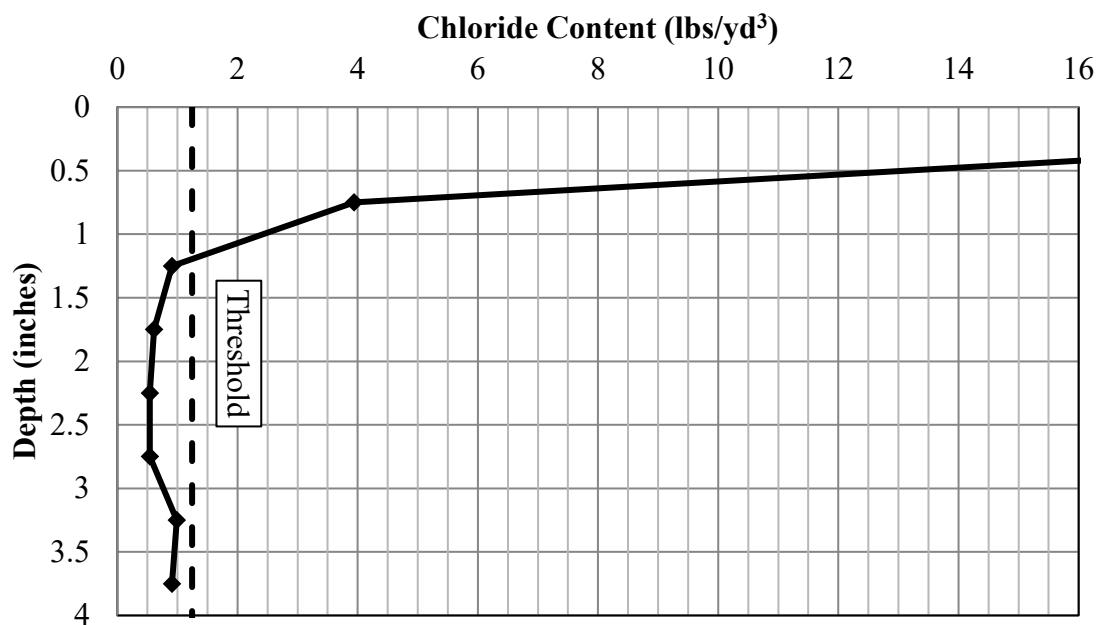


Figure C.18: Vertical chloride profile of dust sample 2 at MRM 25

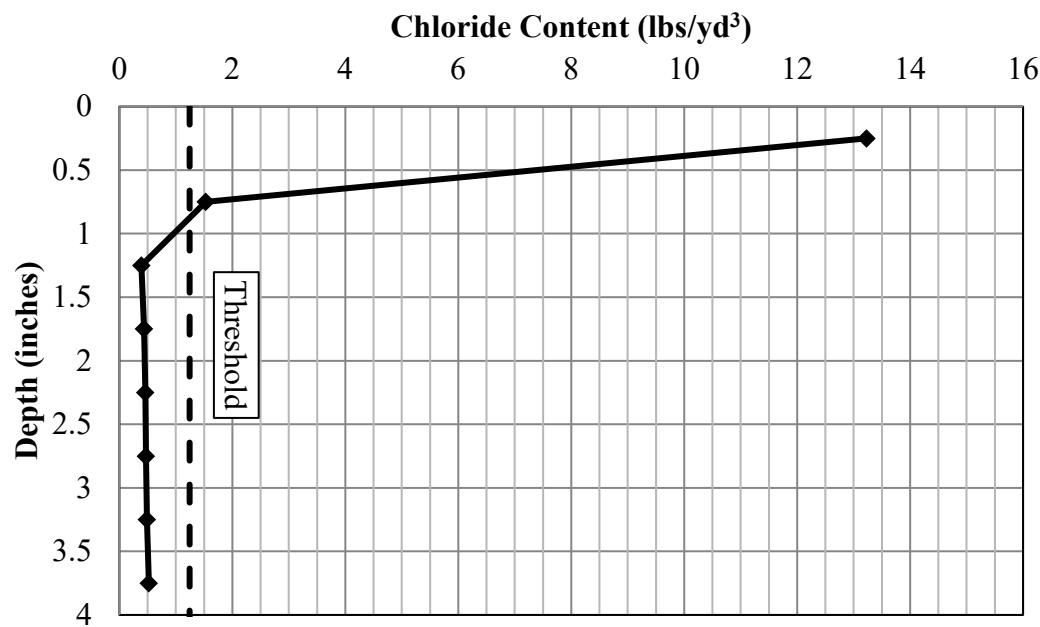


Figure C.19: Vertical chloride profile of dust sample 1 at MRM 54

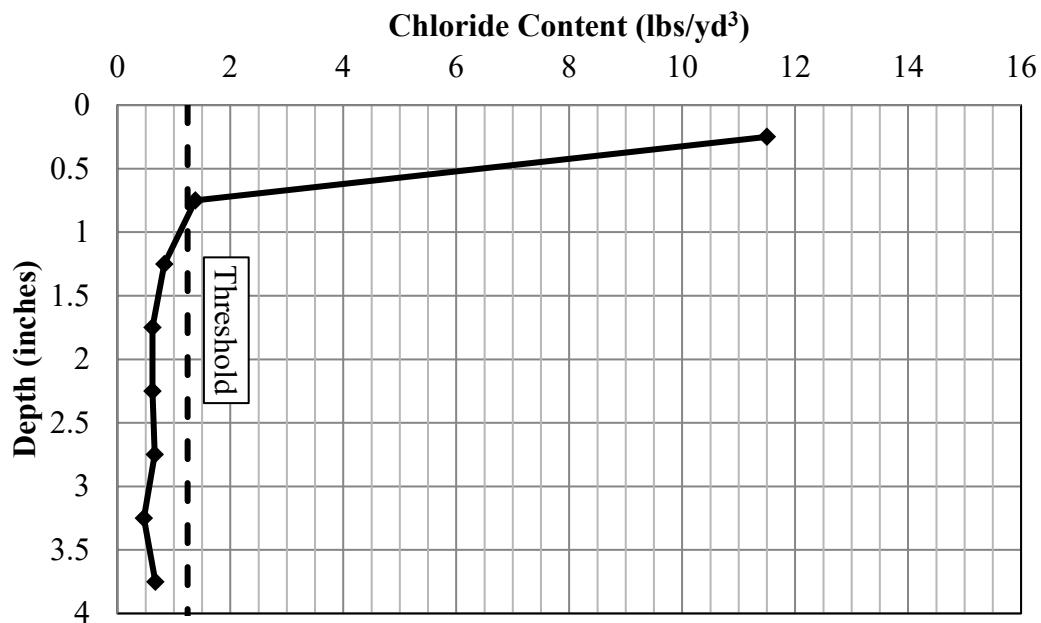


Figure C.20: Vertical chloride profile of dust sample 2 at MRM 54

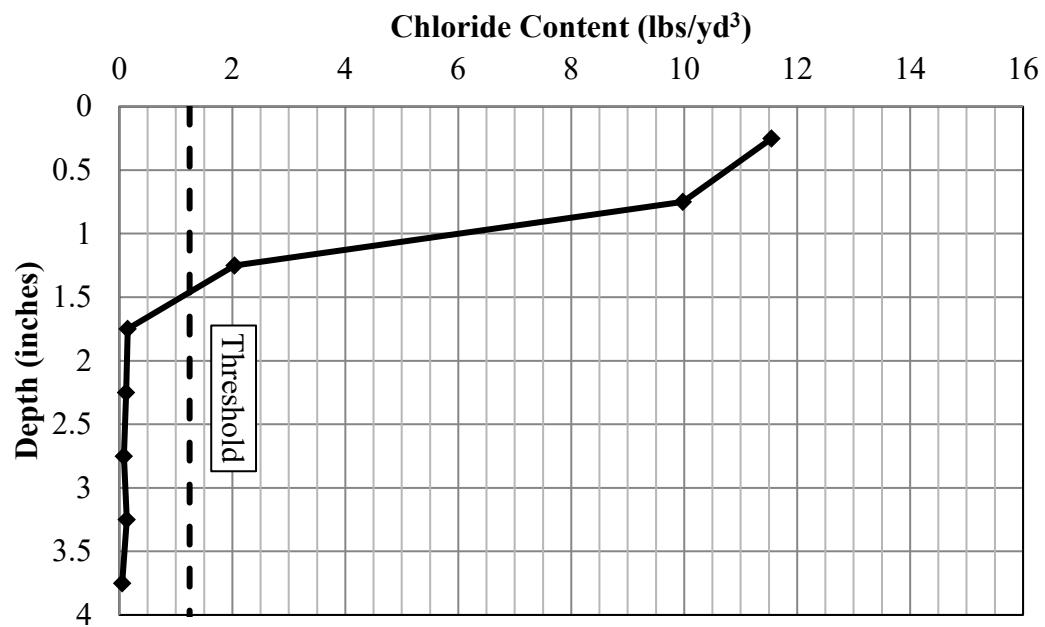


Figure C.21: Vertical chloride profile of dust sample 1 at MRM 222

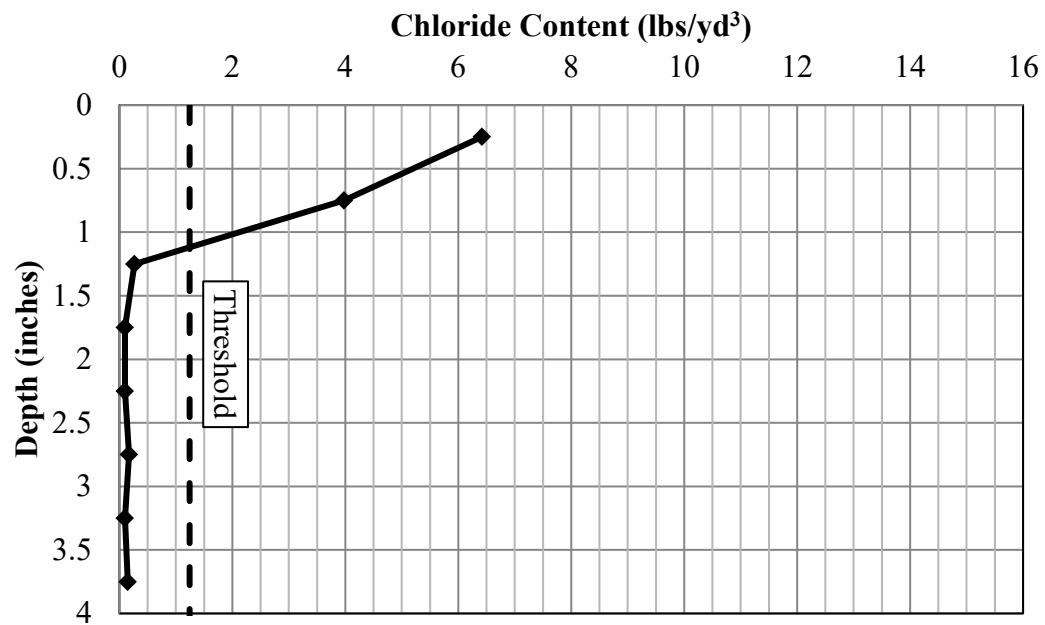


Figure C.22: Vertical chloride profile of dust sample 2 at MRM 222

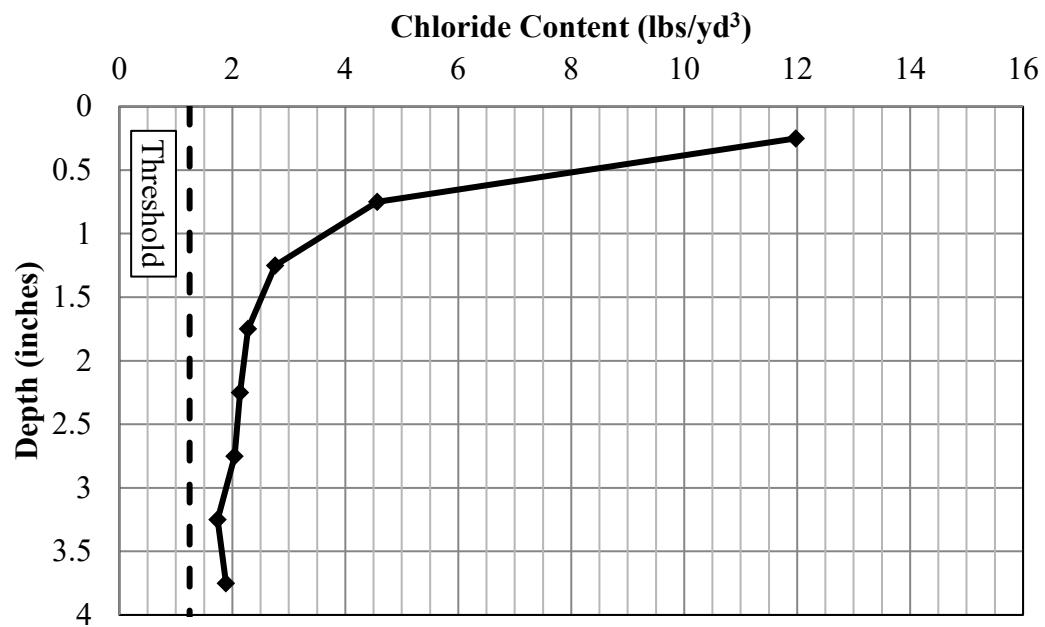


Figure C.23: Vertical chloride profile of dust sample 1 at MRM 246

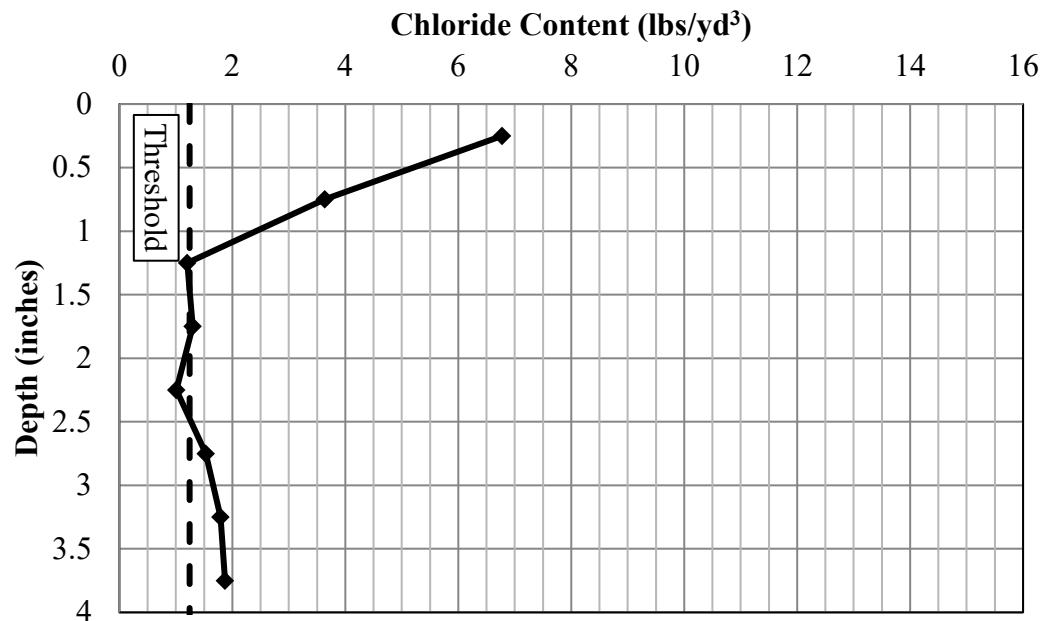


Figure C.24: Vertical chloride profile of dust sample 2 at MRM 246

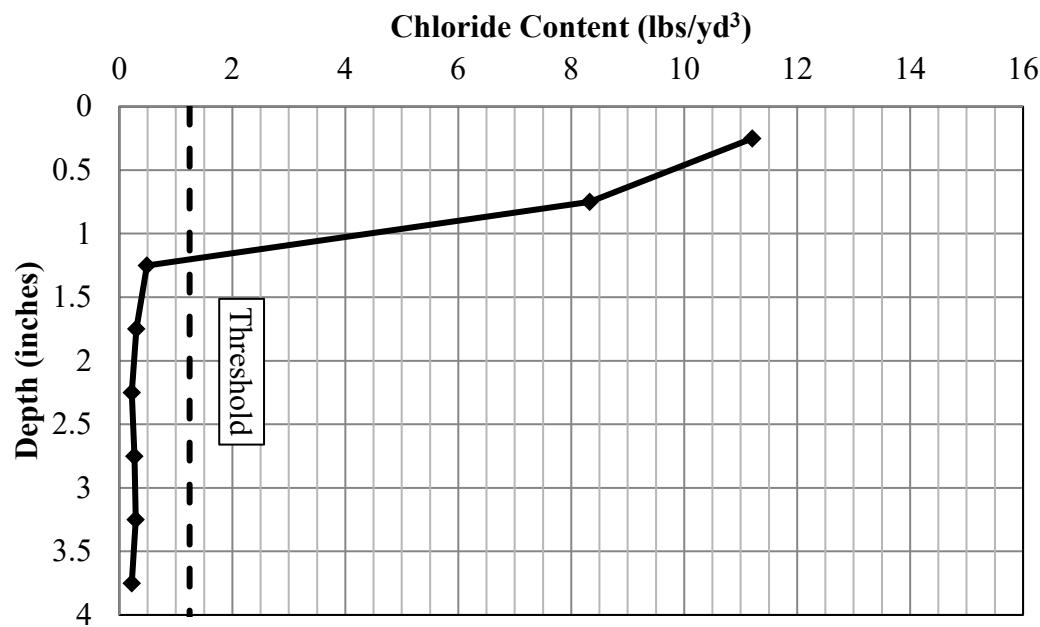


Figure C.25: Vertical chloride profile of dust sample 1 at MRM 168 NB

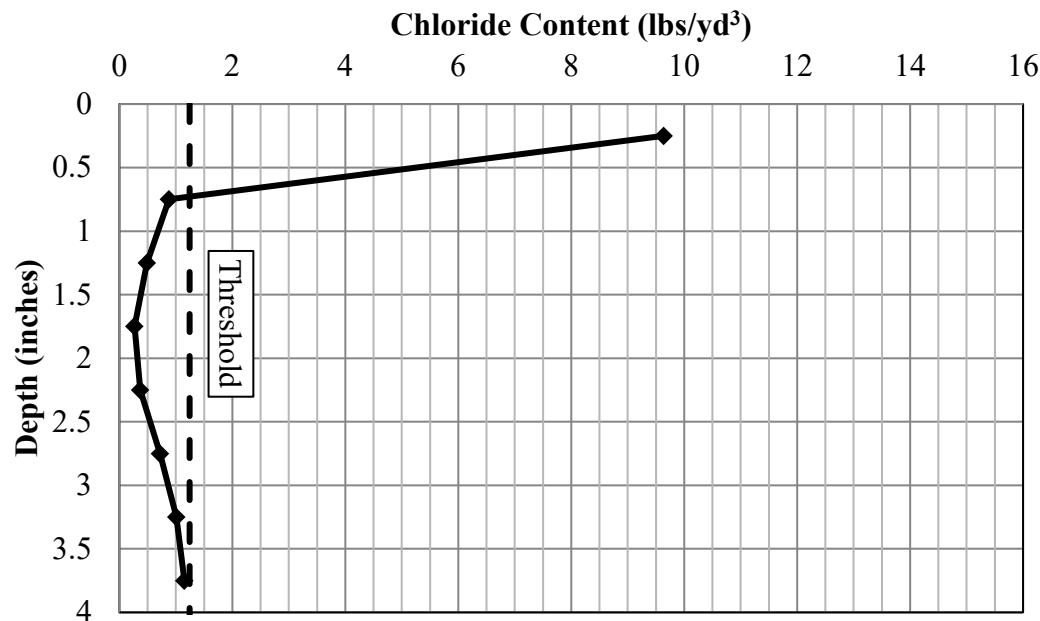


Figure C.26: Vertical chloride profile of dust sample 2 at MRM 168 NB

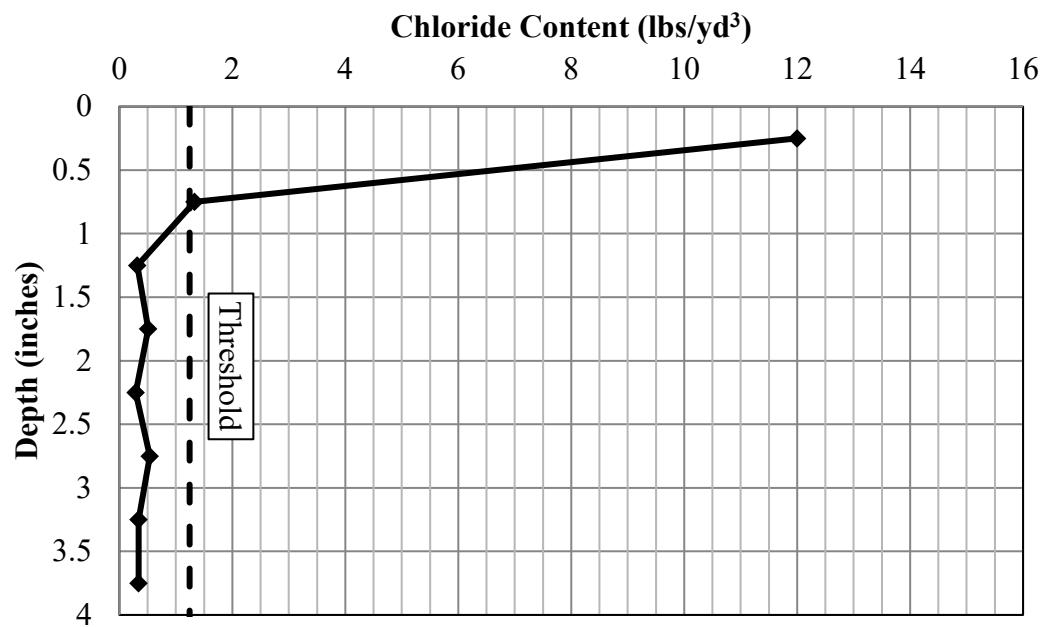


Figure C.27: Vertical chloride profile of dust sample 1 at MRM 168SB

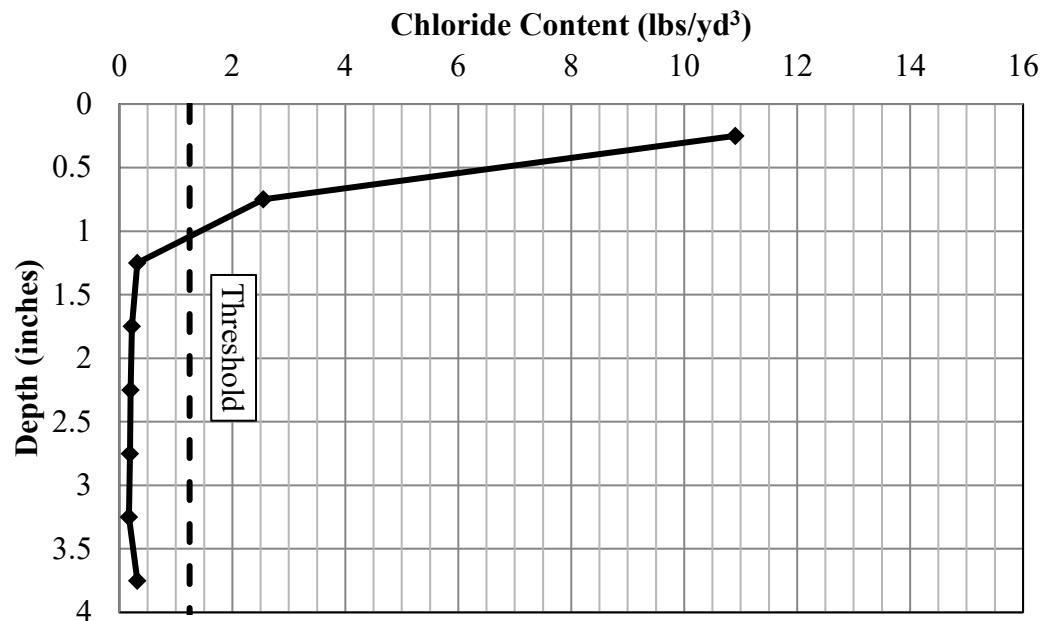


Figure C.28: Vertical chloride profile of dust sample 2 at MRM 168SB

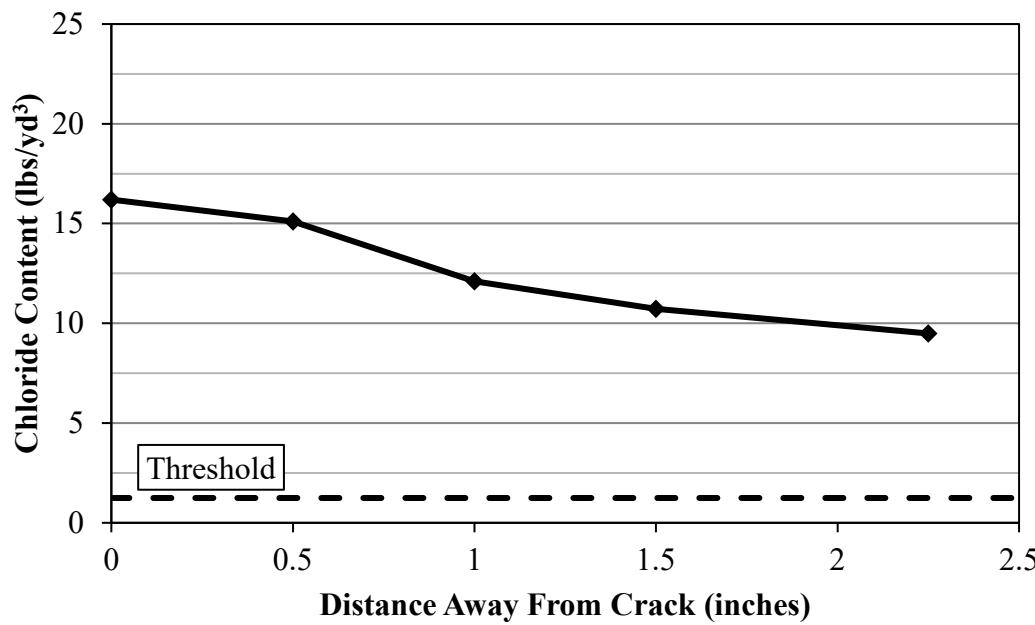


Figure C.29: Horizontal chloride profile of core MRM 87-3 at depth 0.5 inches

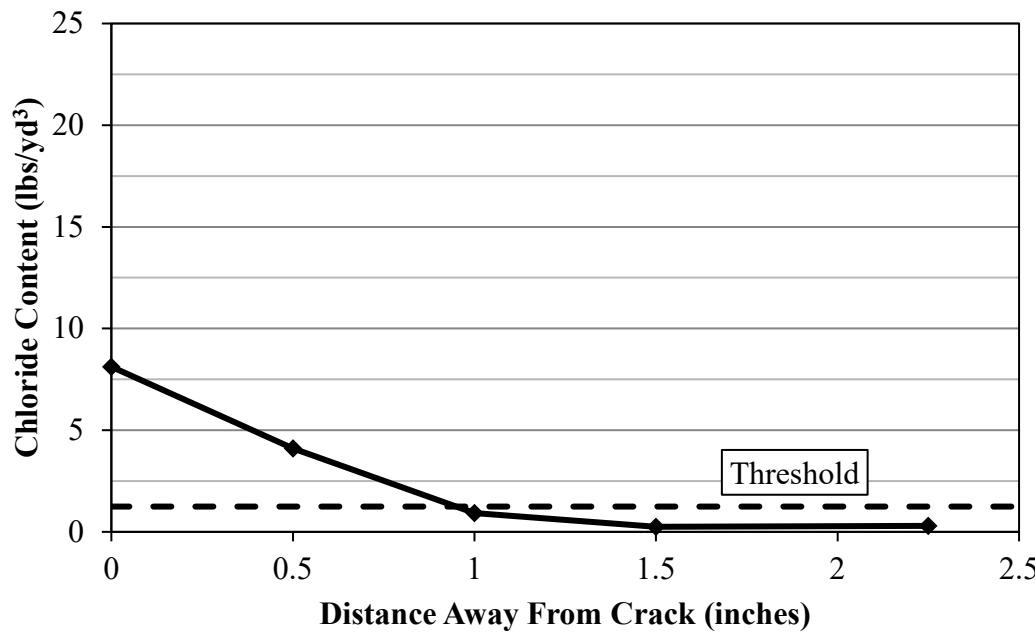


Figure C.30: Horizontal chloride profile of core MRM 87-3 at depth 1.5 inches

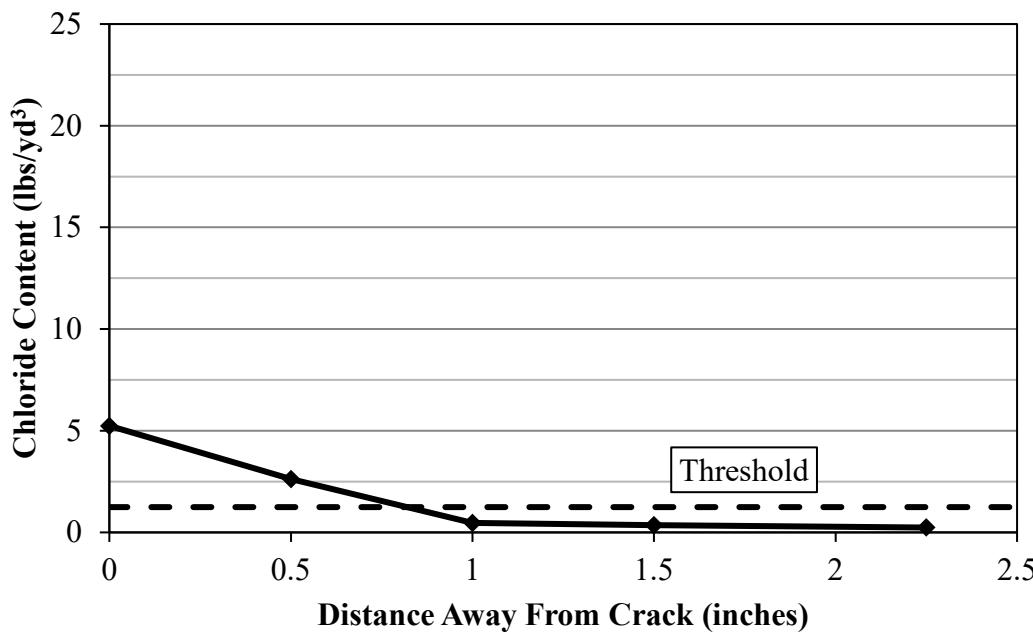


Figure C.31: Horizontal chloride profile of core MRM 87-3 at depth 2.5 inches

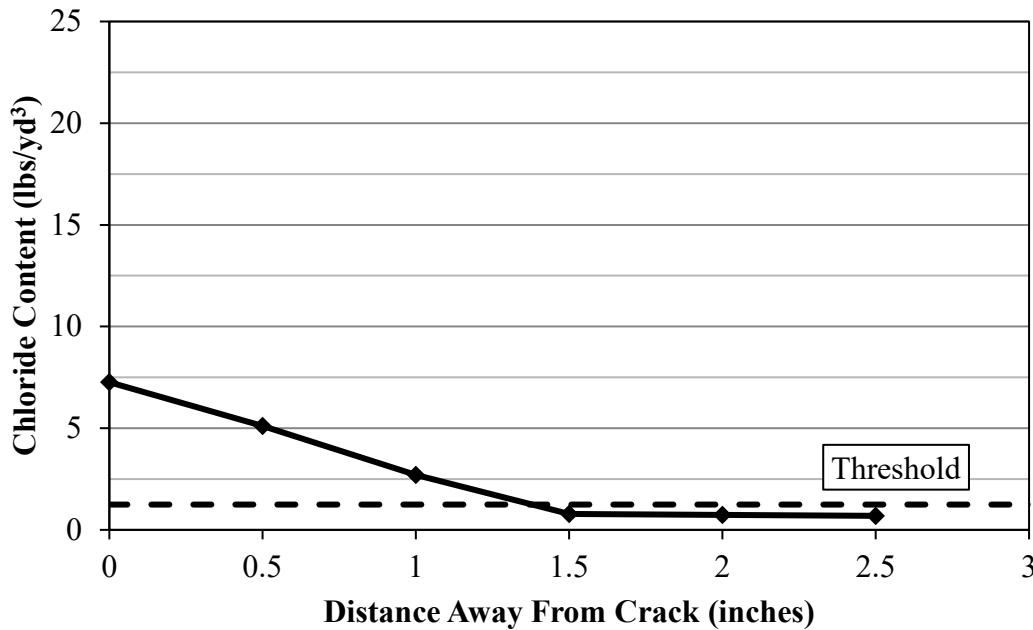


Figure C.32: Horizontal chloride profile of core MRM 87-3 at depth 3.5 inches

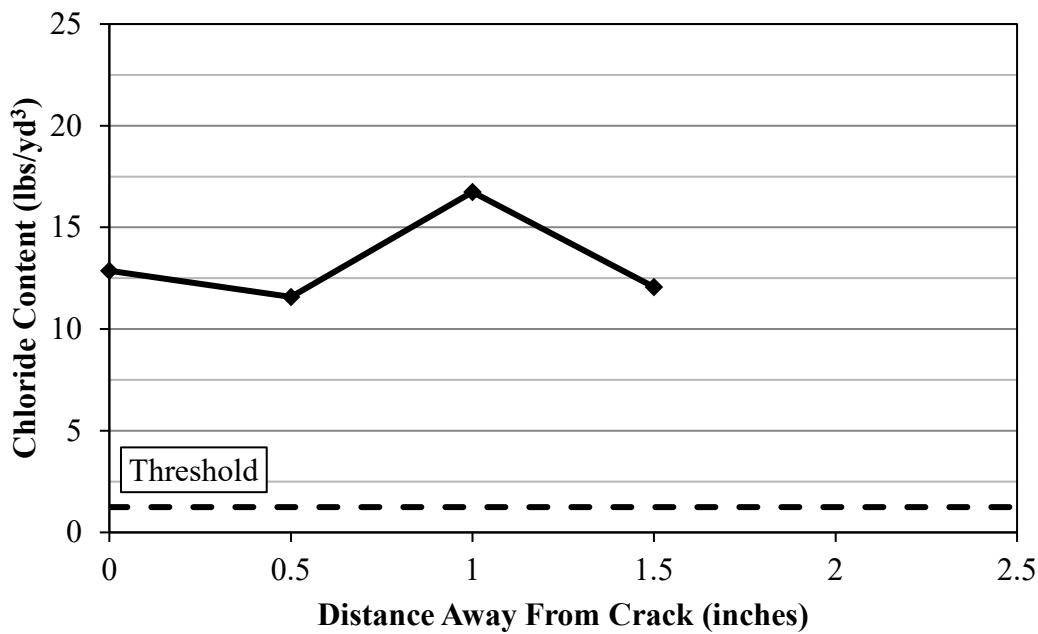


Figure C.33: Horizontal chloride profile of core MRM 68-3 at depth 0.5 inches

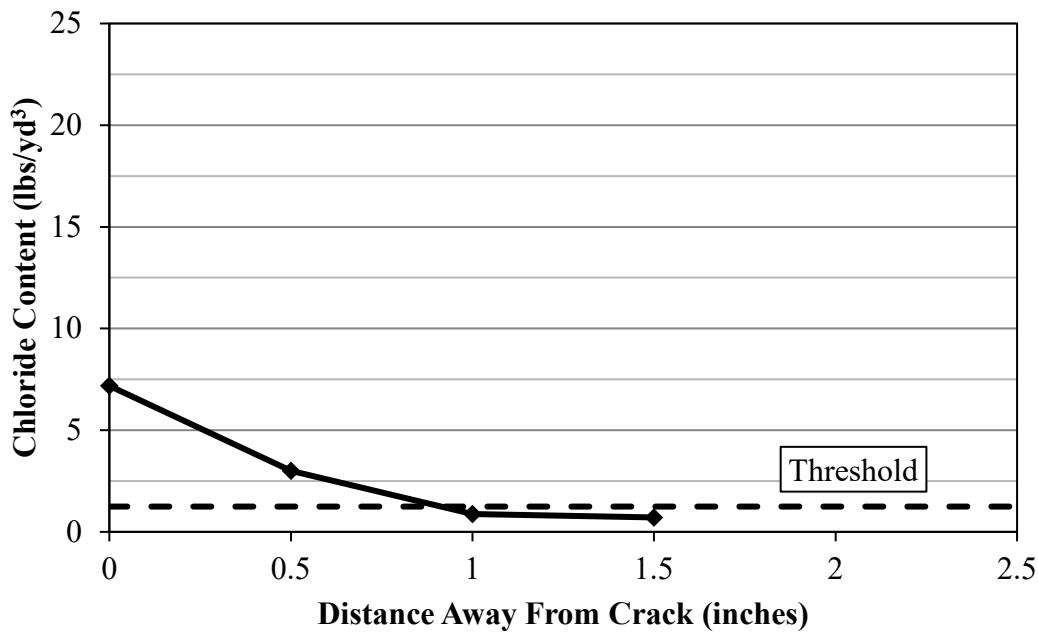


Figure C.34: Horizontal chloride profile of core MRM 68-3 at depth 1.5 inches

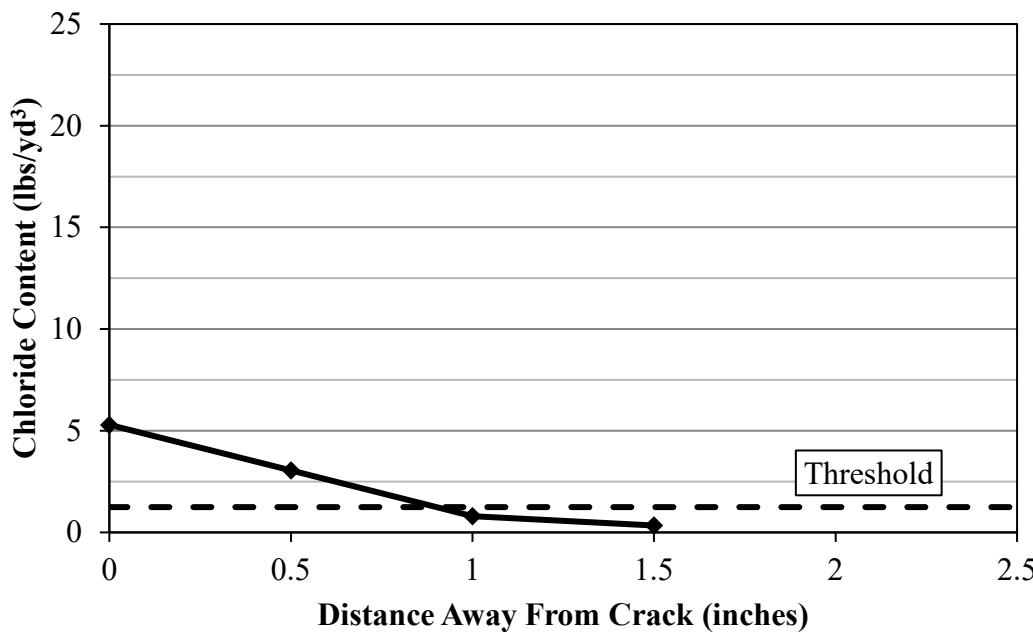


Figure C.35: Horizontal chloride profile of core MRM 68-3 at depth 2.5 inches

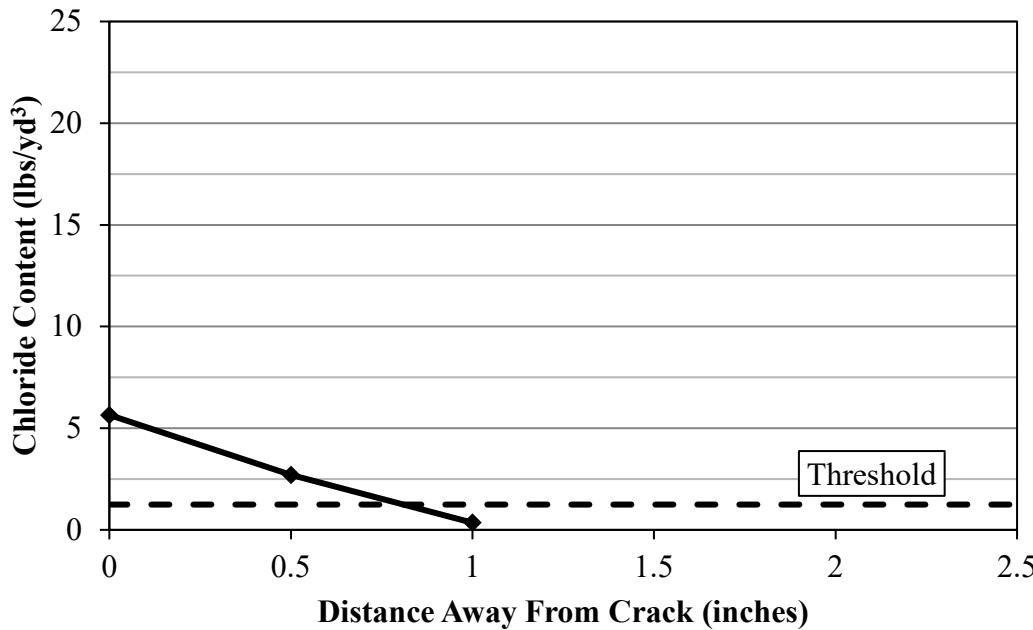


Figure C.36: Horizontal chloride profile of core MRM 68-3 at depth 3.5 inches

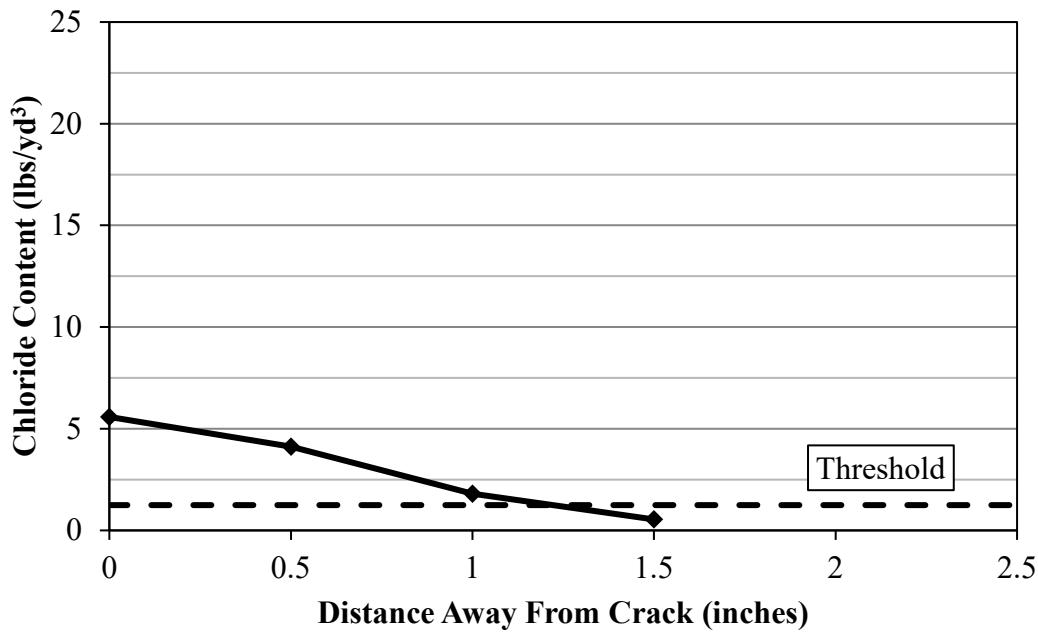


Figure C.37: Horizontal chloride profile of core MRM 68-3 at depth 4.5 inches

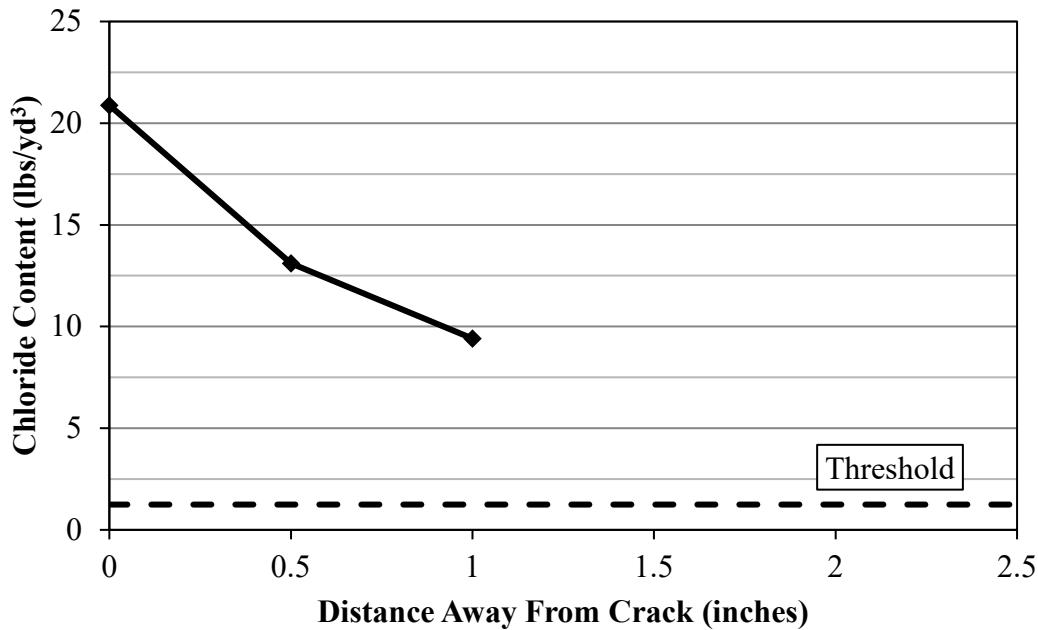


Figure C.38: Horizontal chloride profile of core MRM 411-1 at depth 0.5 inches

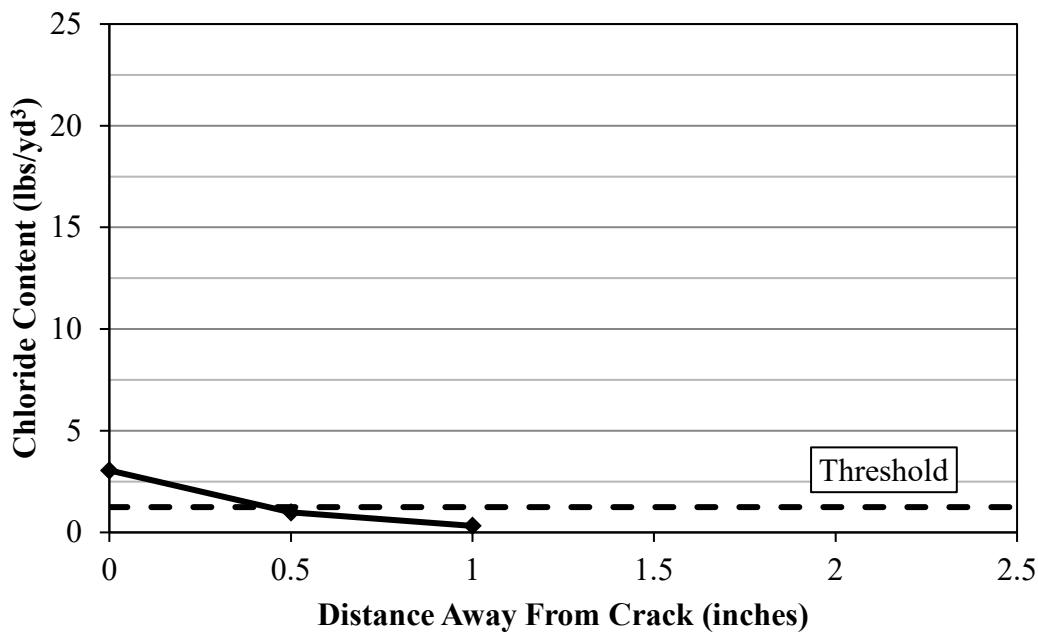


Figure C.39: Horizontal chloride profile of core MRM 411-1 at depth 1.5 inches

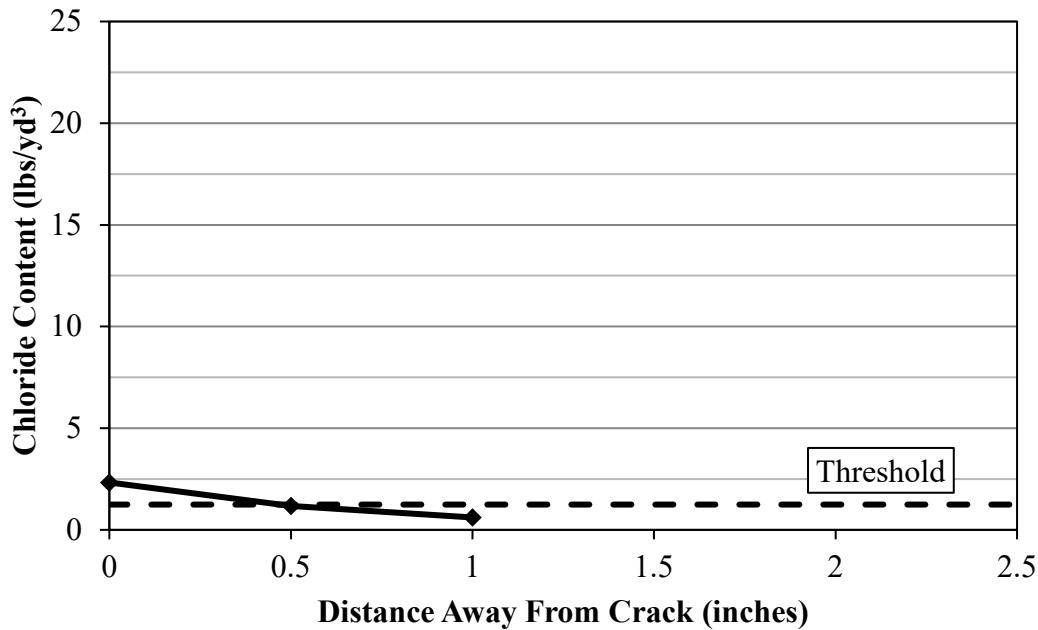


Figure C.40: Horizontal chloride profile of core MRM 411-1 at depth 2.5 inches

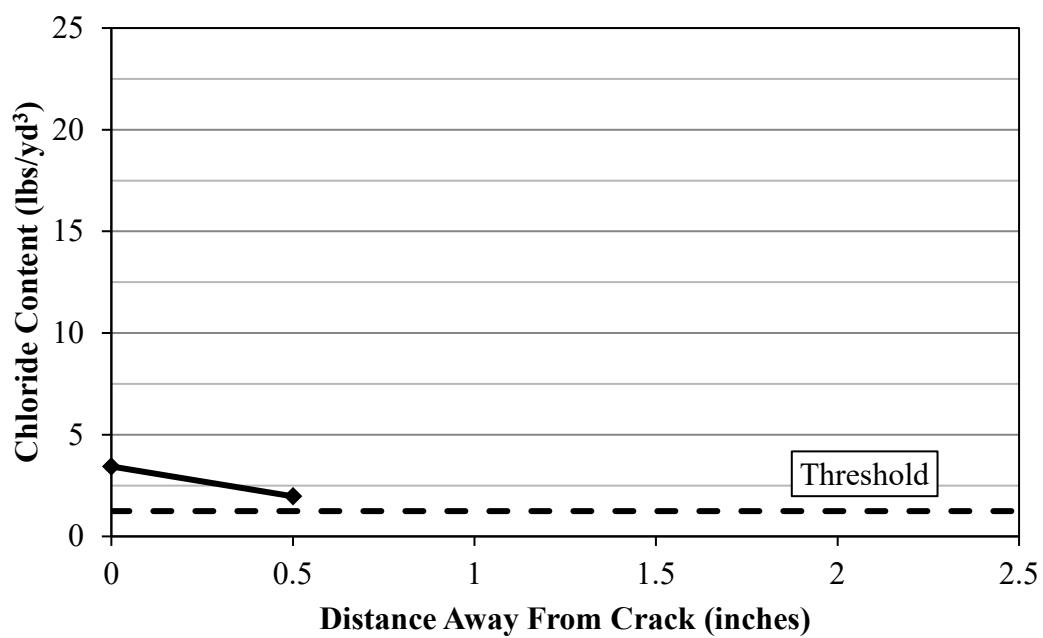


Figure C.41: Horizontal chloride profile of core MRM 411-1 at depth 3.5 inches

APPENDIX D. PAVEMENT DISTRESS DEFINITIONS

The definitions presented in this appendix were obtained from the Distress Identification Manual for the Long-Term Pavement Performance Program.

Longitudinal Cracking: Cracks that are predominately parallel to the pavement centerline.

Transverse Cracking: Cracks that are predominantly perpendicular to the pavement centerline.

Polished Aggregate: Surface mortar and texturing worn away to expose coarse aggregate.

Popouts: Small pieces of pavement broken loose from the surface, normally ranging in diameter from 25 mm to 100 mm and depth from 13 mm to 50 mm.

Patch/Patch Deterioration: A portion, greater than 0.1 m², or all of the original concrete slab that has been removed and replaced, or additional material applied to the pavement after original construction.

Punchouts: The area enclosed by two closely spaced (usually < 0.6 m) transverse cracks, a short longitudinal crack, and the edge of the pavement or a longitudinal joint. Also includes “Y” cracks that exhibit spalling, breakup, or faulting.

Spalling of Longitudinal Joints: Cracking, breaking, chipping, or fraying of slab edges within 0.3 m from the face of the longitudinal joint.

APPENDIX E. EQUIPOTENTIAL CONTOUR MAPS FOR MITIGATION PRODUCT ASSESSMENT

The grid shown on the equipotential contour maps (Figure E-2 through Figure E-65) is 4 feet by 4 feet. However, the half-cell potential measurements were obtained on a 2 feet by 2 feet grid.

Figure E-2 through Figure E-36 show contour maps of the half-cell potential measurements at the date indicated.

Figure E-38 through Figure E-65 show contour maps of the differences between half-cell measurements at the dates indicated.

Section A – MCI-2018

Section B – Protectosil CIT and Ferrogard 903

Section C – Protectosil CIT

Section D – Ferrogard 903

Section E – Duralprep 3020

Section F – Chemtrete 40

Section G – Control

Minimum Reading (mV)	Maximum Reading (mV)	Color
-750.00	-720.00	■
-720.00	-690.00	■
-690.00	-660.00	■
-660.00	-630.00	■
-630.00	-600.00	■
-600.00	-570.00	■
-570.00	-540.00	■
-540.00	-510.00	■
-510.00	-480.00	■
-480.00	-450.00	■
-450.00	-420.00	■
-420.00	-390.00	■
-390.00	-360.00	■
-360.00	-330.00	■
-330.00	-300.00	■
-300.00	-270.00	■
-270.00	-240.00	■
-240.00	-210.00	■
-210.00	-180.00	■
-180.00	-150.00	■

Figure E.1: Legend for half-cell potential contour maps

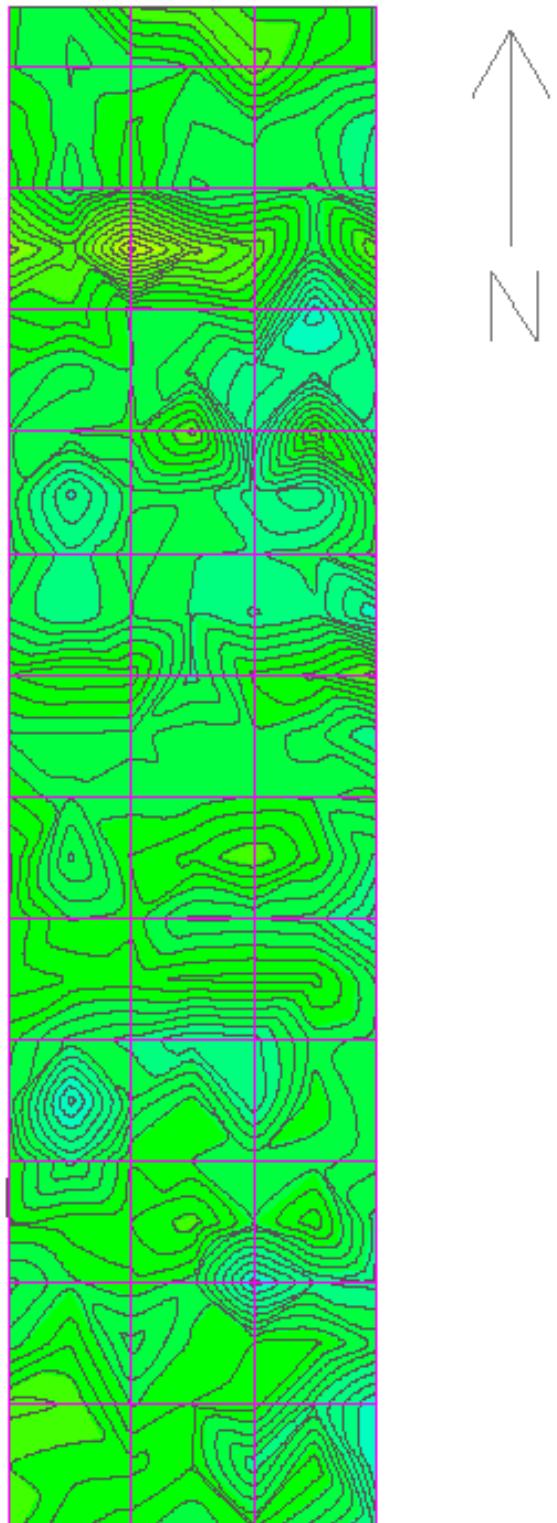


Figure E.2: Section A – 8/25/2011

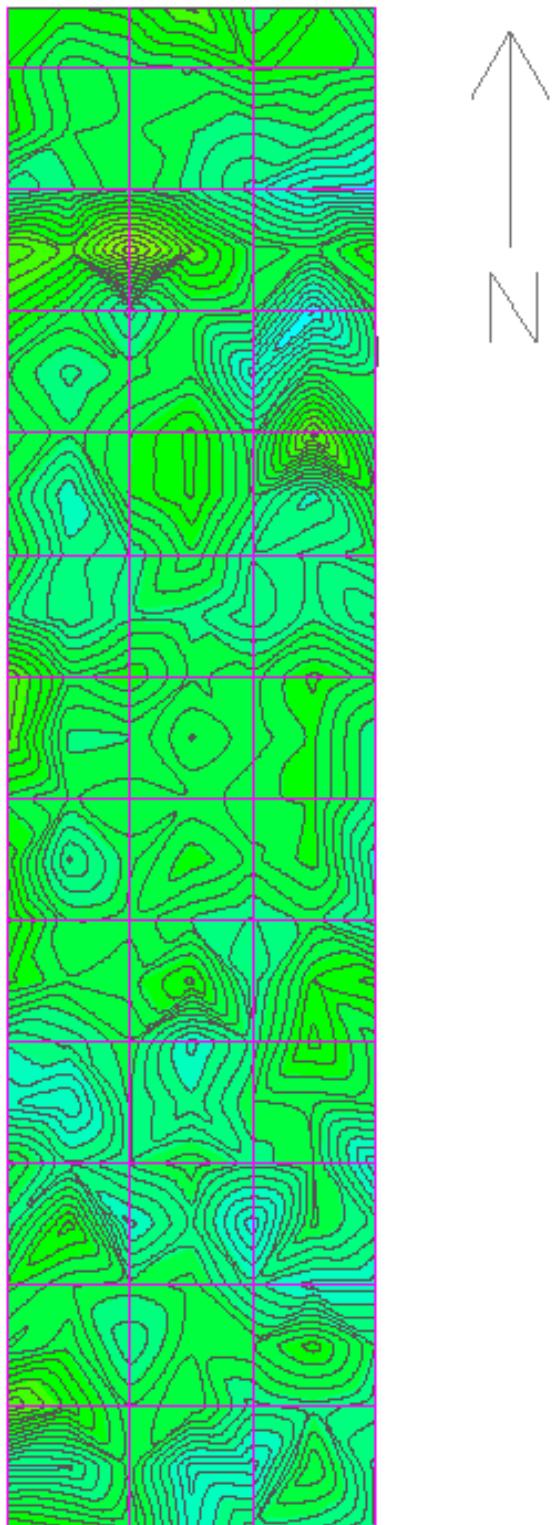


Figure E.3: Section A – 10/6/2011

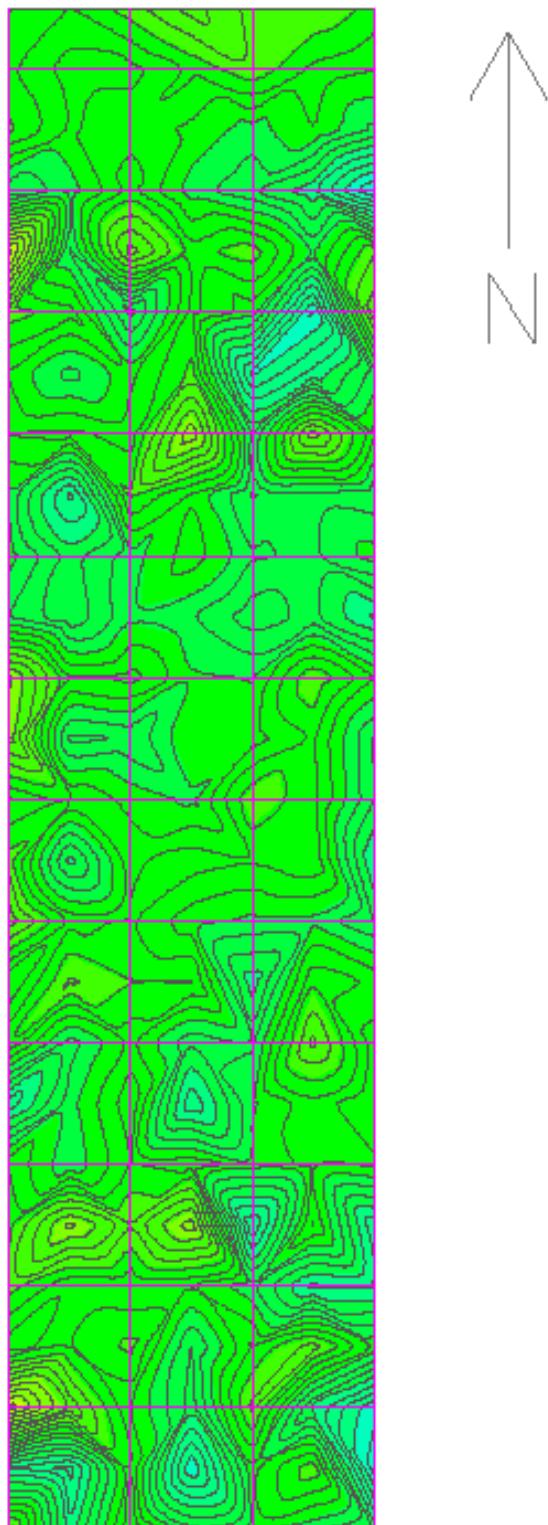


Figure E.4: Section A – 10/27/2012

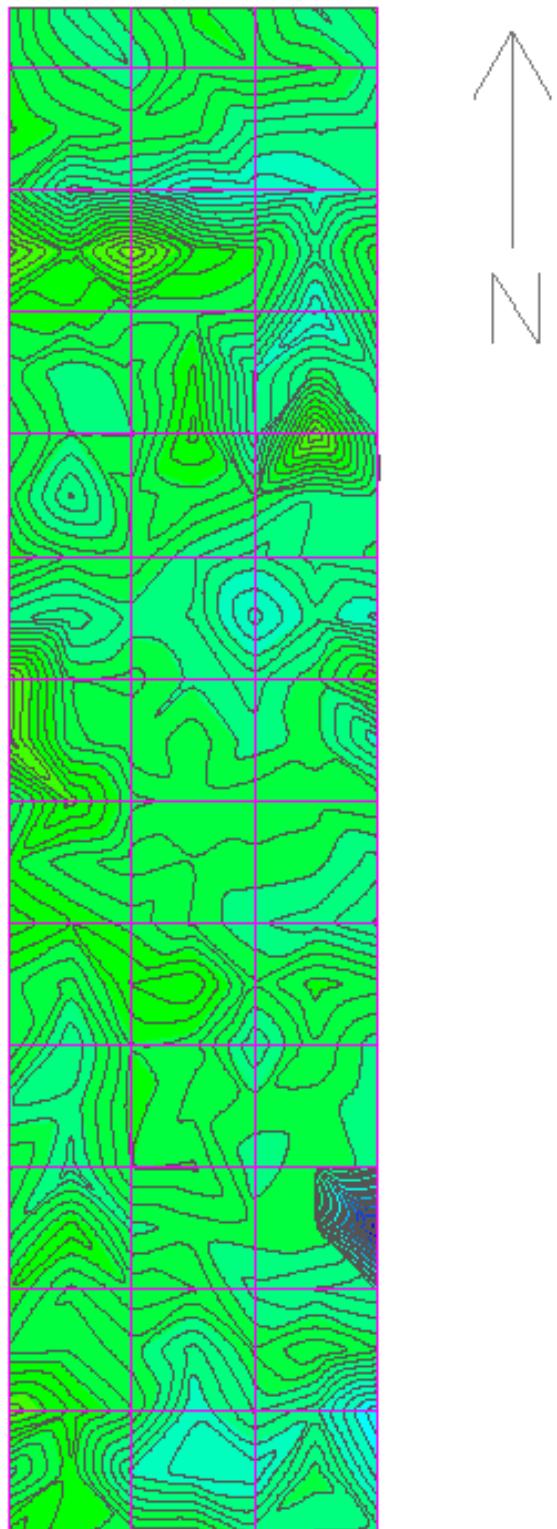


Figure E.5: Section A – 4/10/2012

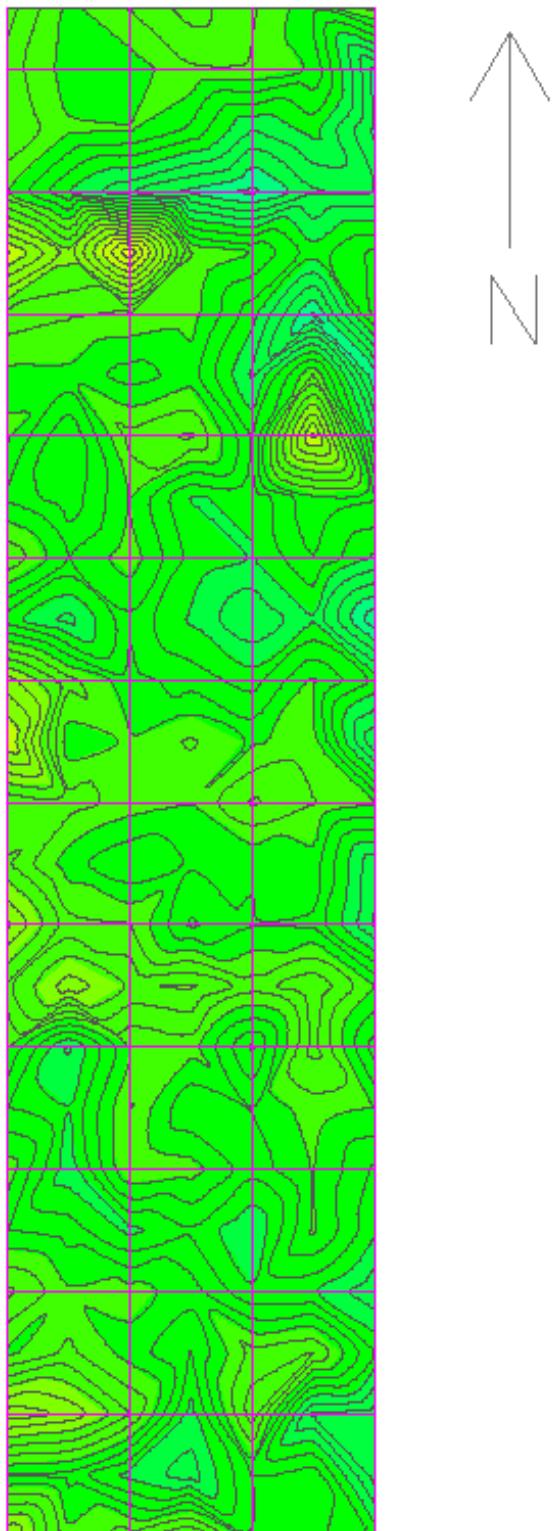


Figure E.6: Section A – 5/9/2012

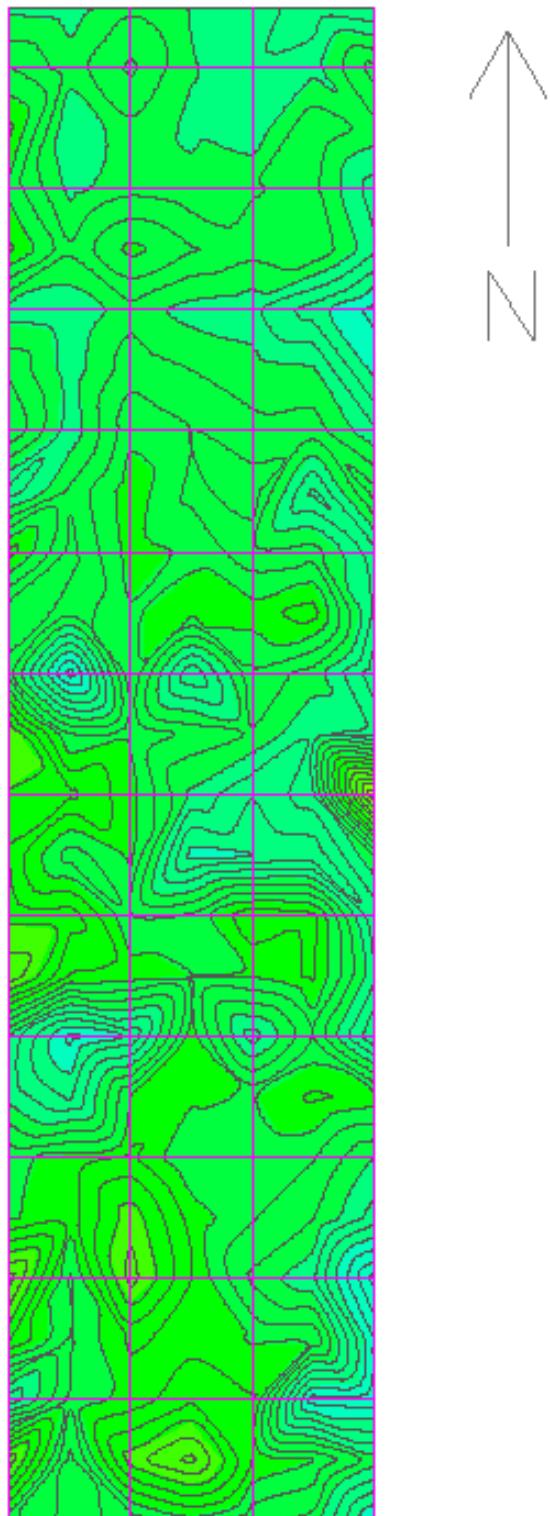


Figure E.7: Section B – 8/25/2011

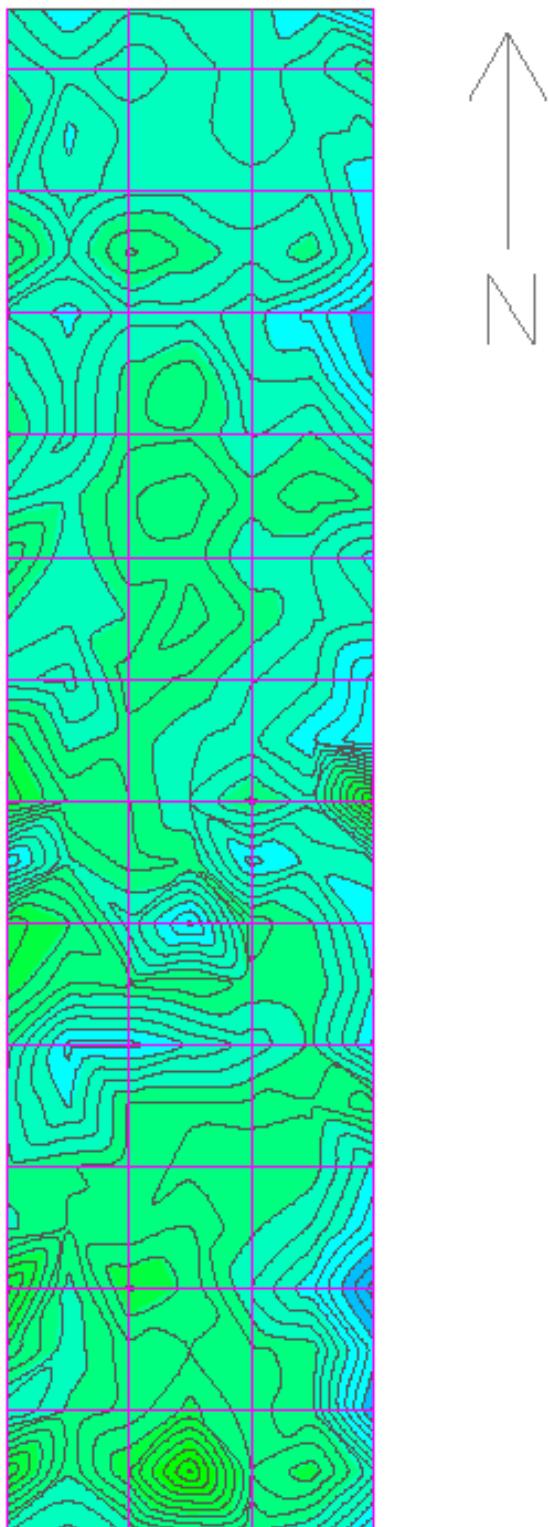


Figure E.8: Section B – 10/6/2011

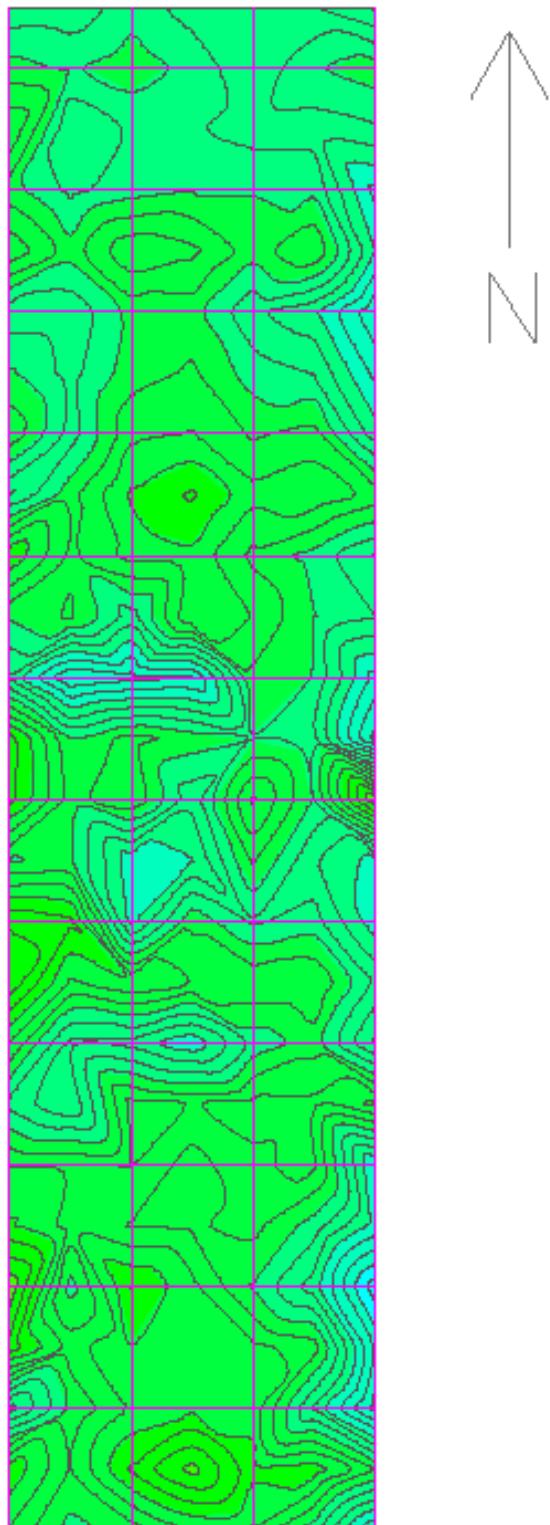


Figure E.9: Section B – 10/27/2012

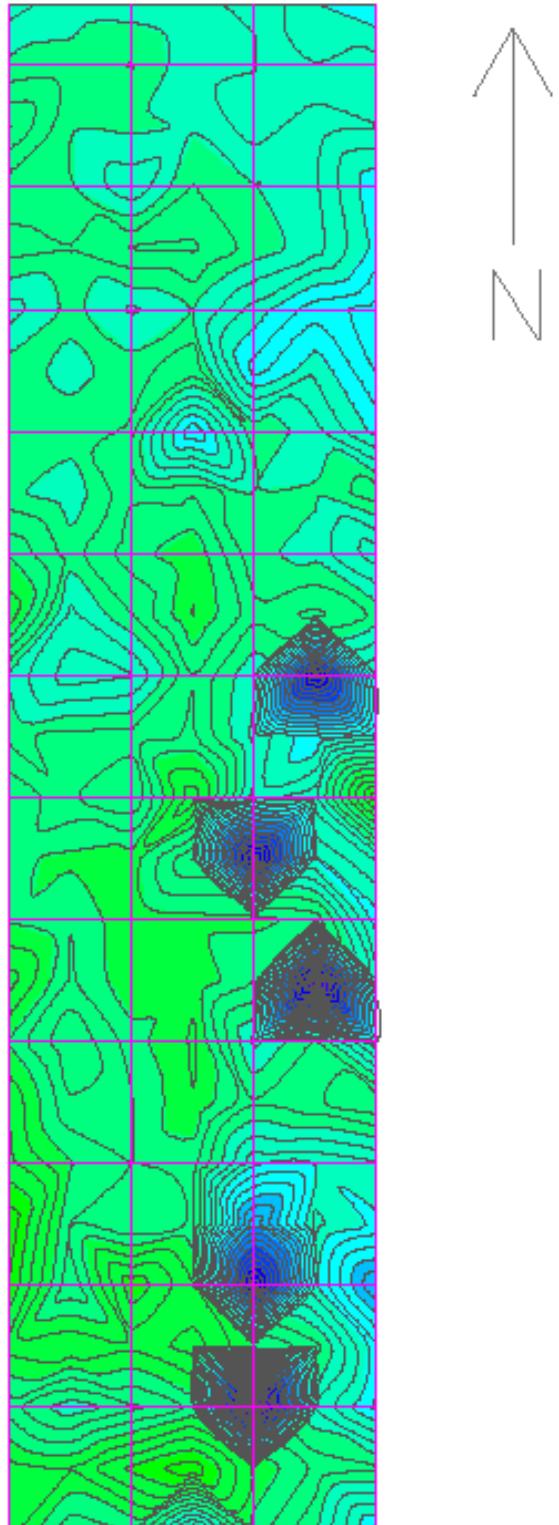


Figure E.10: Section B – 4/10/2012

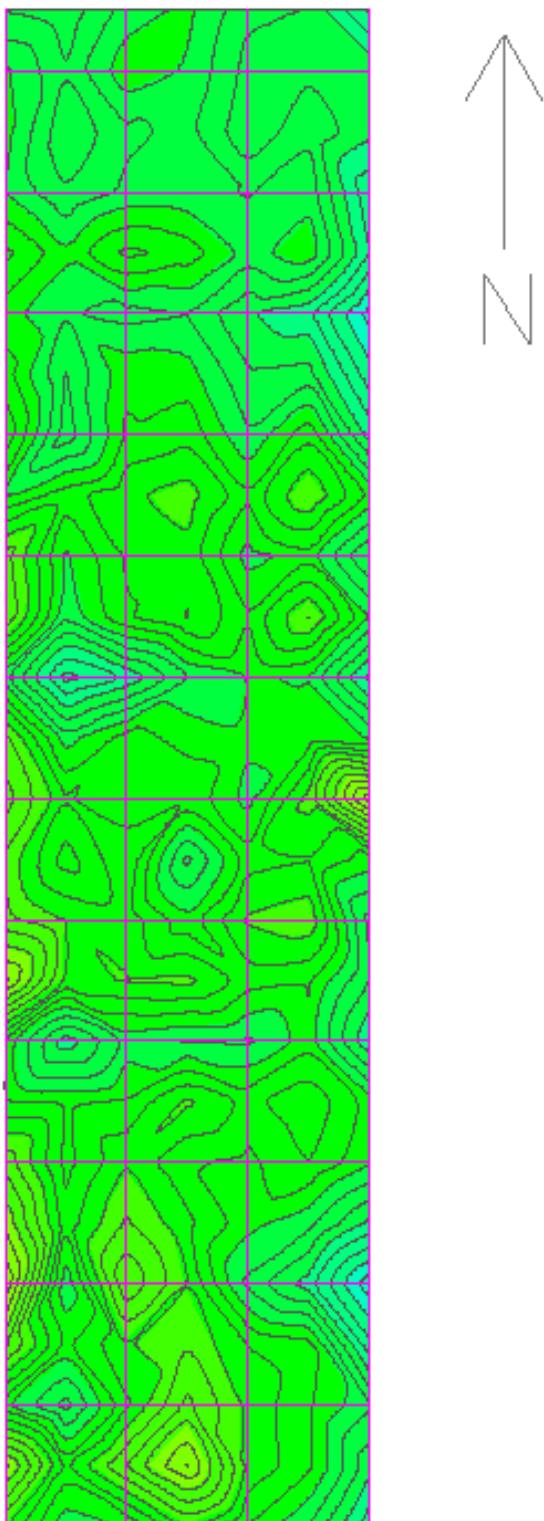


Figure E.11: Section B – 5/9/2012

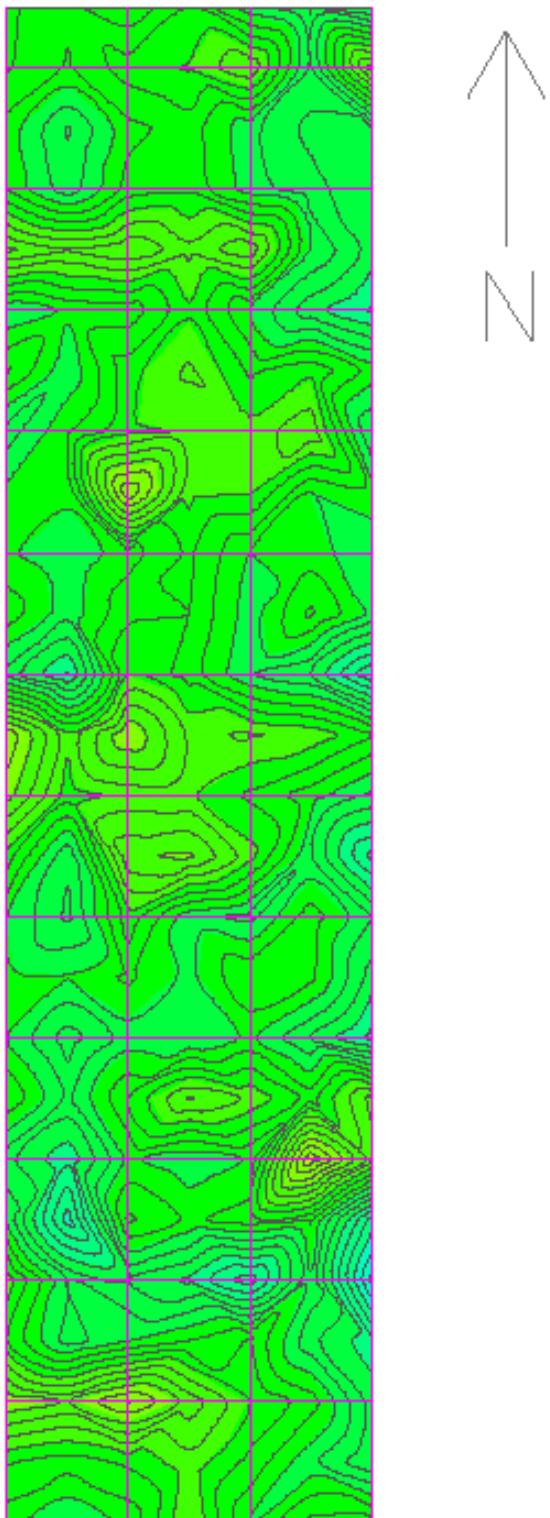


Figure E.12: Section C – 8/25/2011

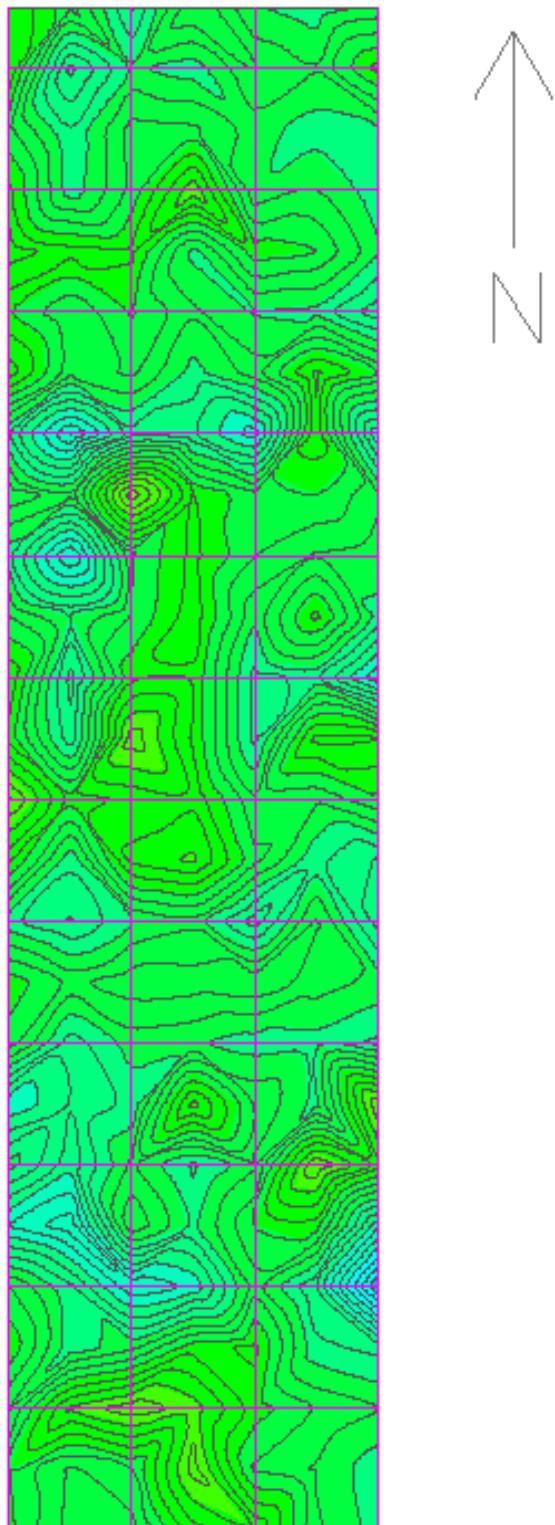


Figure E.13: Section C – 10/6/2011

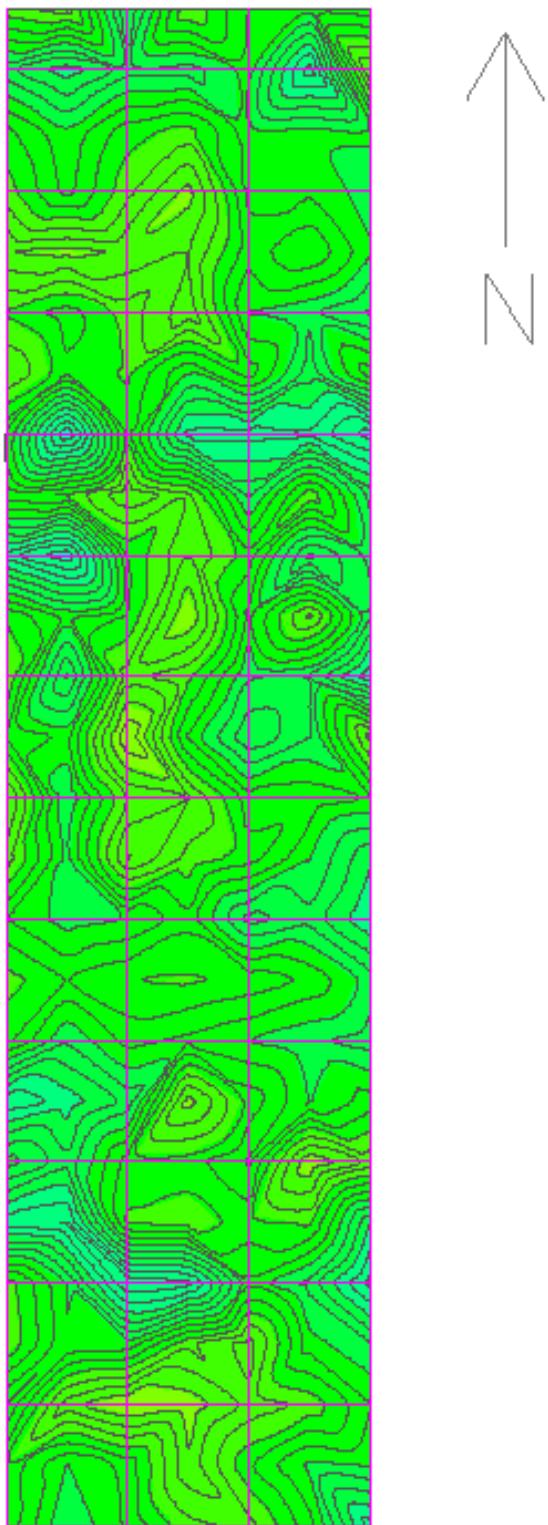


Figure E.14: Section C – 10/27/2012

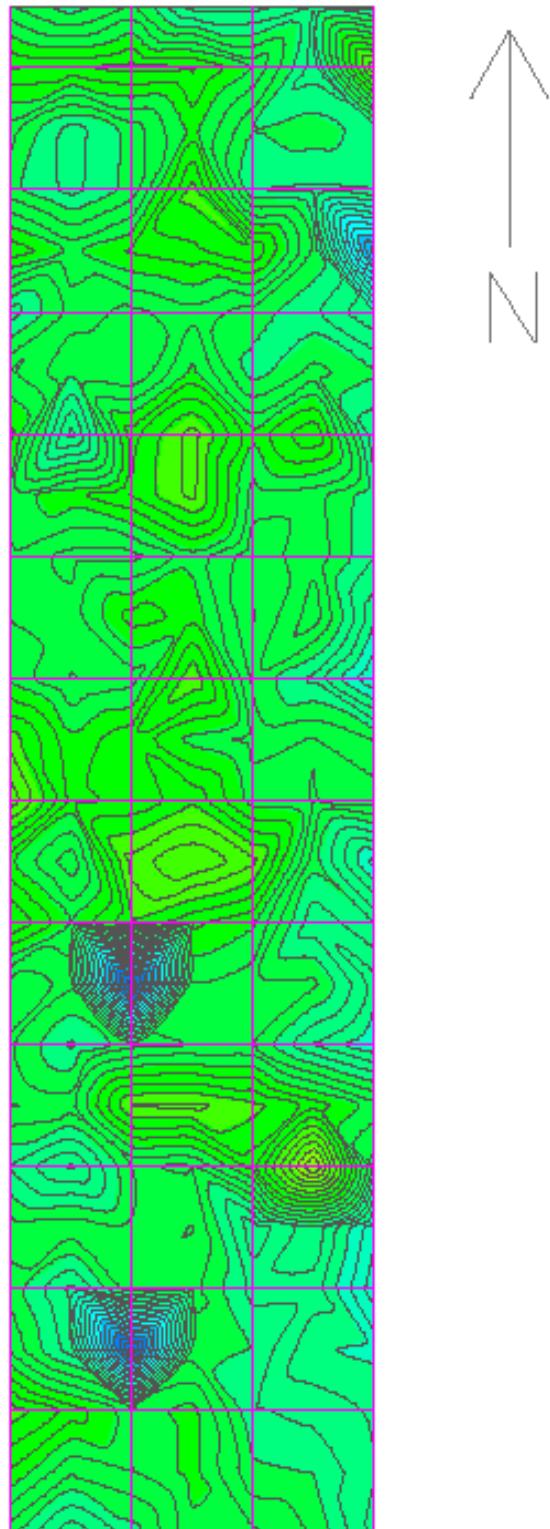


Figure E.15: Section C – 4/10/2012

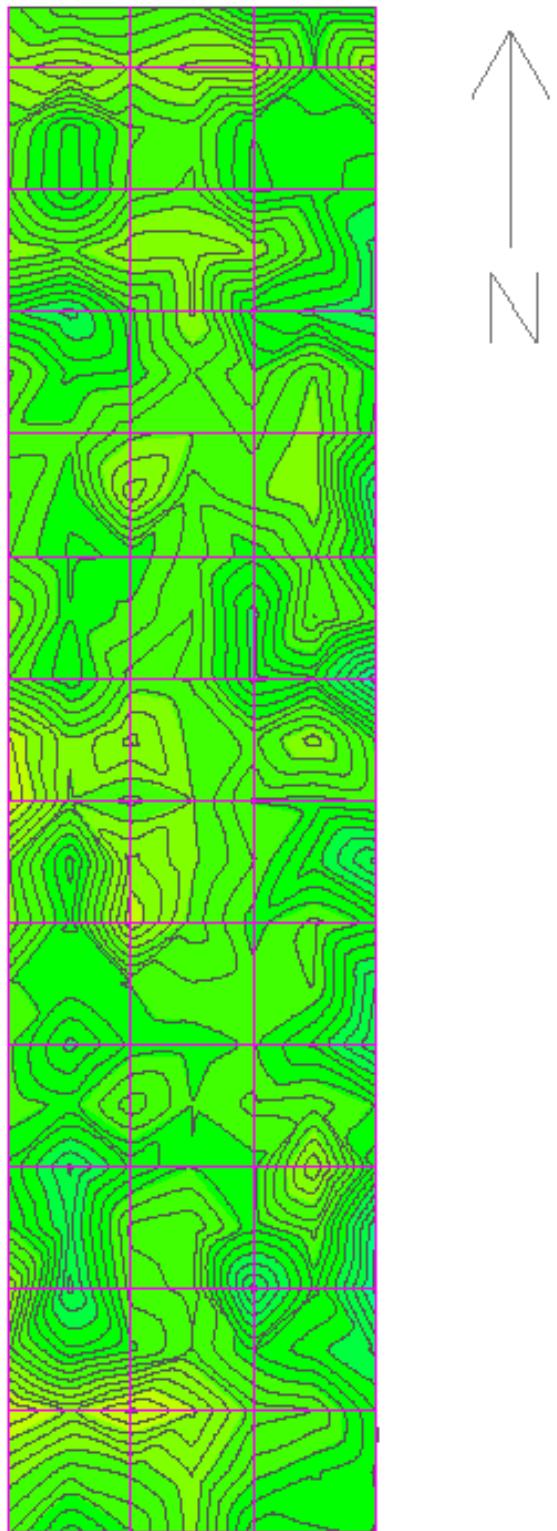


Figure E.16: Section C – 5/9/2012

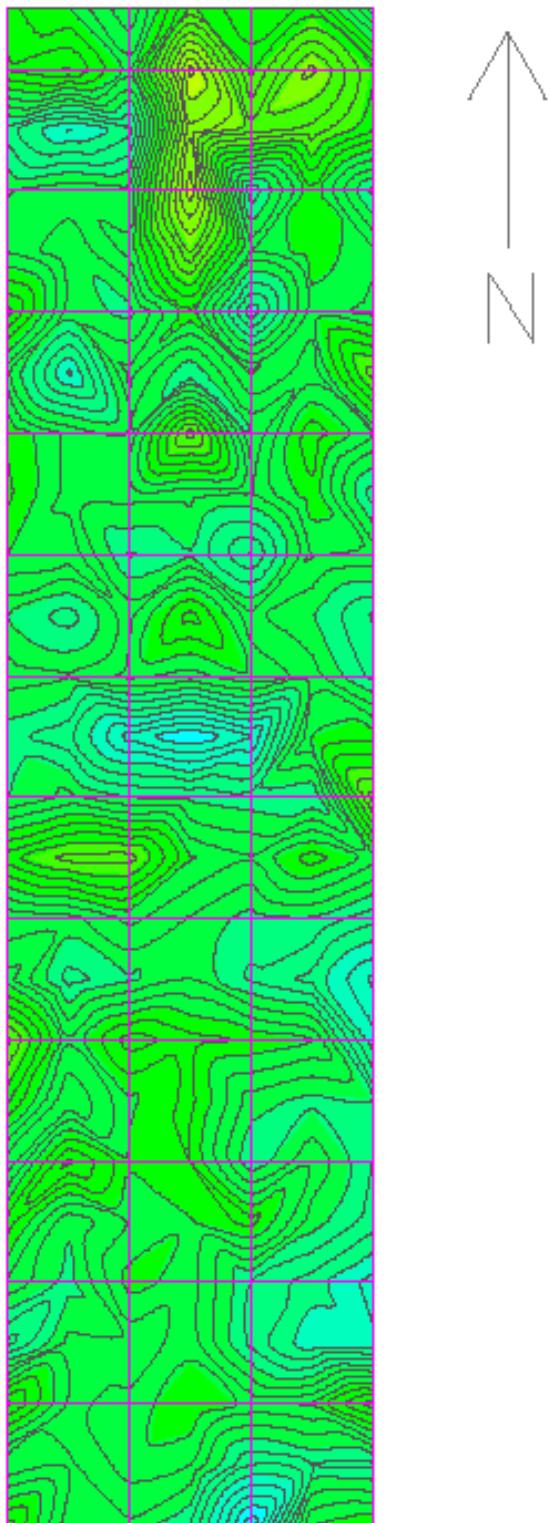


Figure E.17: Section D – 8/25/2011

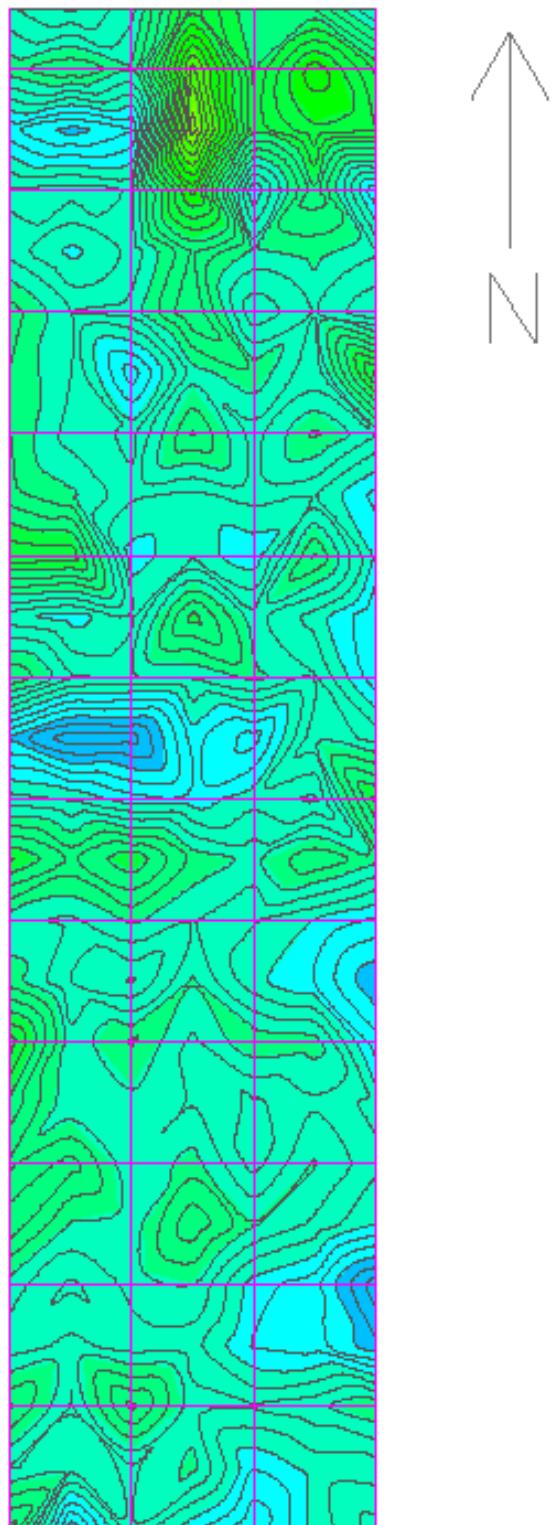


Figure E.18: Section D – 10/6/2011

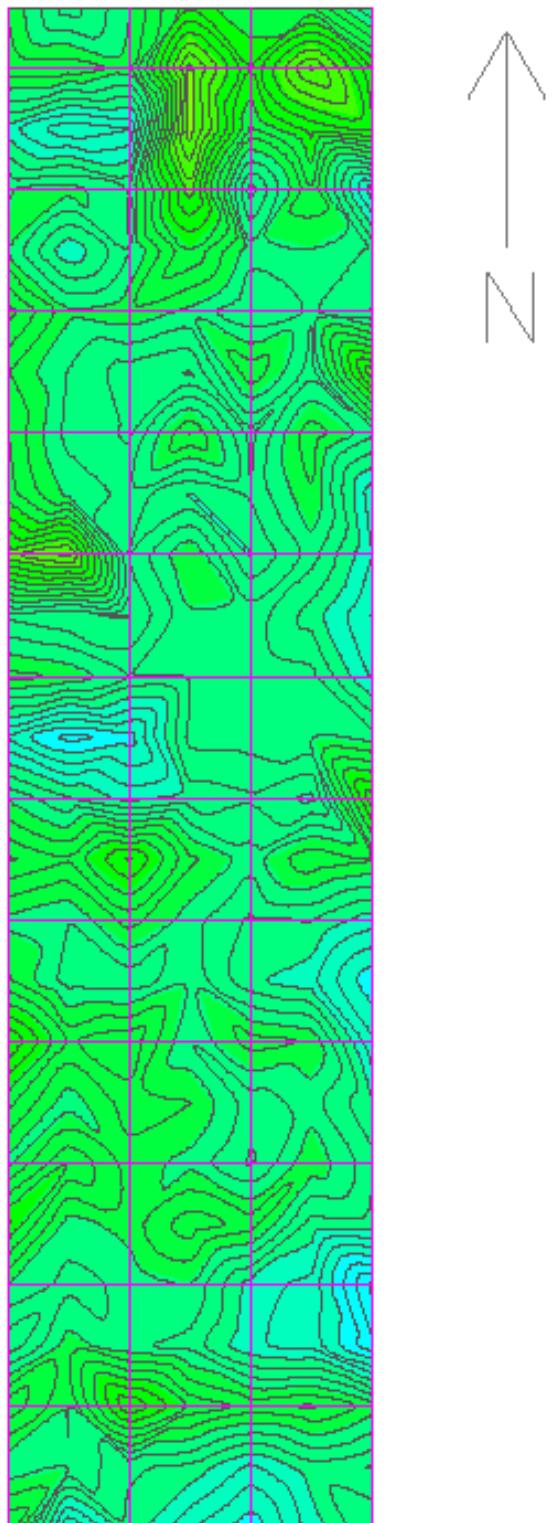


Figure E.19: Section D – 10/27/2012

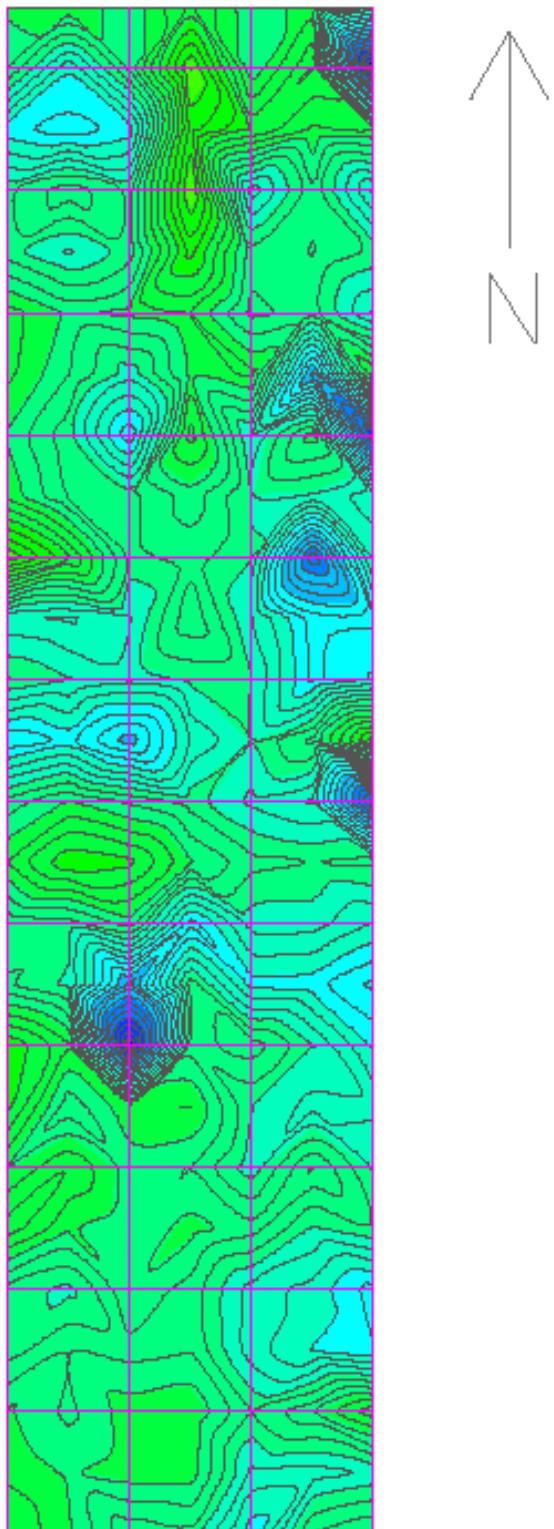


Figure E.20: Section D – 4/10/2012

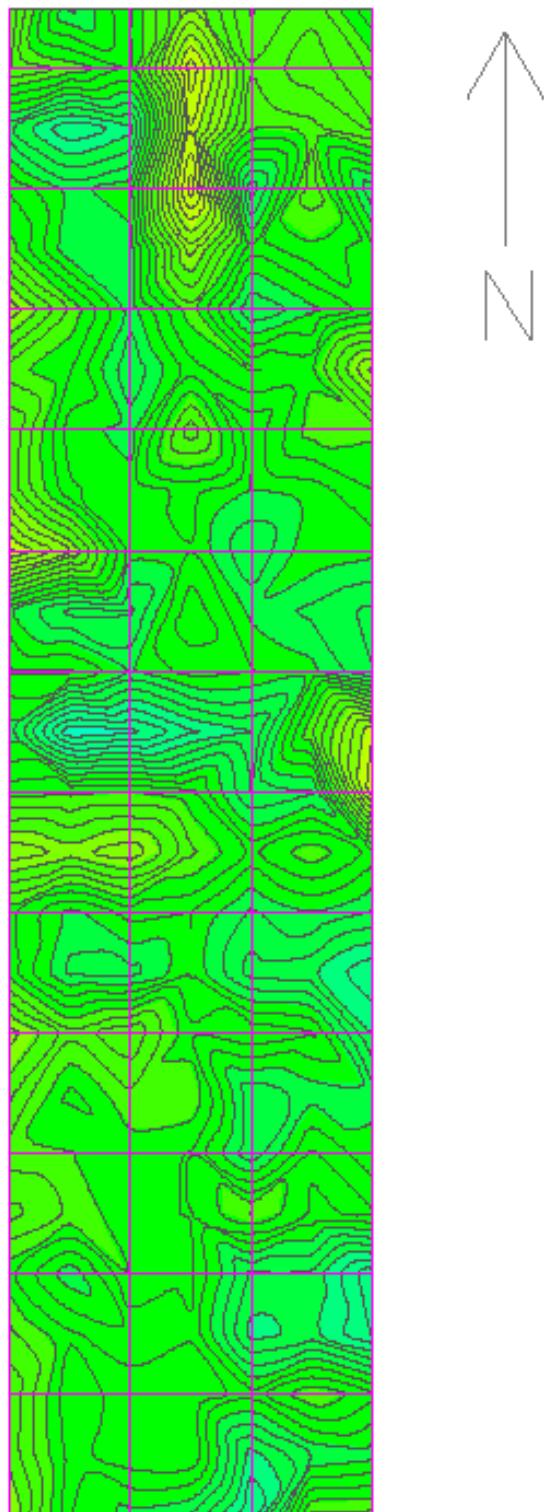


Figure E.21: Section D – 5/9/2012

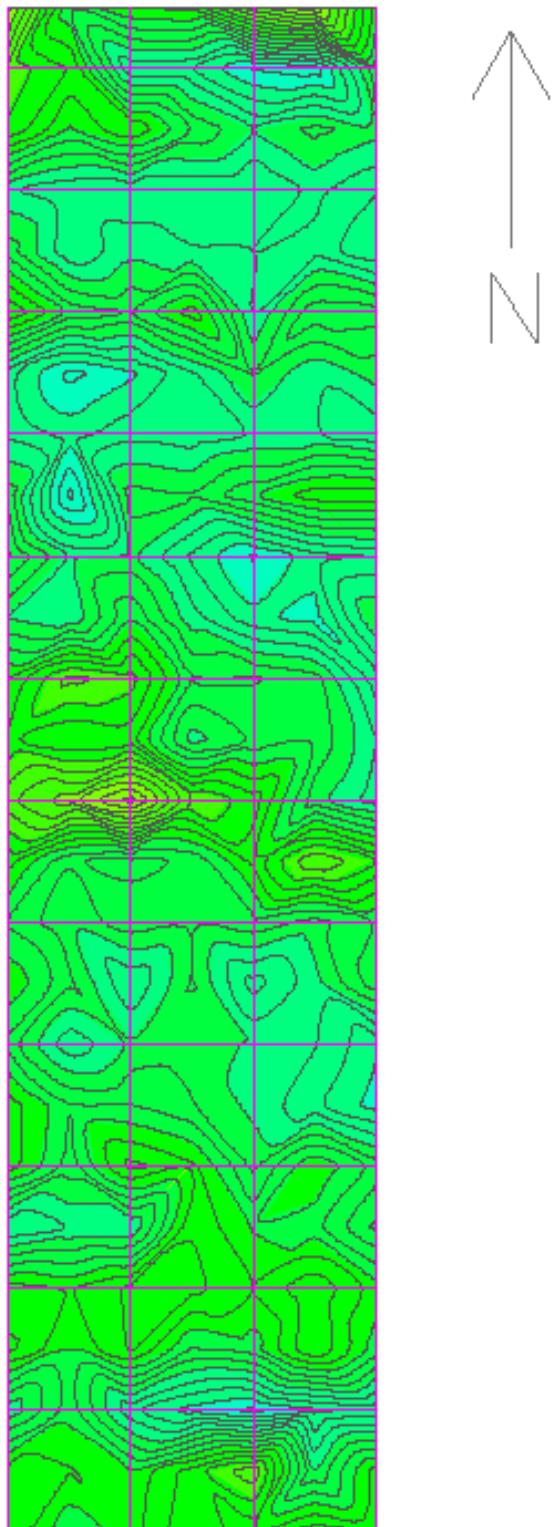


Figure E.22: Section E – 8/25/2011

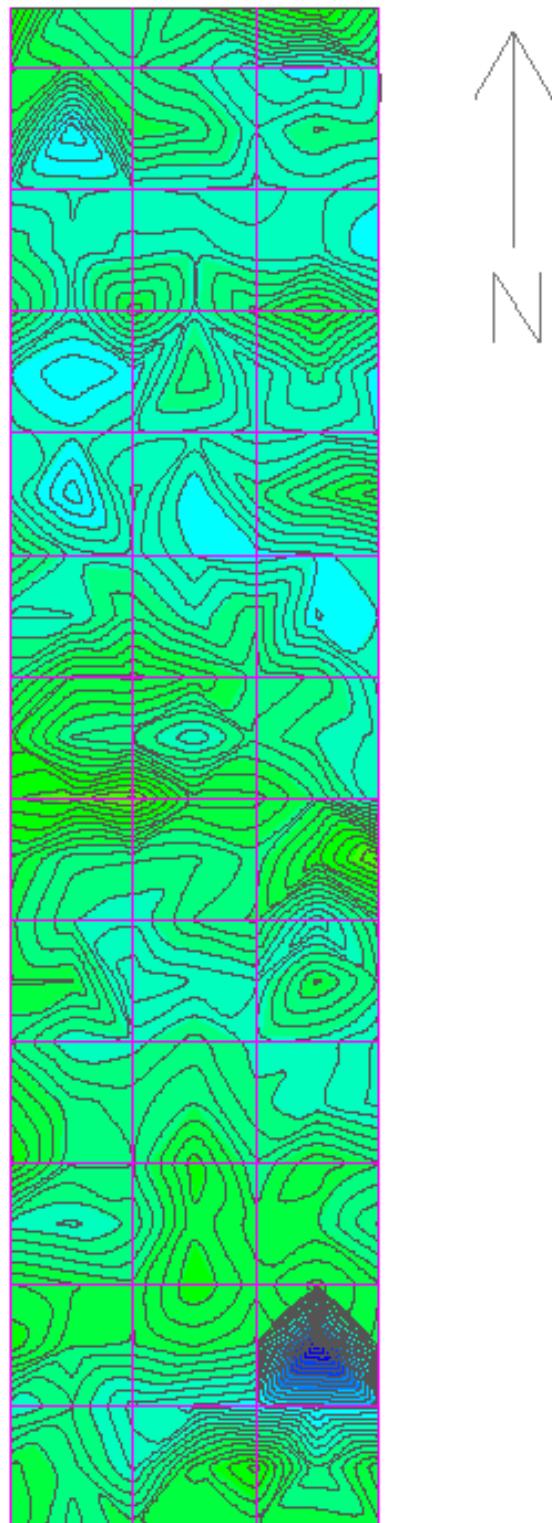


Figure E.23: Section E – 10/6/2011

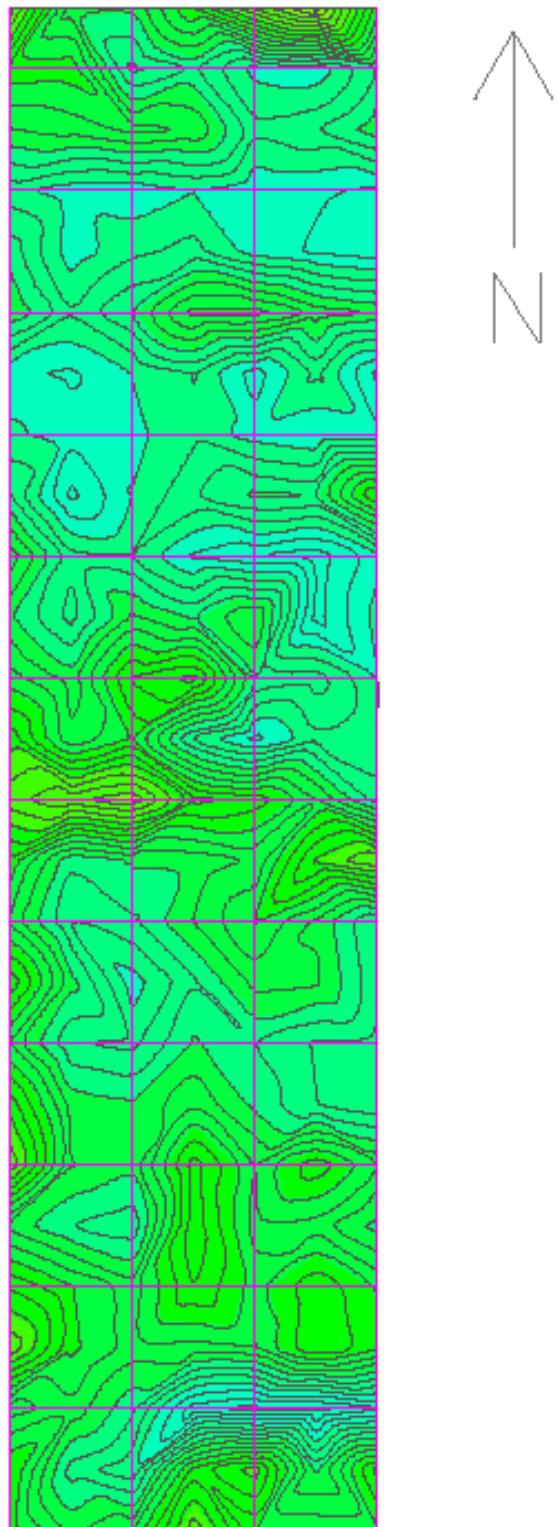


Figure E.24: Section E – 10/27/2011

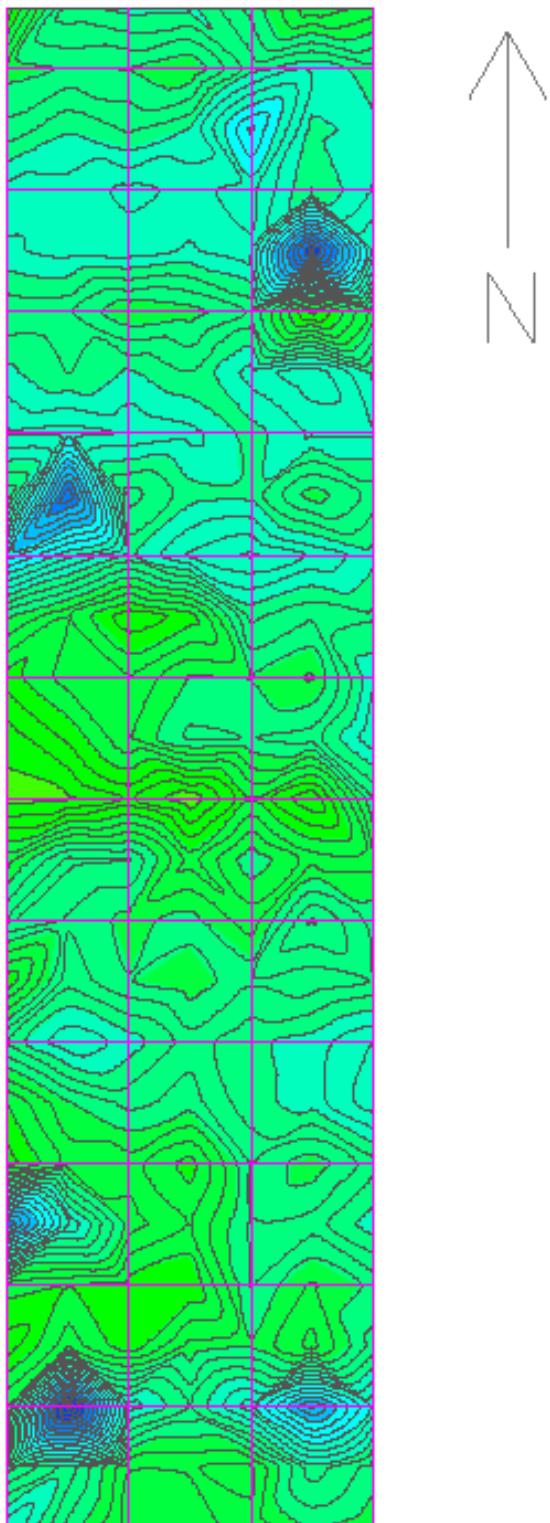


Figure E.25: Section E – 4/10/2012

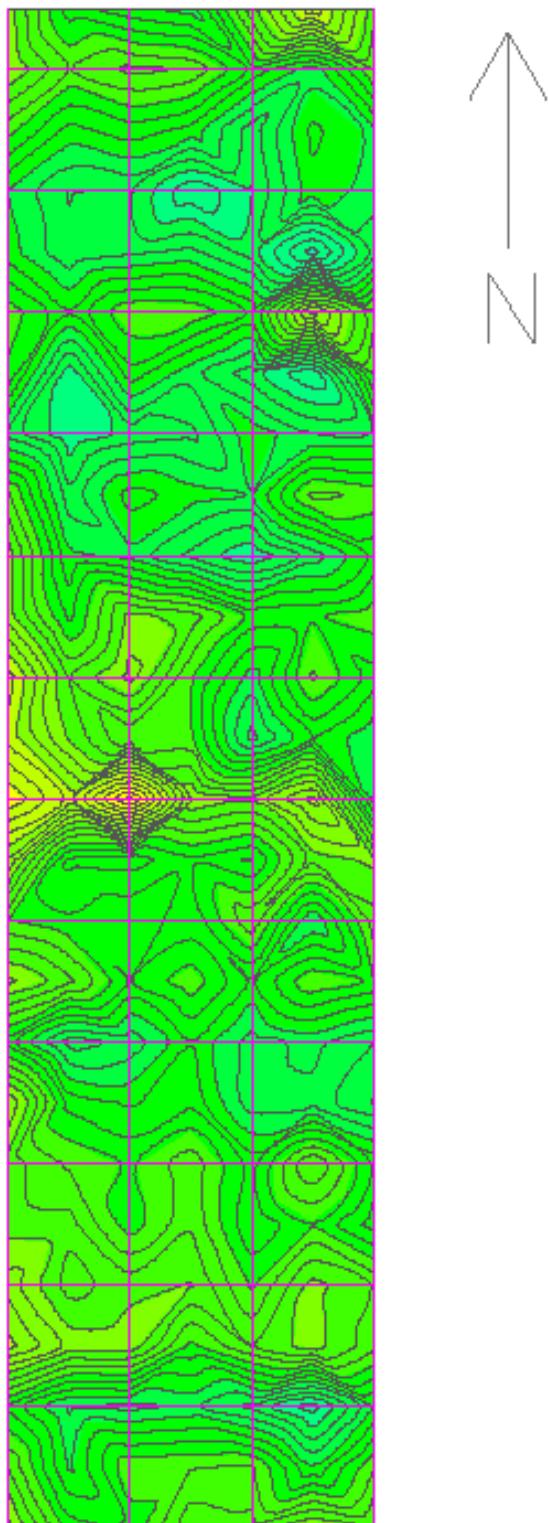


Figure E.26: Section E – 5/9/2012

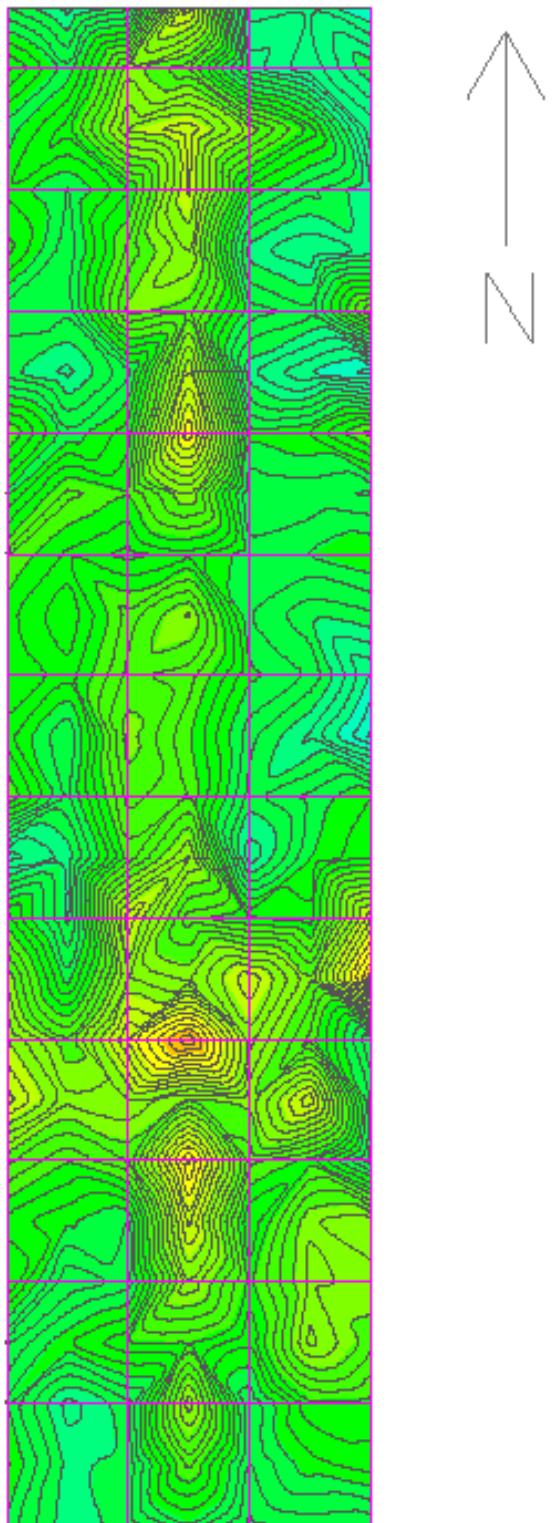


Figure E.27: Section F – 8/25/2011

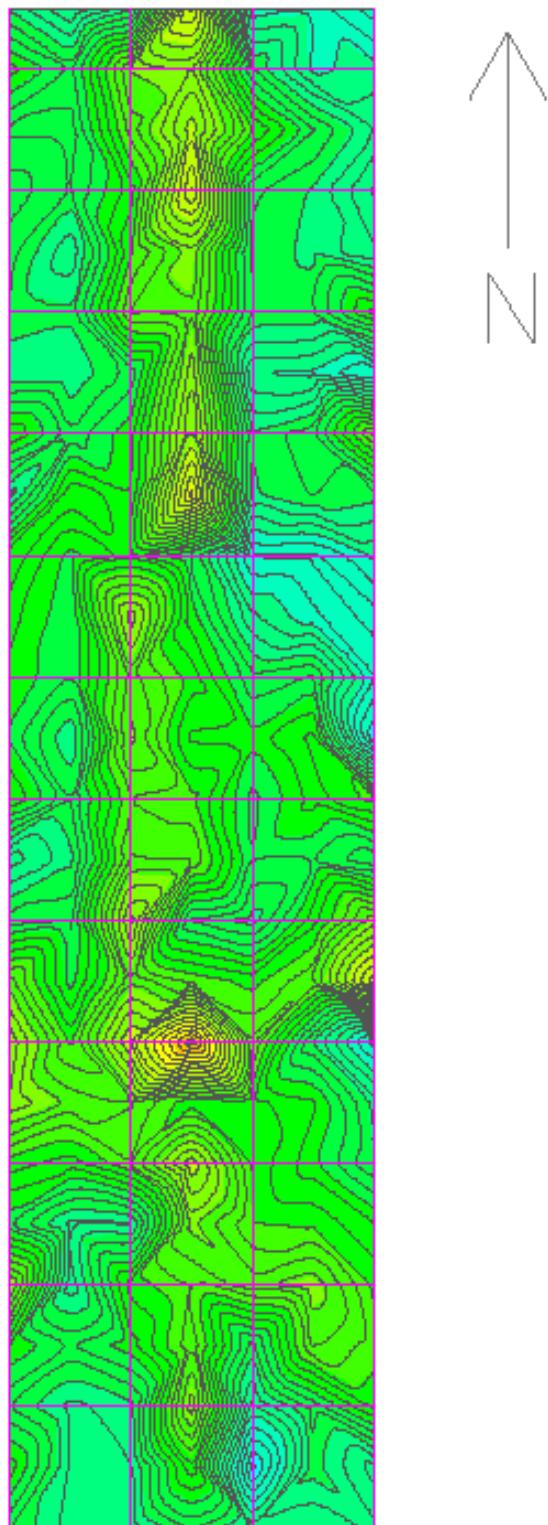


Figure E.28: Section F – 10/6/2011

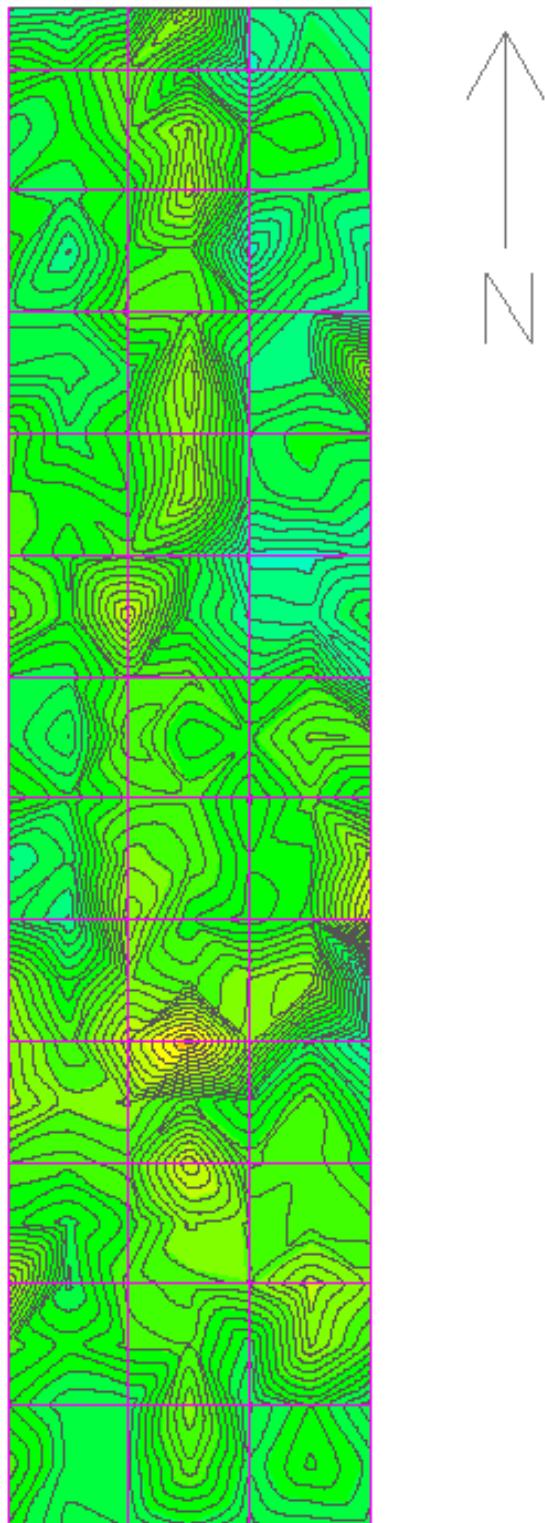


Figure E.29: Section F – 10/27/2011

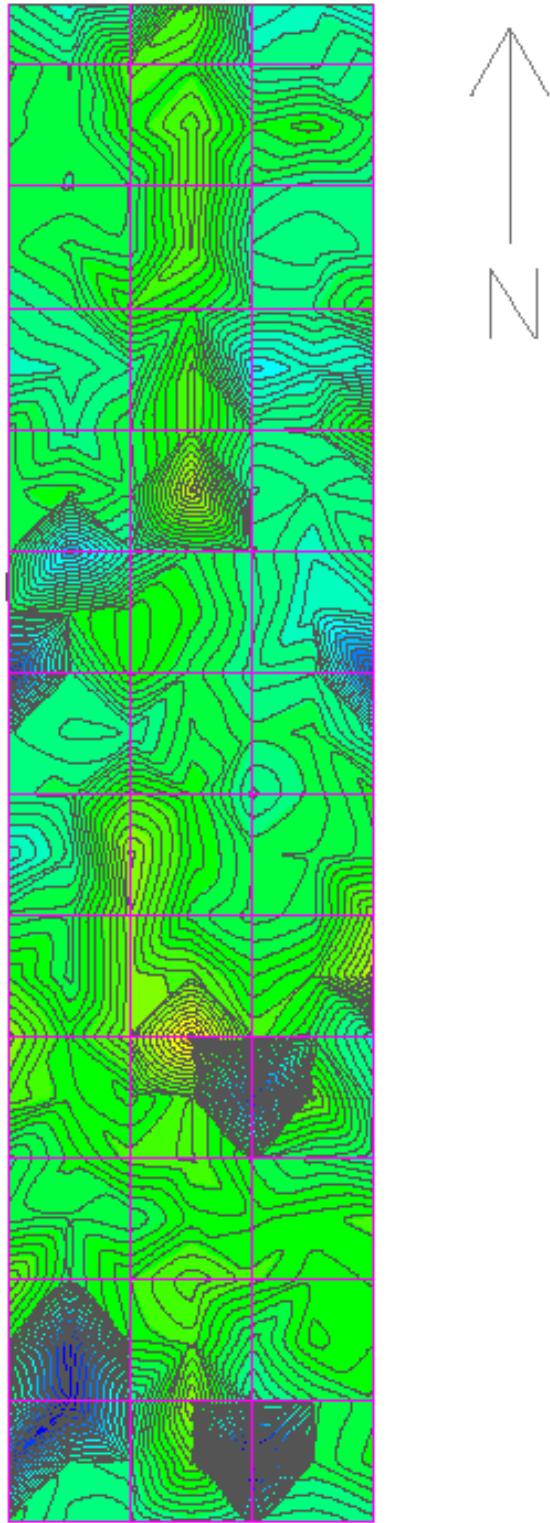


Figure E.30: Section F – 4/10/2012

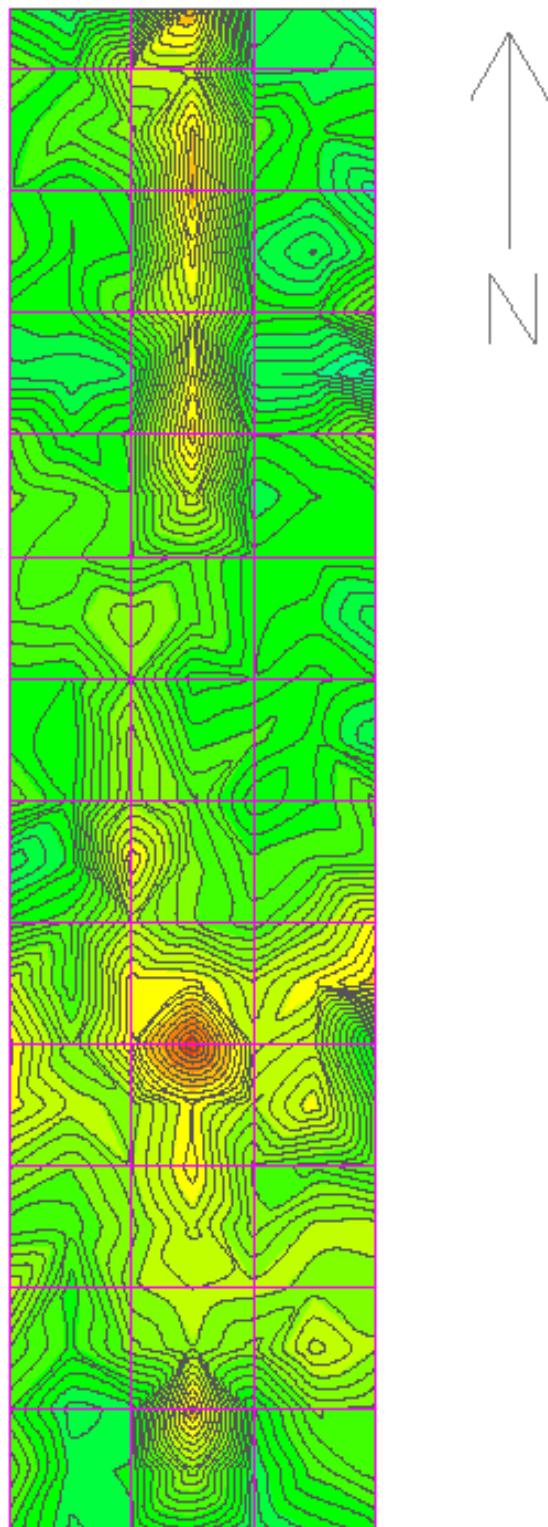


Figure E.31: Section F – 5/9/2012

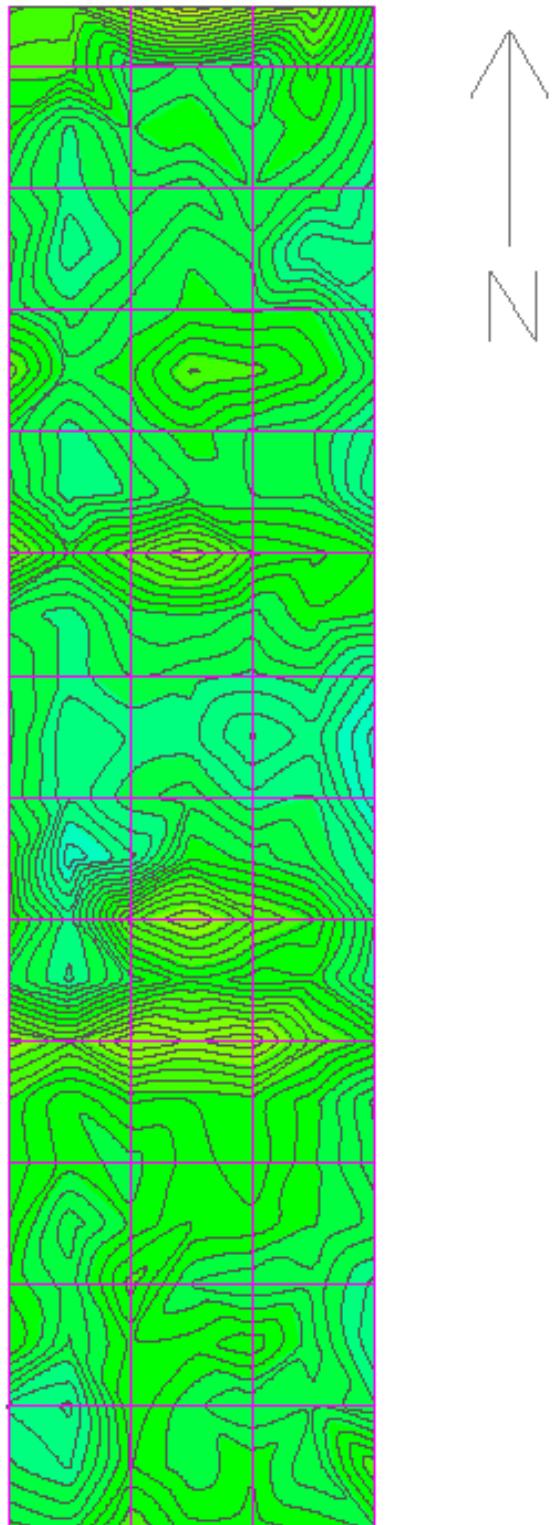


Figure E.32: Section G – 8/25/2011

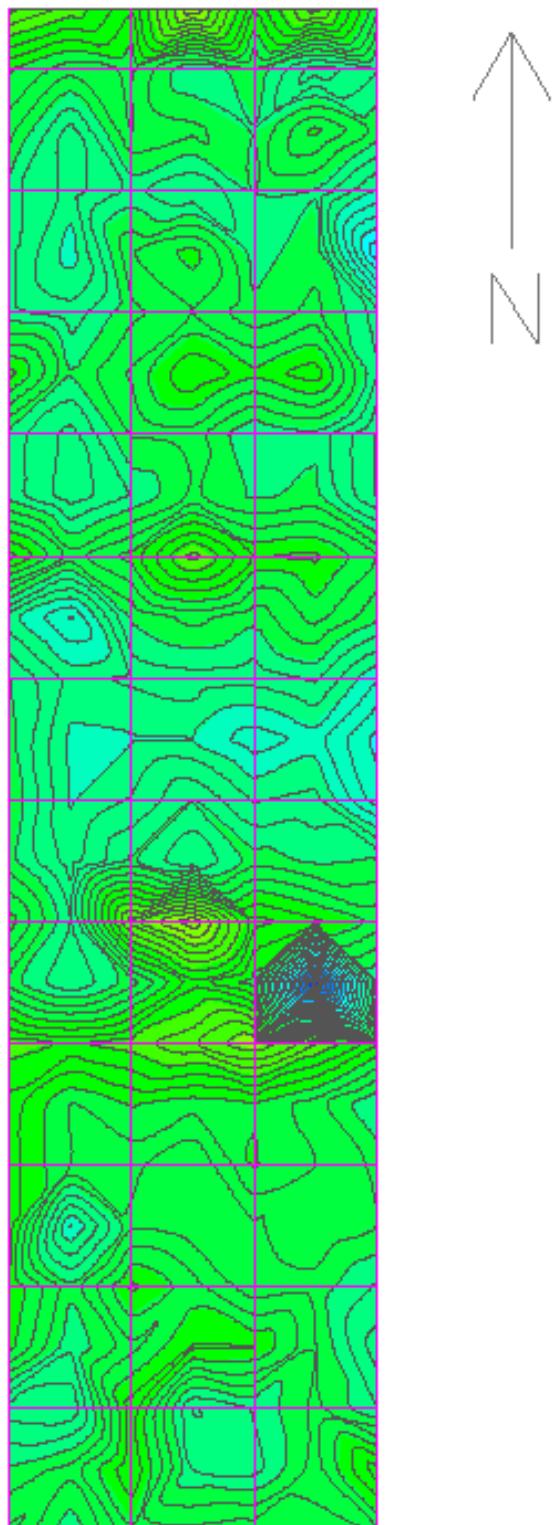


Figure E.33: Section G – 10/6/2011

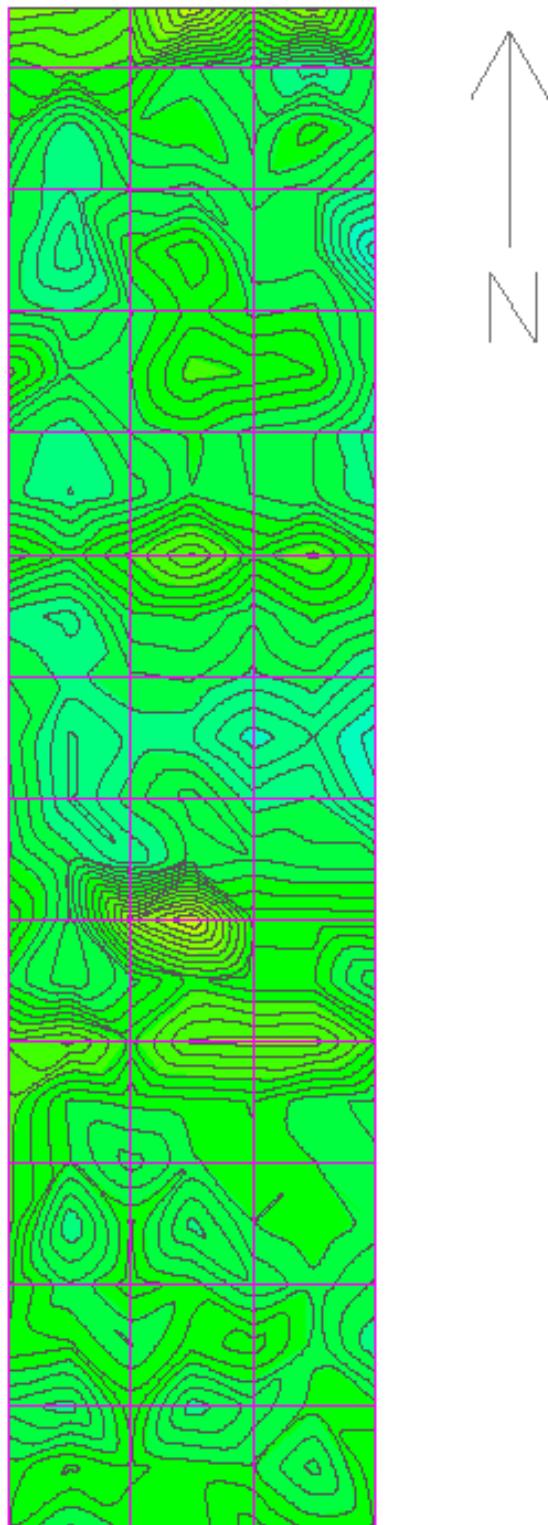


Figure E.34: Section G – 10/27/2011

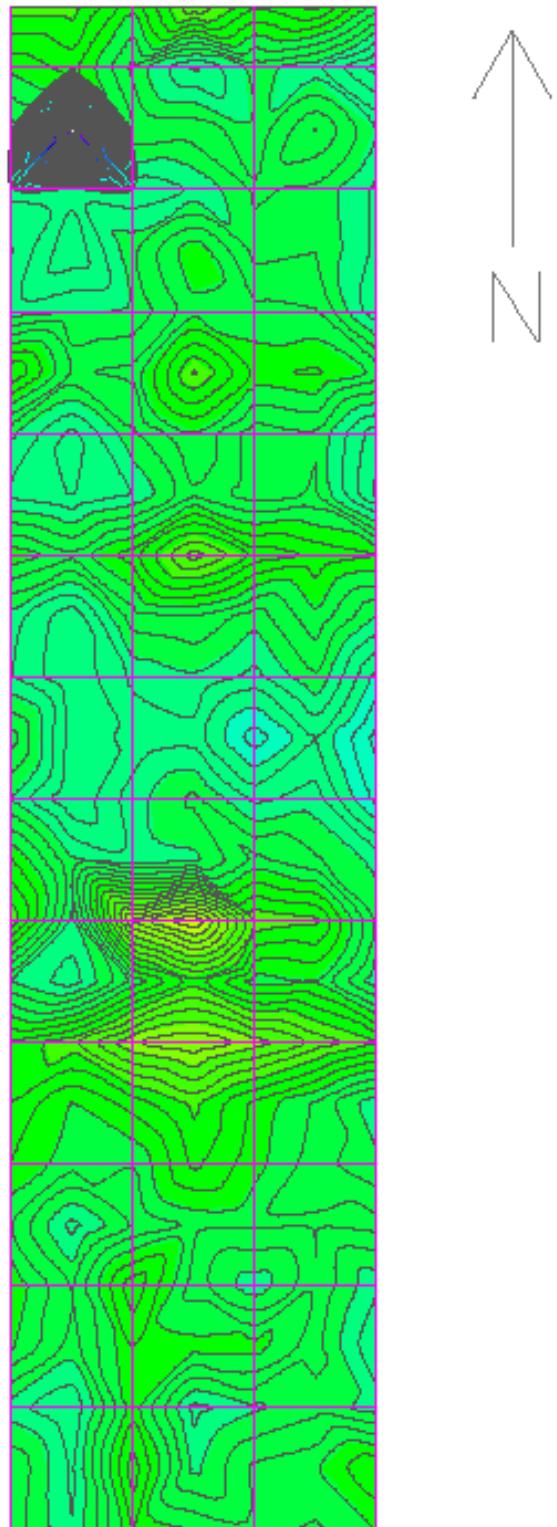


Figure E.35: Section G – 4/10/2012

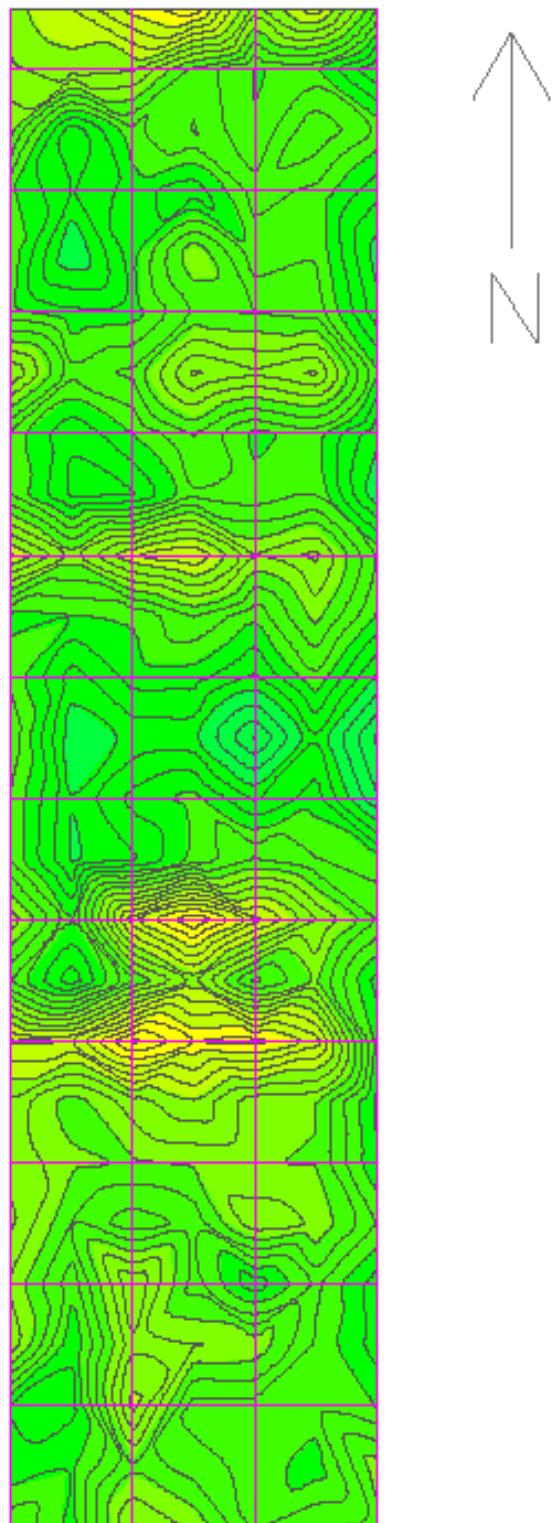


Figure E.36: Section G – 5/9/2012

Minimum Elevation	Maximum Elevation	Color
-150.00	-120.00	Red
-120.00	-90.00	Orange Red
-90.00	-60.00	Orange
-60.00	-30.00	Yellow Orange
-30.00	0.00	Yellow
0.00	30.00	Light Green
30.00	60.00	Green
60.00	90.00	Dark Green
90.00	120.00	Cyan
120.00	150.00	Blue Cyan
150.00	180.00	Blue
180.00	210.00	Dark Blue
210.00	240.00	Purple
240.00	270.00	Dark Purple

Figure E.37: Legend for the difference in half-cell potential contour maps

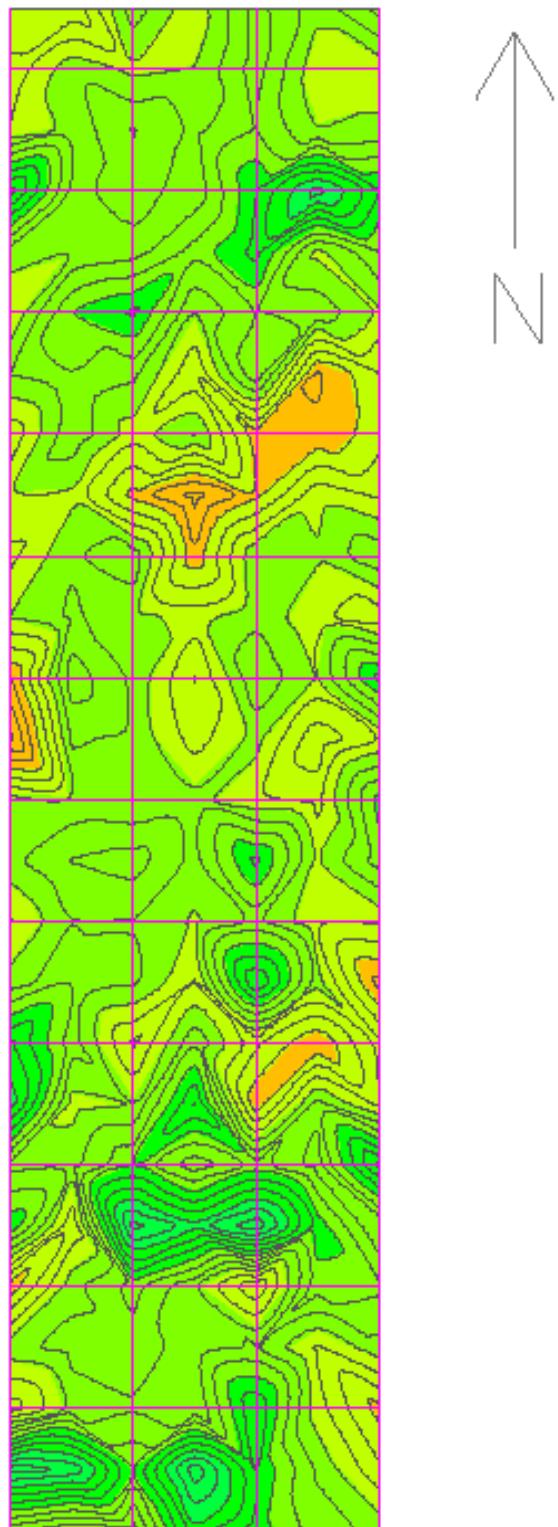


Figure E.38: Section A – Difference between 8/25/2011 and 10/6/2011

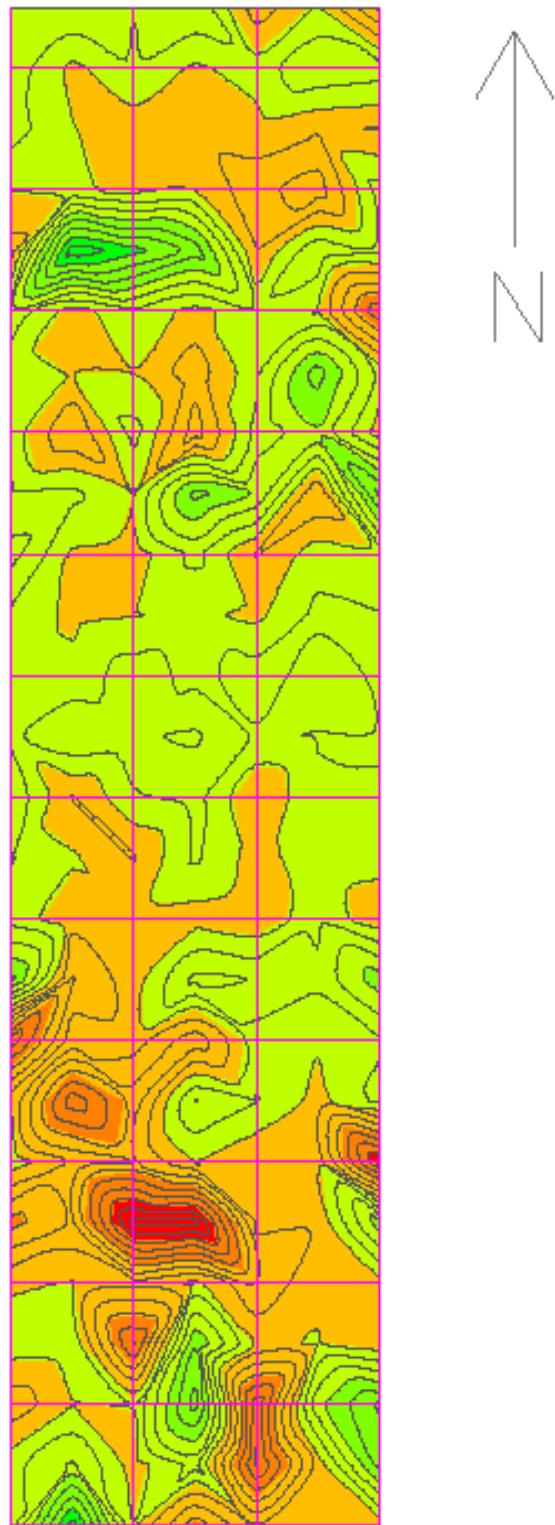


Figure E.39: Section A – Difference between 10/6/2011 and 10/27/2011

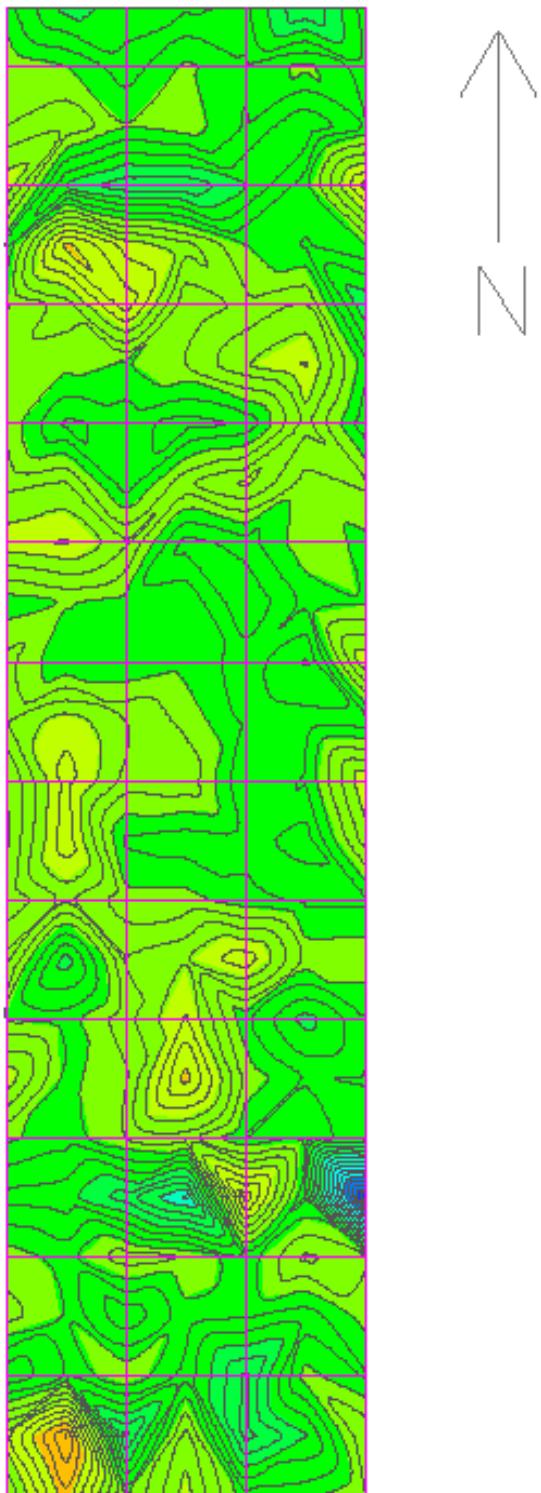


Figure E.40: Section A – Difference between 10/27/2011 and 4/10/2012

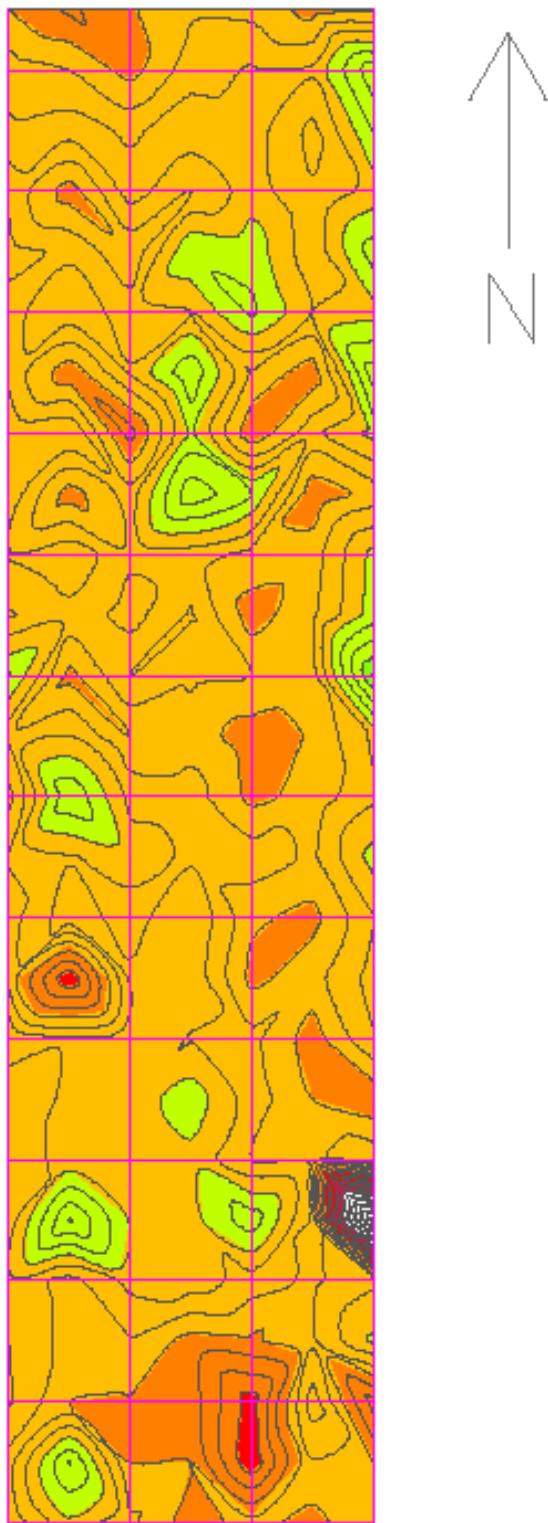


Figure E.41: Section A – Difference between 4/10/2012 and 5/9/2012

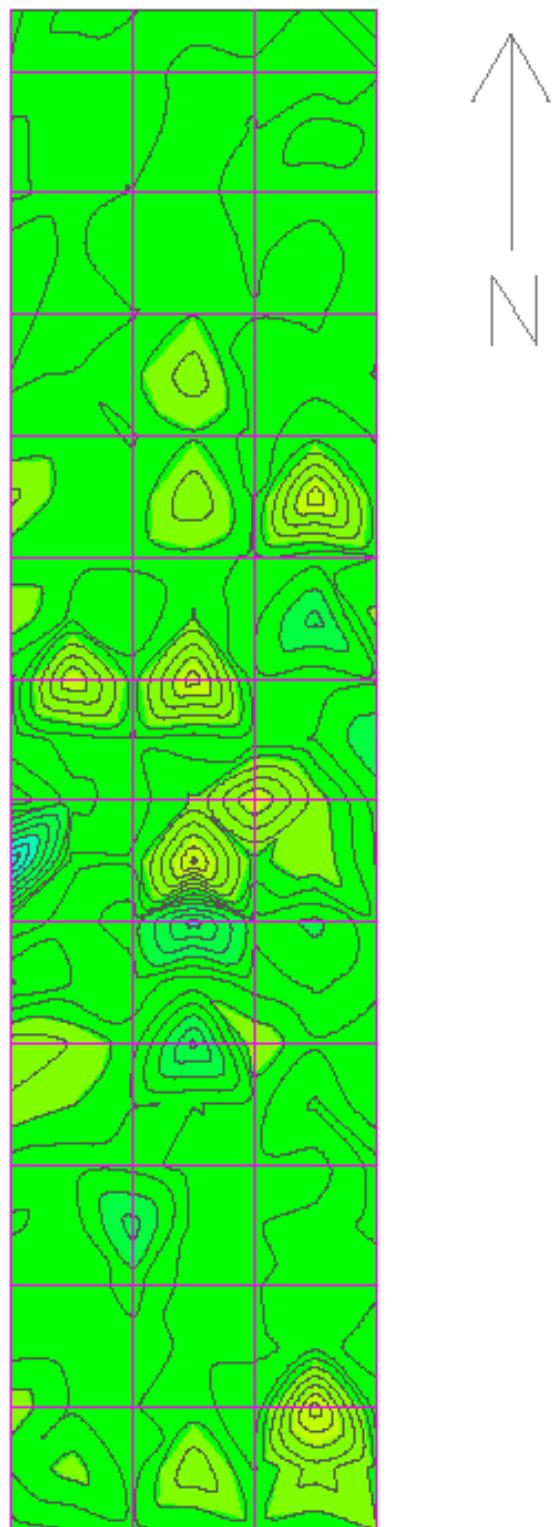


Figure E.42: Section B – Difference between 8/25/2011 and 10/6/2011

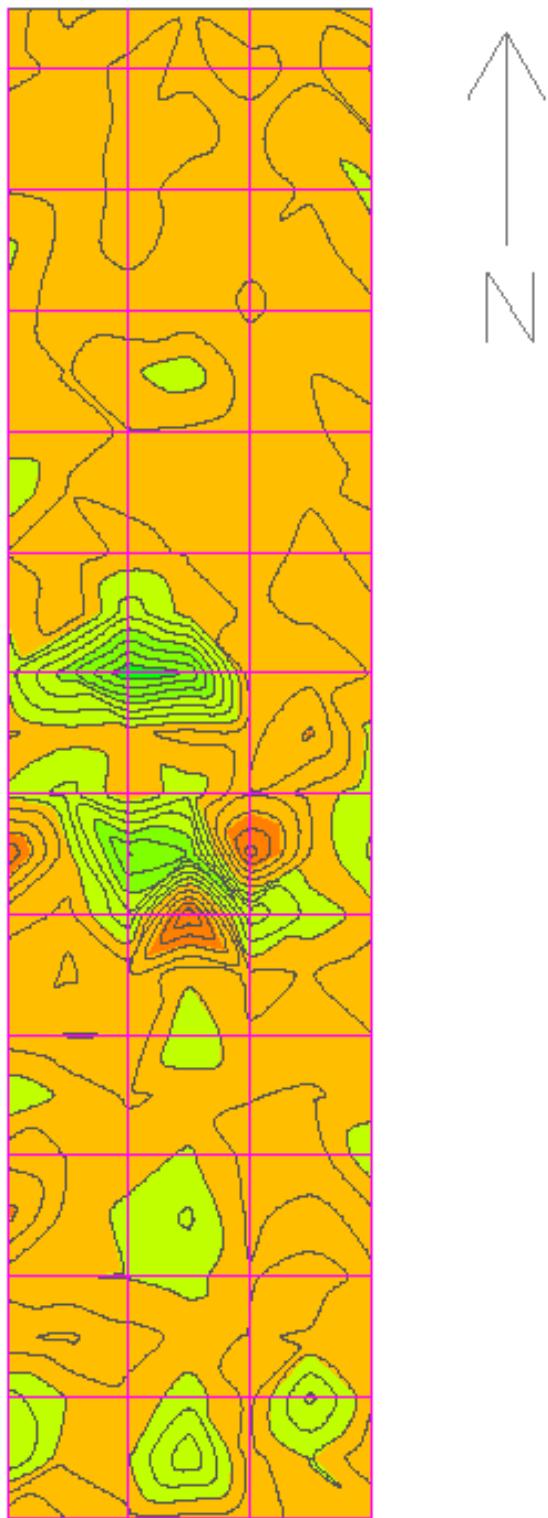


Figure E.43: Section B – Difference between 10/6/2011 and 10/27/2011

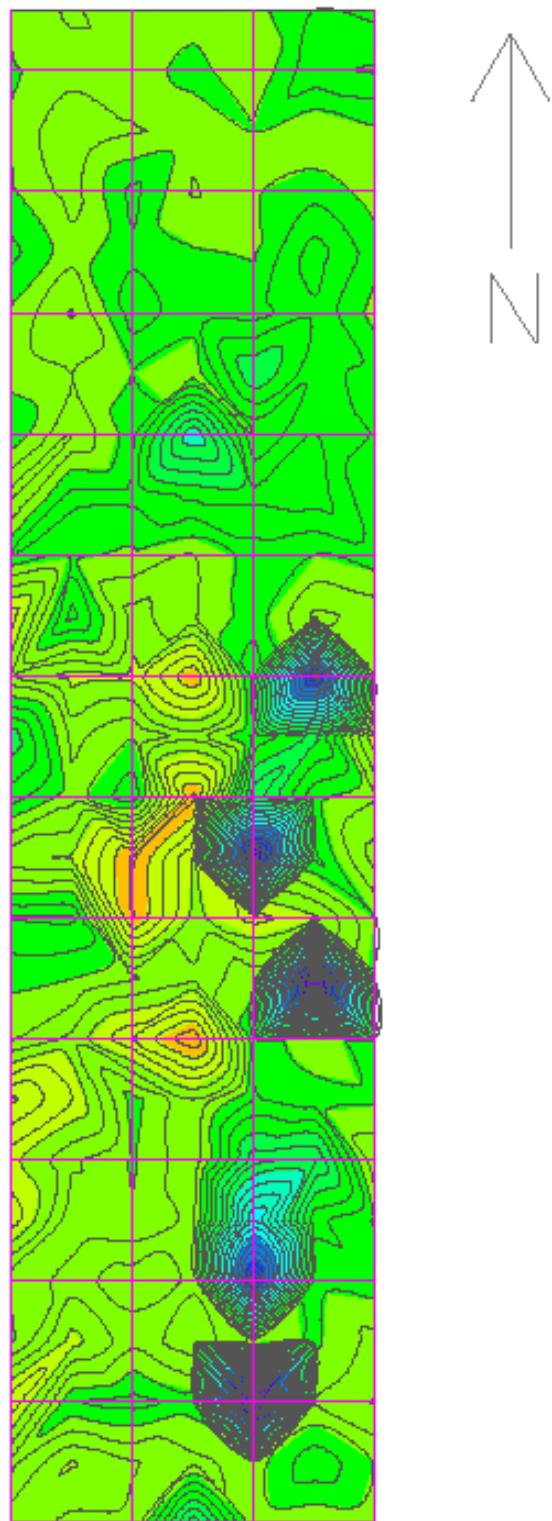


Figure E.44: Section B – Difference between 10/27/2011 and 4/10/2012

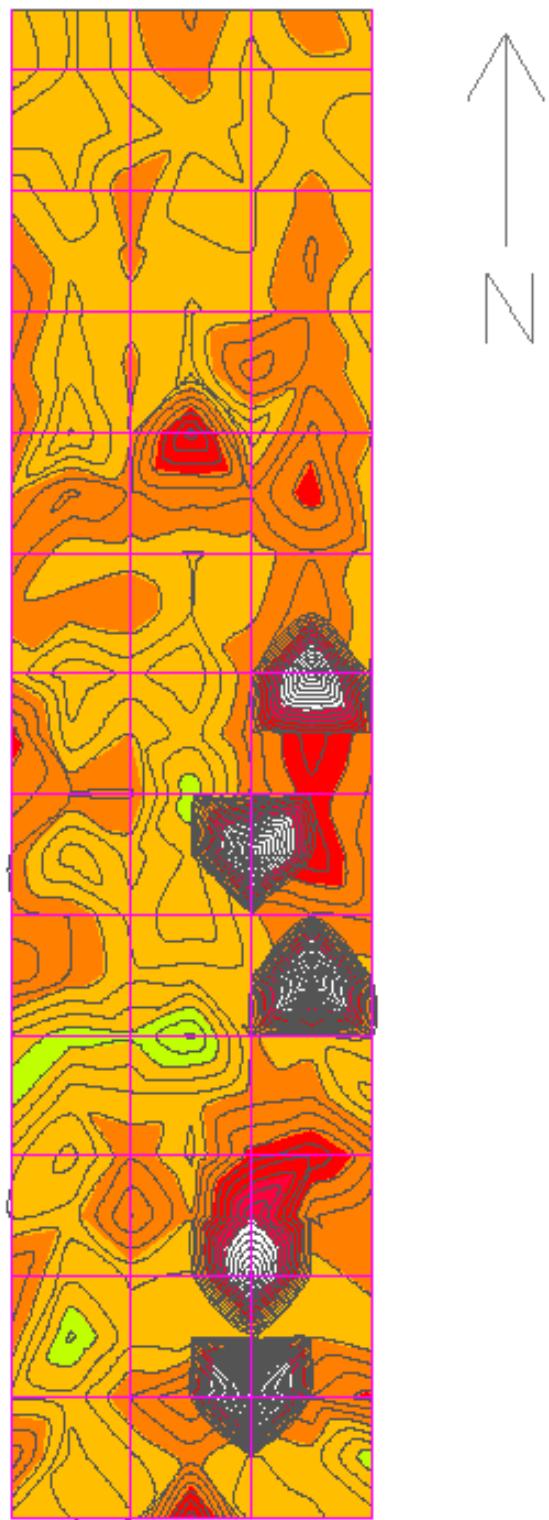


Figure E.45: Section B – Difference between 4/10/2012 and 5/9/2012

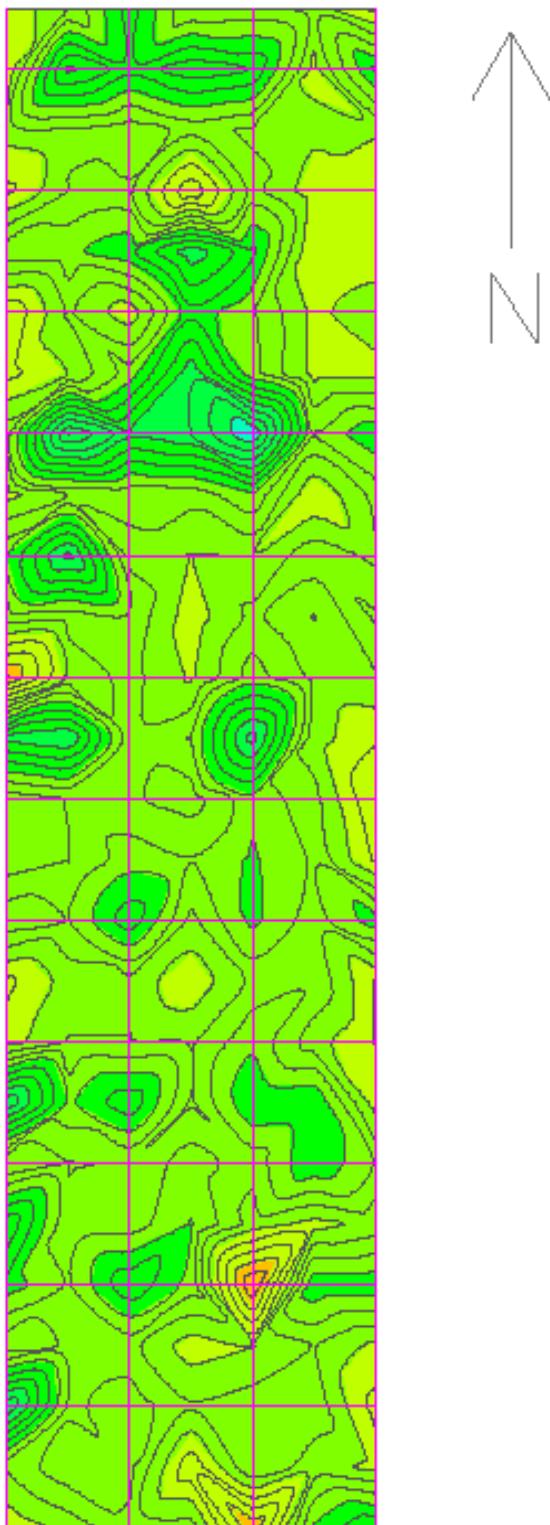


Figure E.46: Section C – Difference between 8/25/2011 and 10/6/2011

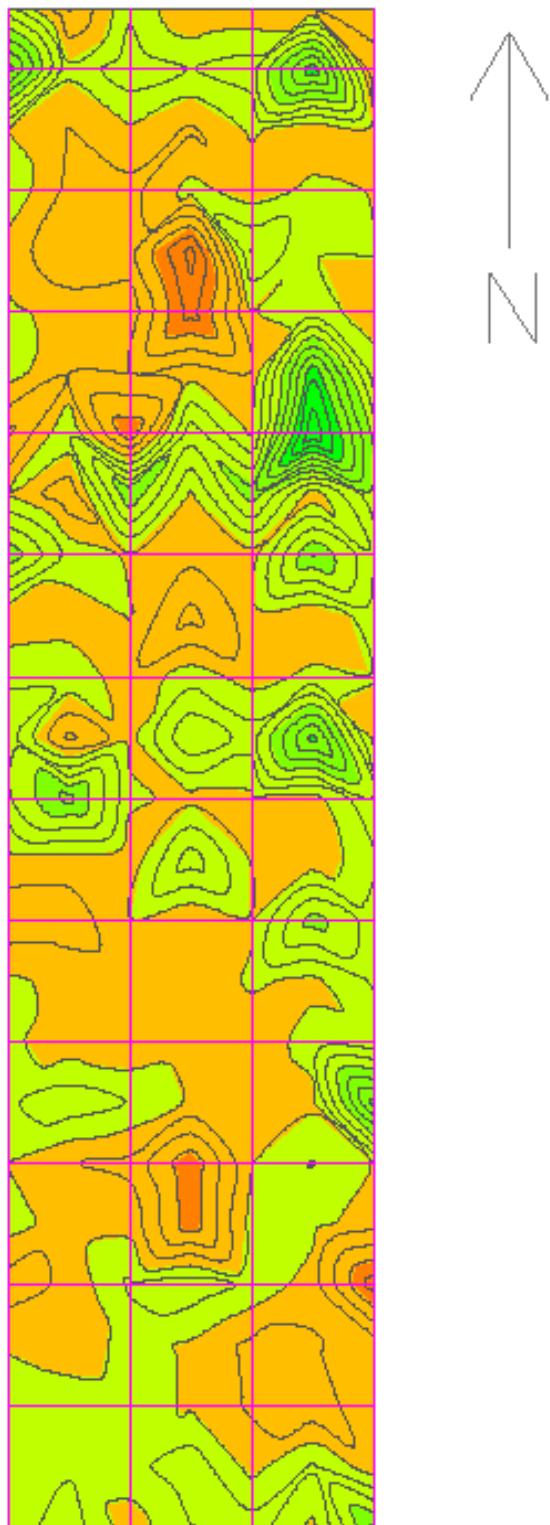


Figure E.47: Section C – Difference between 10/6/2011 and 10/27/2011

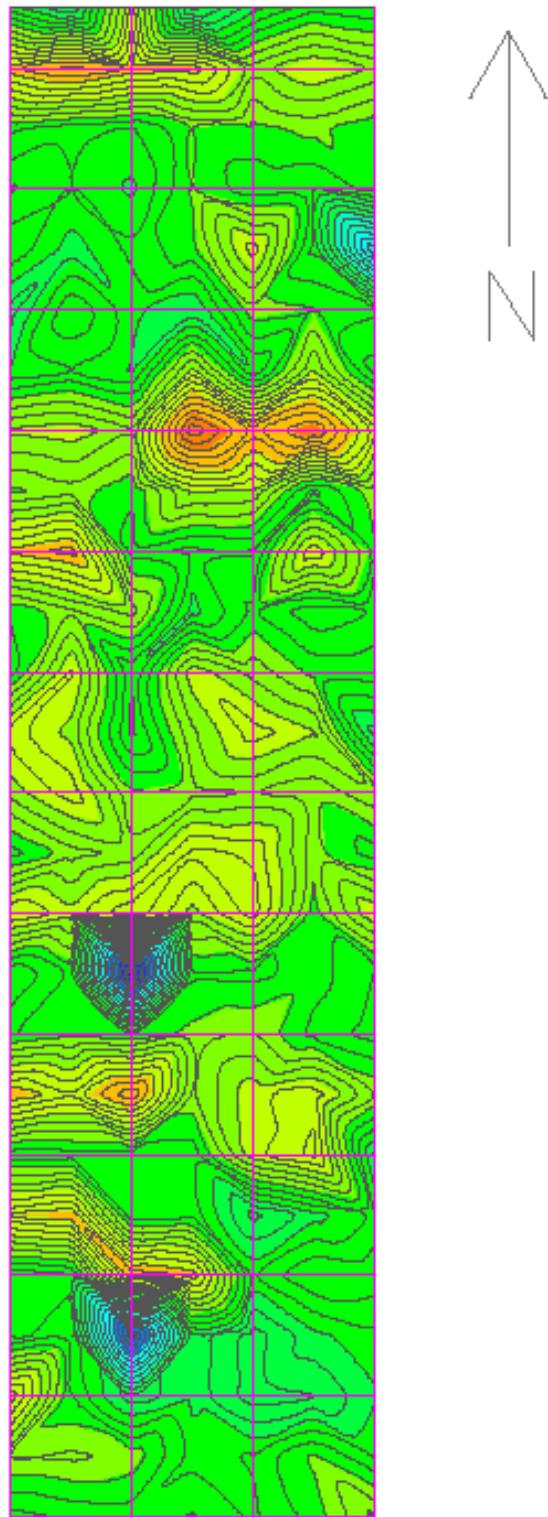


Figure E.48: Section C – Difference between 10/27/2011 and 4/10/2012

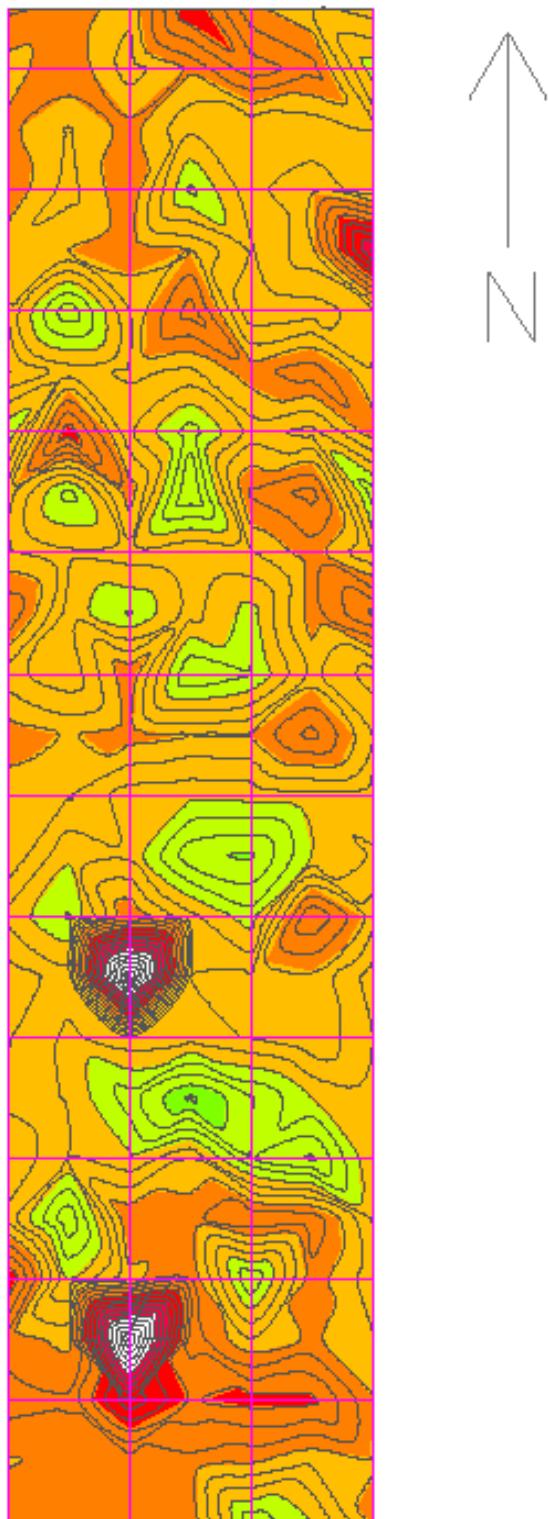


Figure E.49: Section C – Difference between 4/10/2012 and 5/9/2012

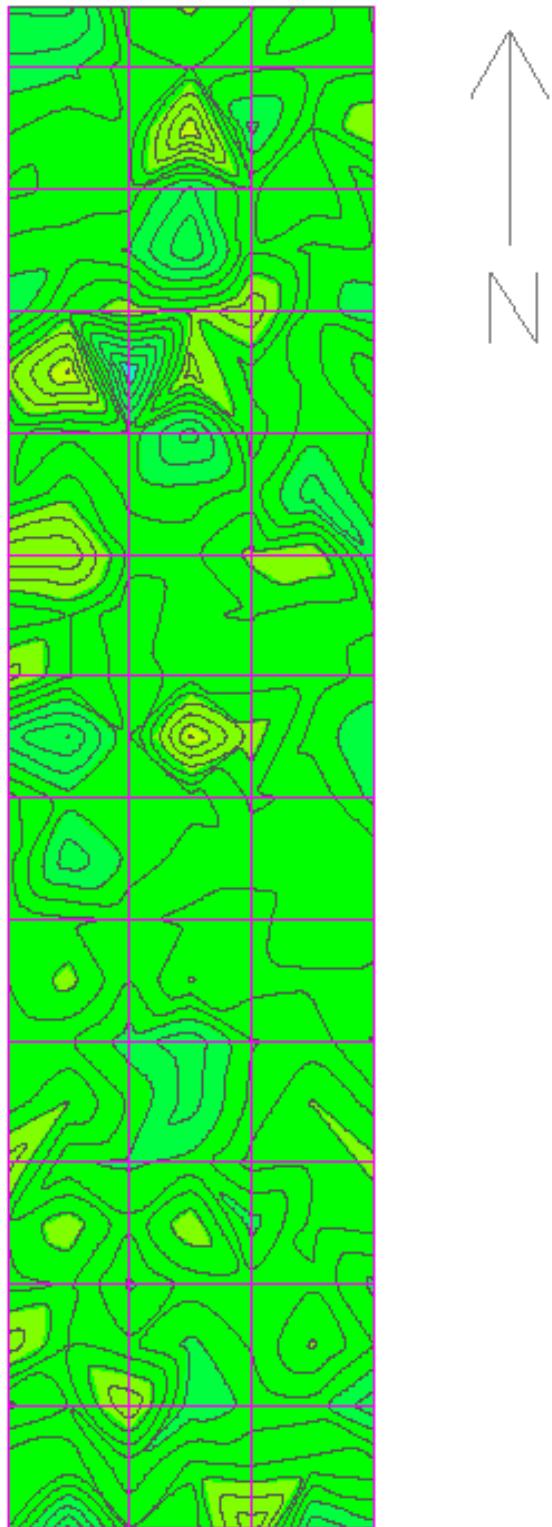


Figure E.50: Section D – Difference between 8/25/2011 and 10/6/2011

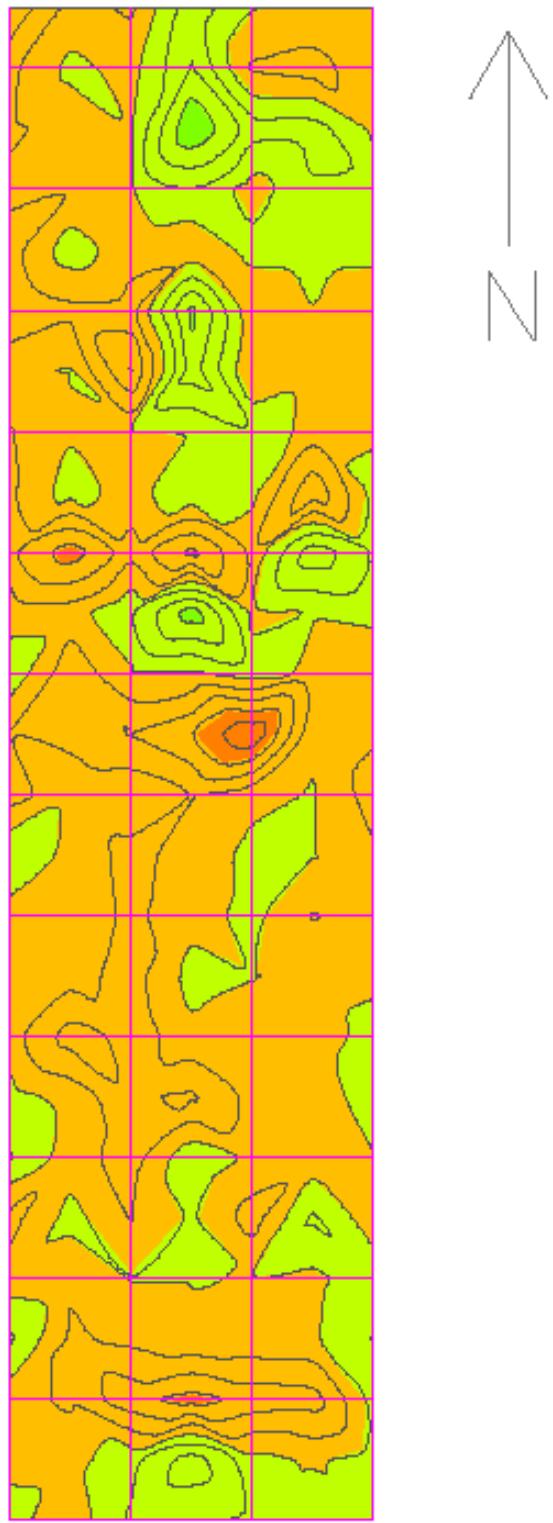


Figure E.51: Section D – Difference between 10/6/2011 and 10/27/2011

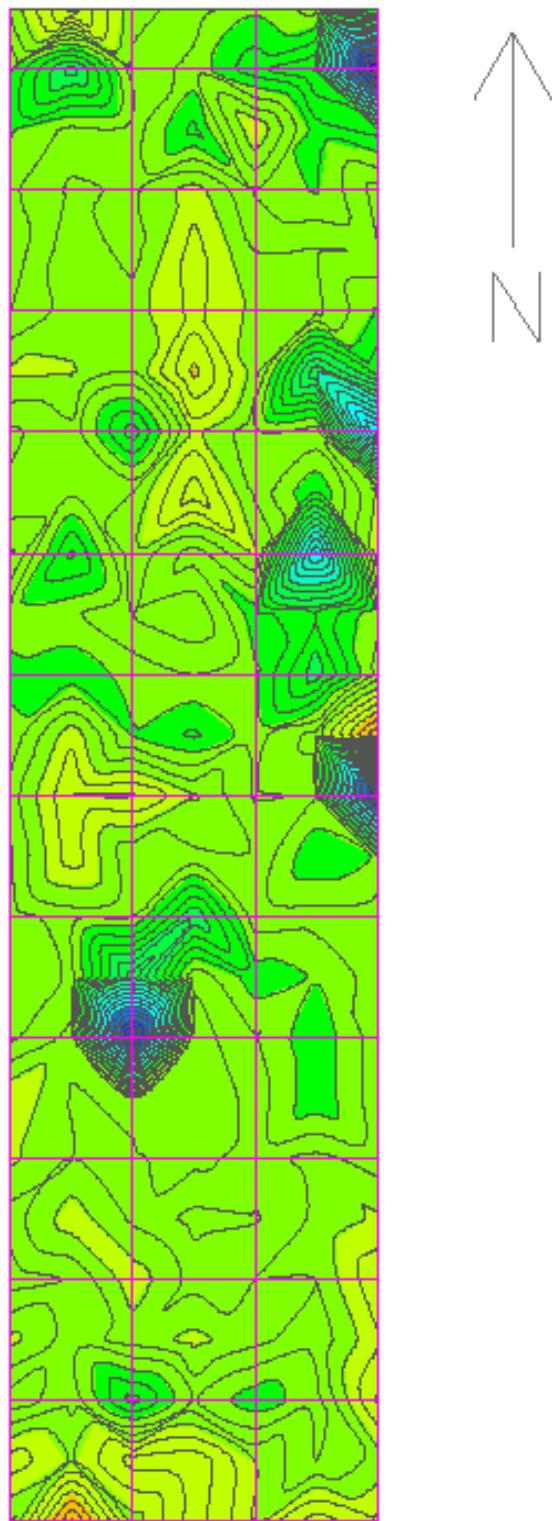


Figure E.52: Section D – Difference between 10/27/2011 and 4/10/2012

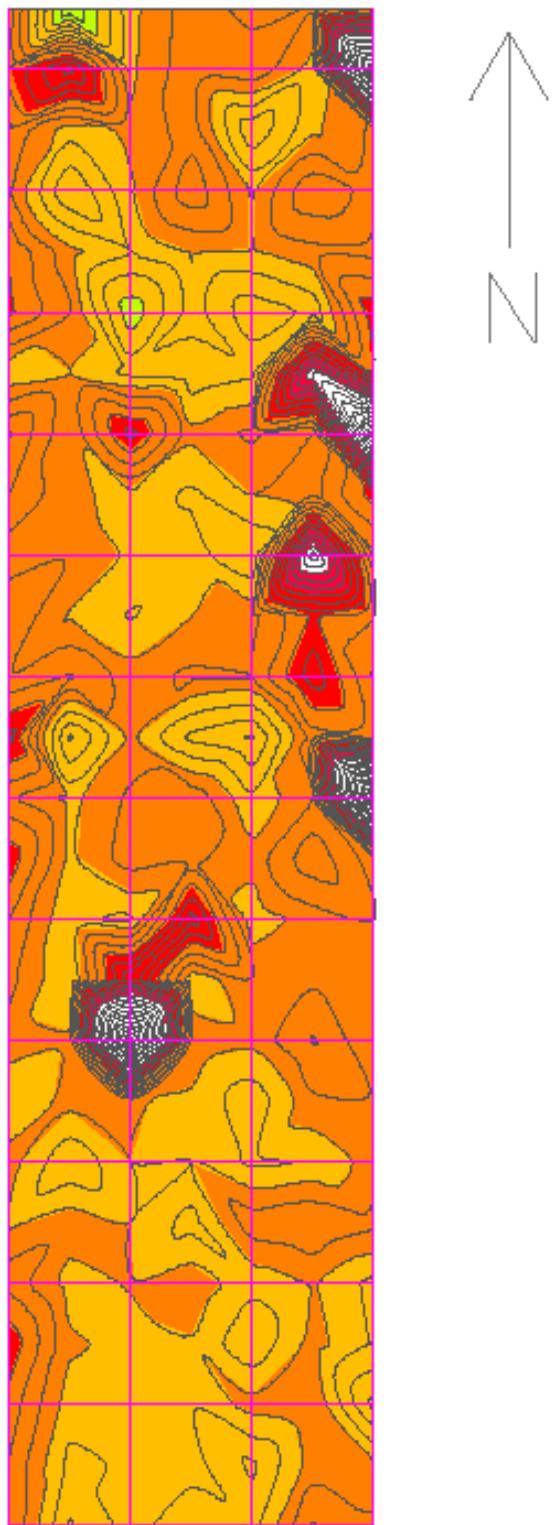


Figure E.53: Section D – Difference between 4/10/2012 and 5/9/2012

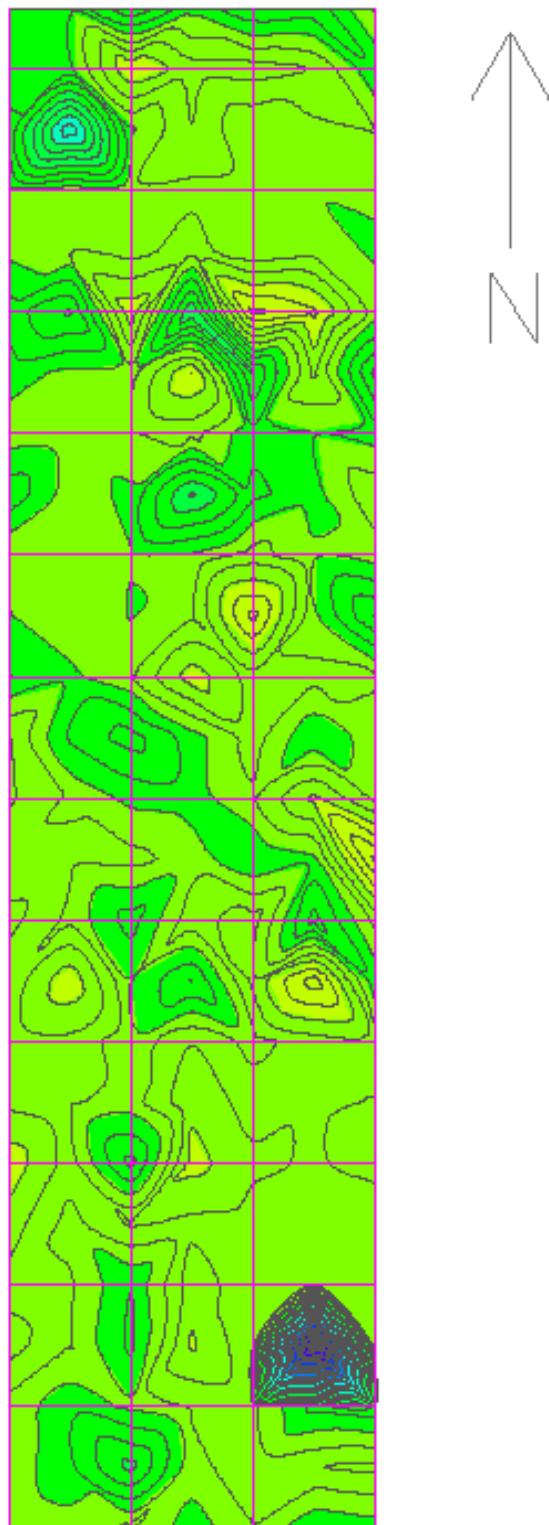


Figure E.54: Section E – Difference between 8/25/2011 and 10/6/2011

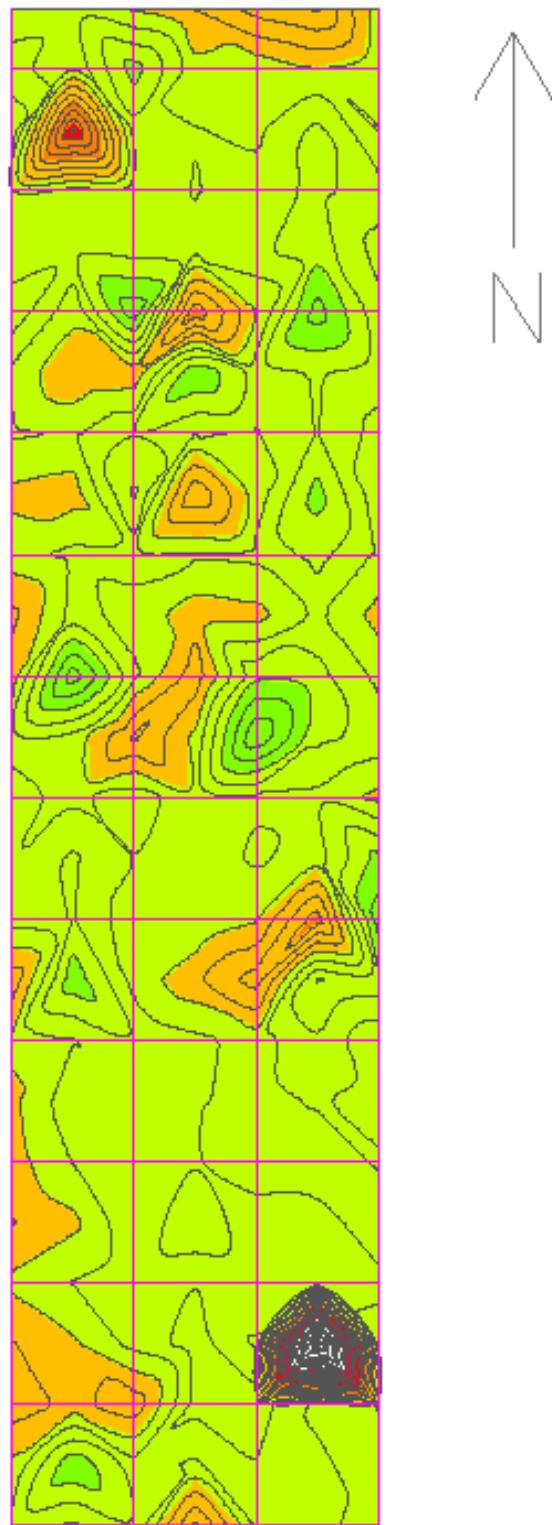


Figure E.55: Section E – Difference between 10/6/2011 and 10/27/2011

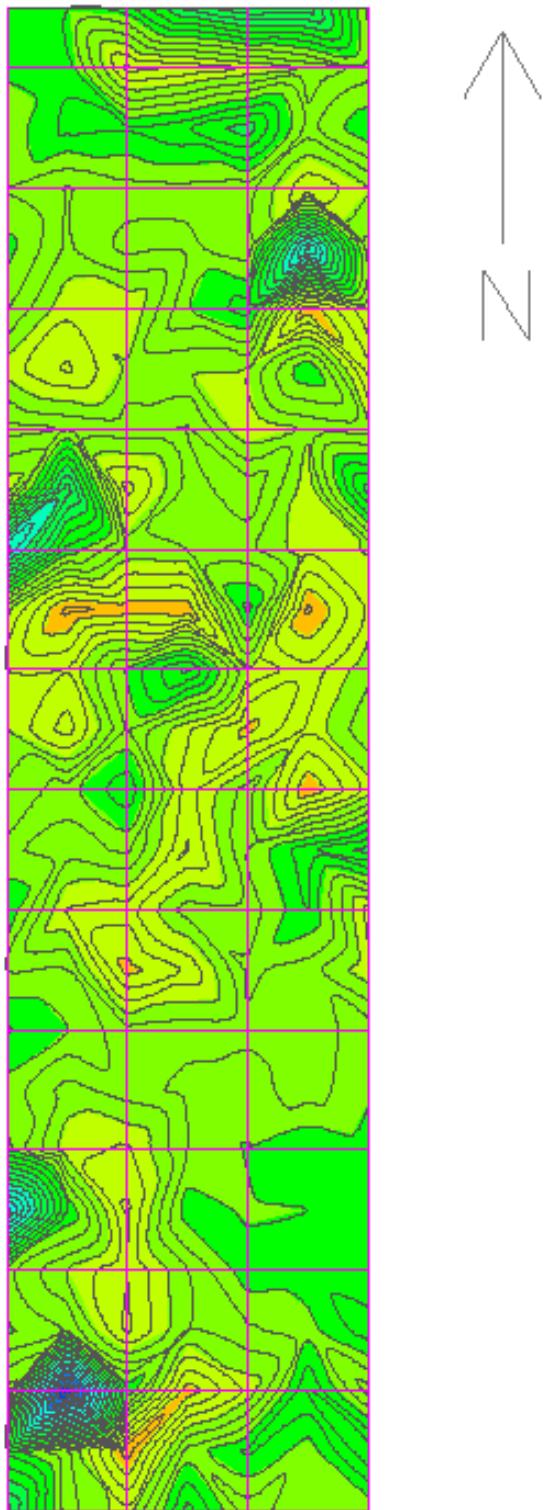


Figure E.56: Section E – Difference between 10/27/2011 and 4/10/2012

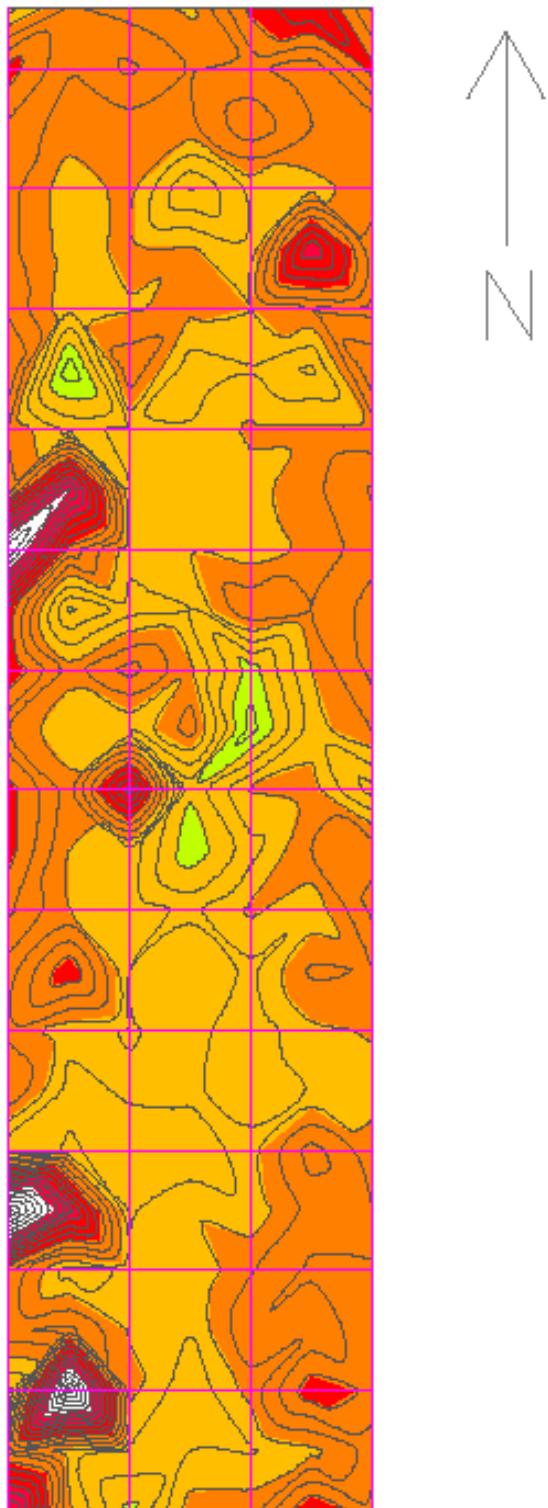


Figure E.57: Section E – Difference between 4/10/2012 and 5/9/2012

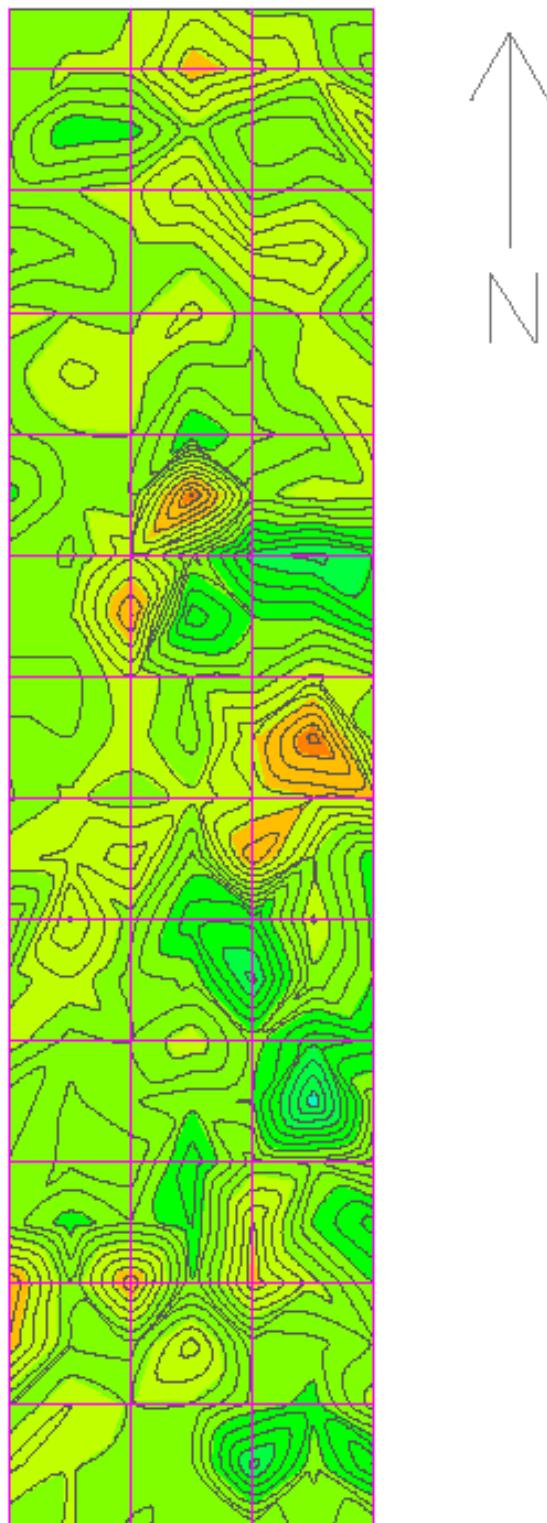


Figure E.58: Section F – Difference between 8/25/2011 and 10/6/2011

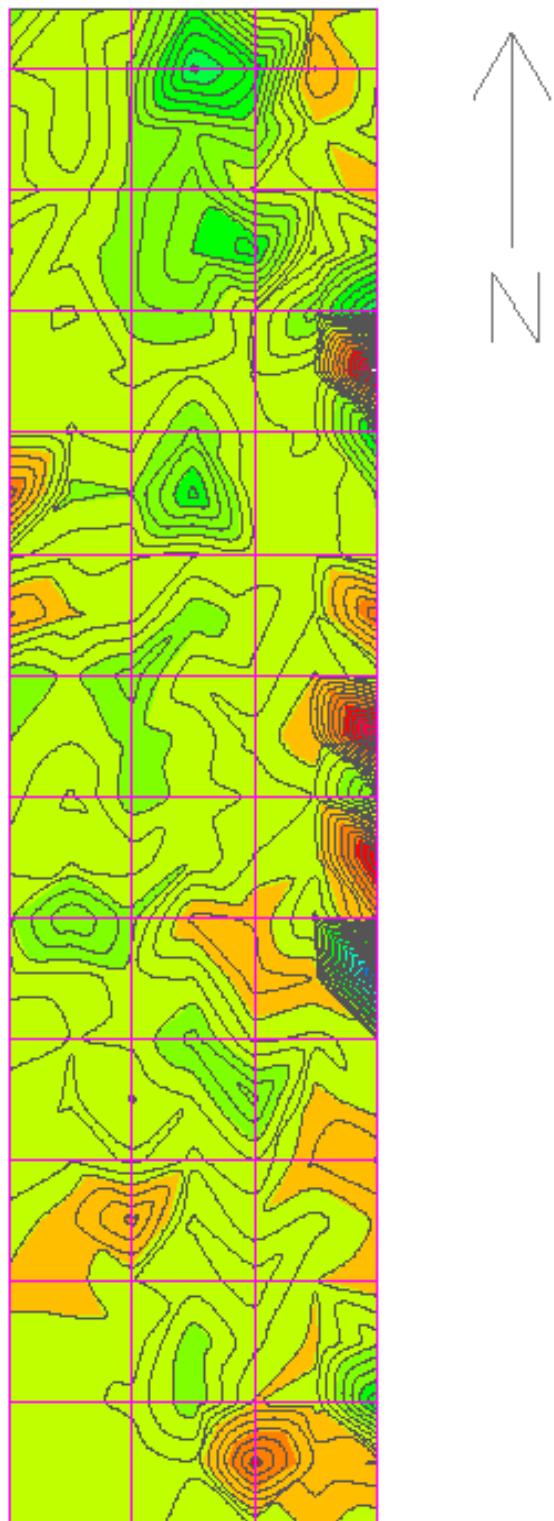


Figure E.59: Section F – Difference between 10/6/2011 and 10/27/2011

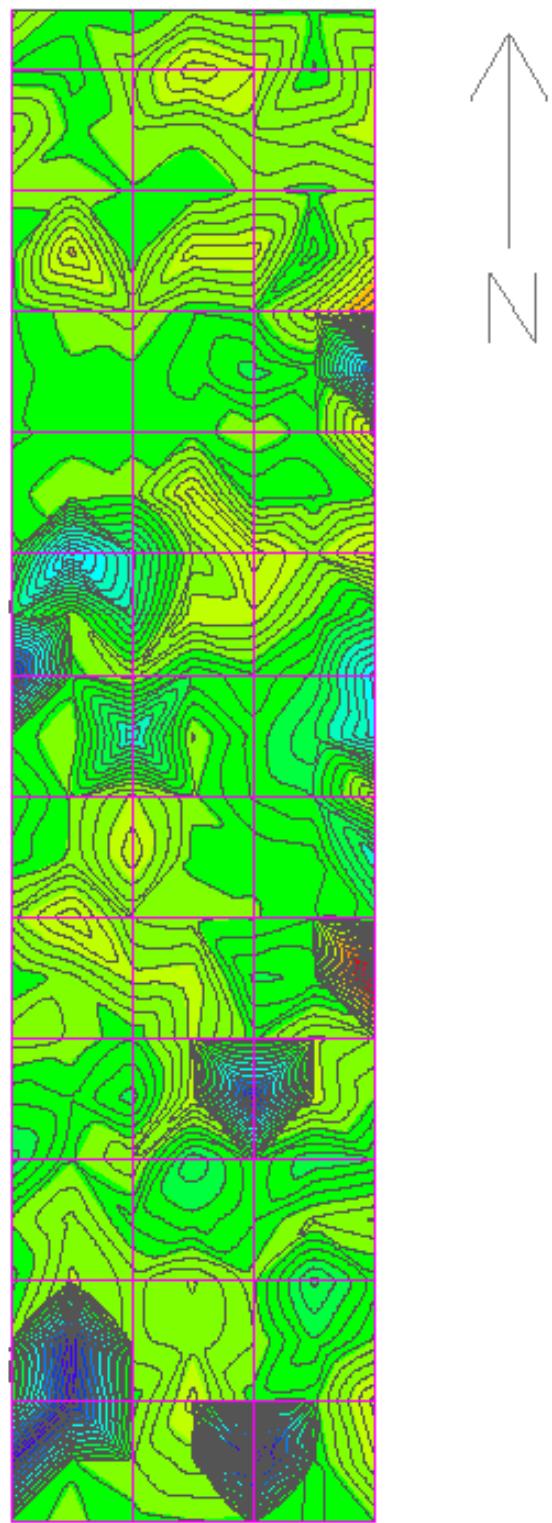


Figure E.60: Section F – Difference between 10/27/2011 and 4/10/2012

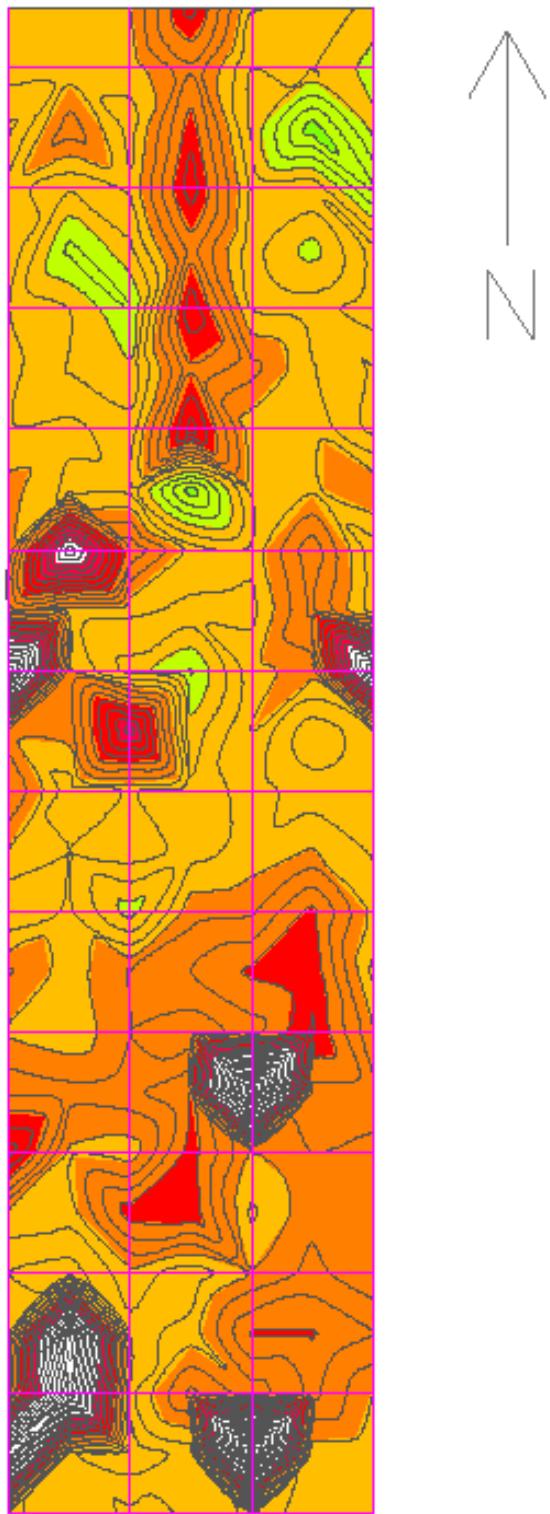


Figure E.61: Section F – Difference between 4/10/2012 and 5/9/2012

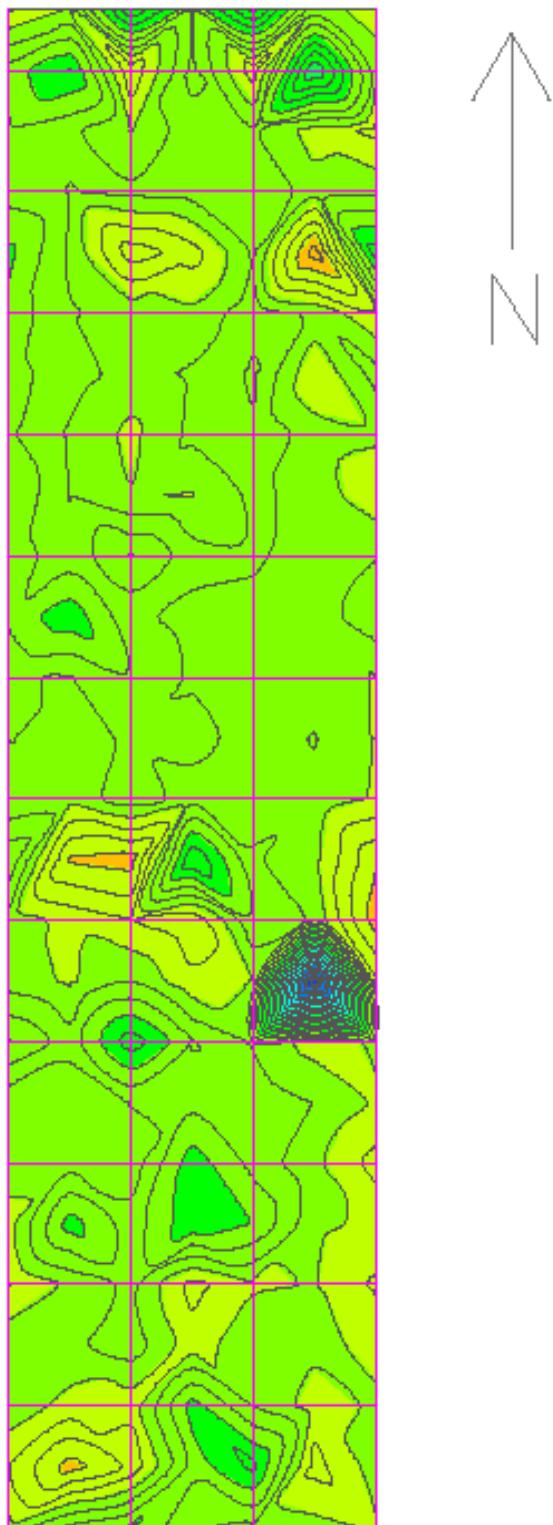


Figure E.62: Section G – Difference between 8/25/2011 and 10/6/2011

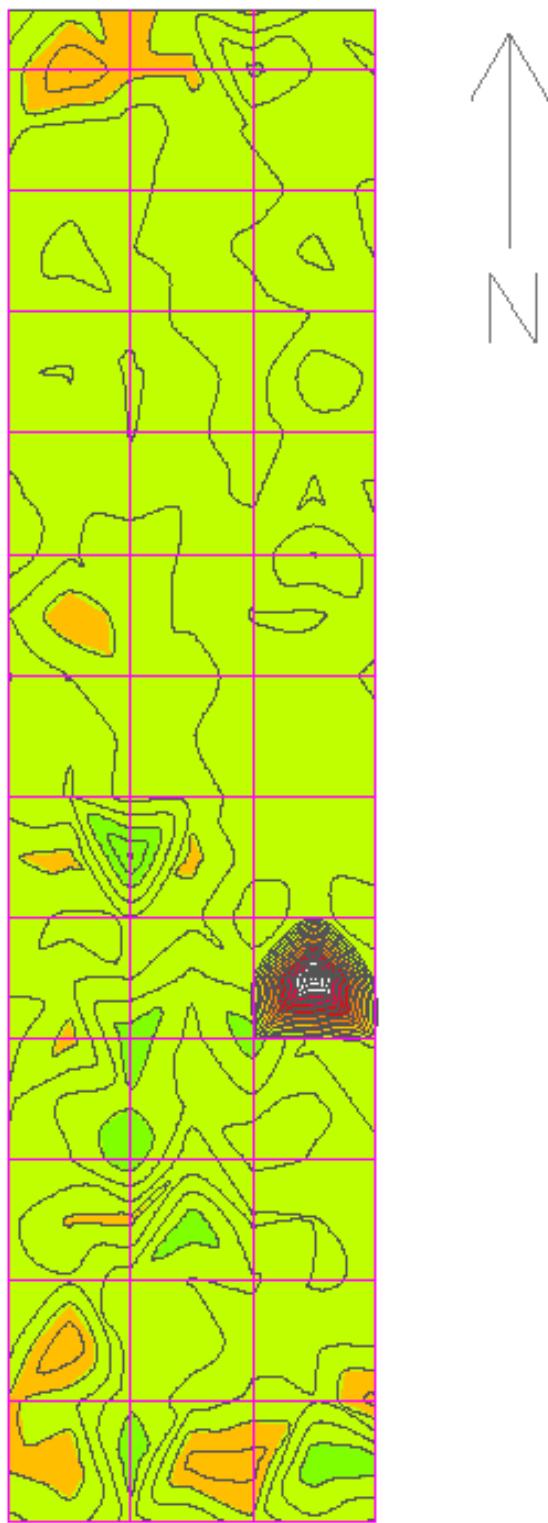


Figure E.63: Section G – Difference between 10/6/2011 and 10/27/2011

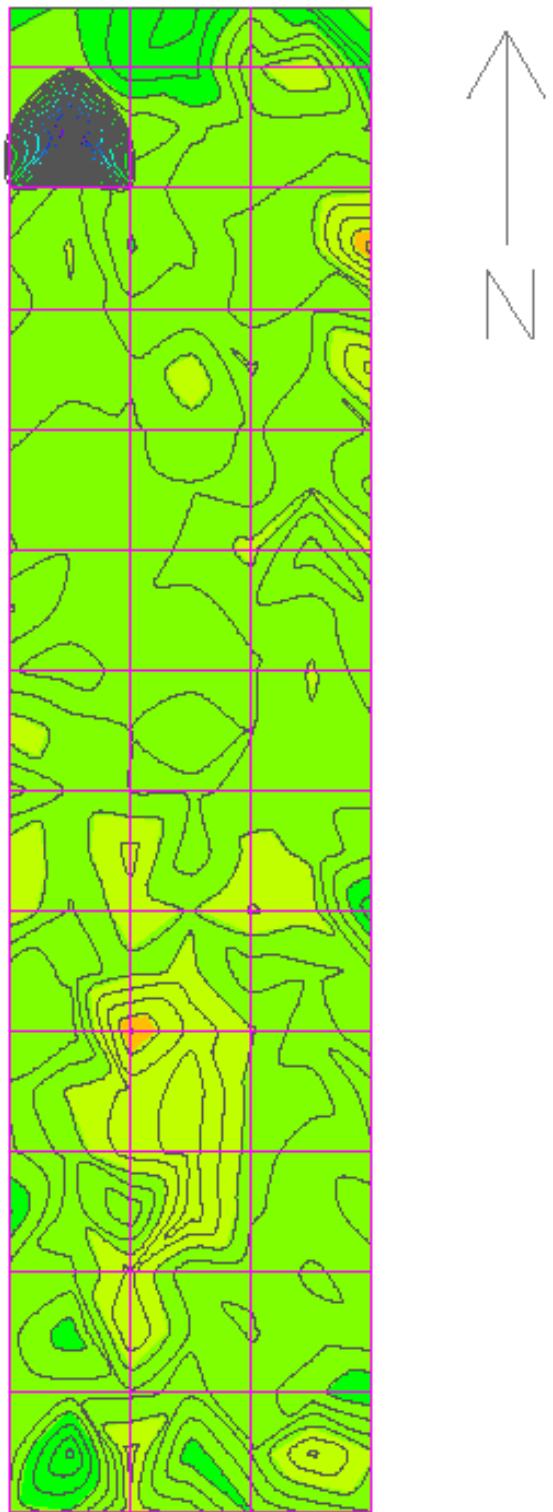


Figure E.64: Section G – Difference between 10/27/2011 and 4/10/2012

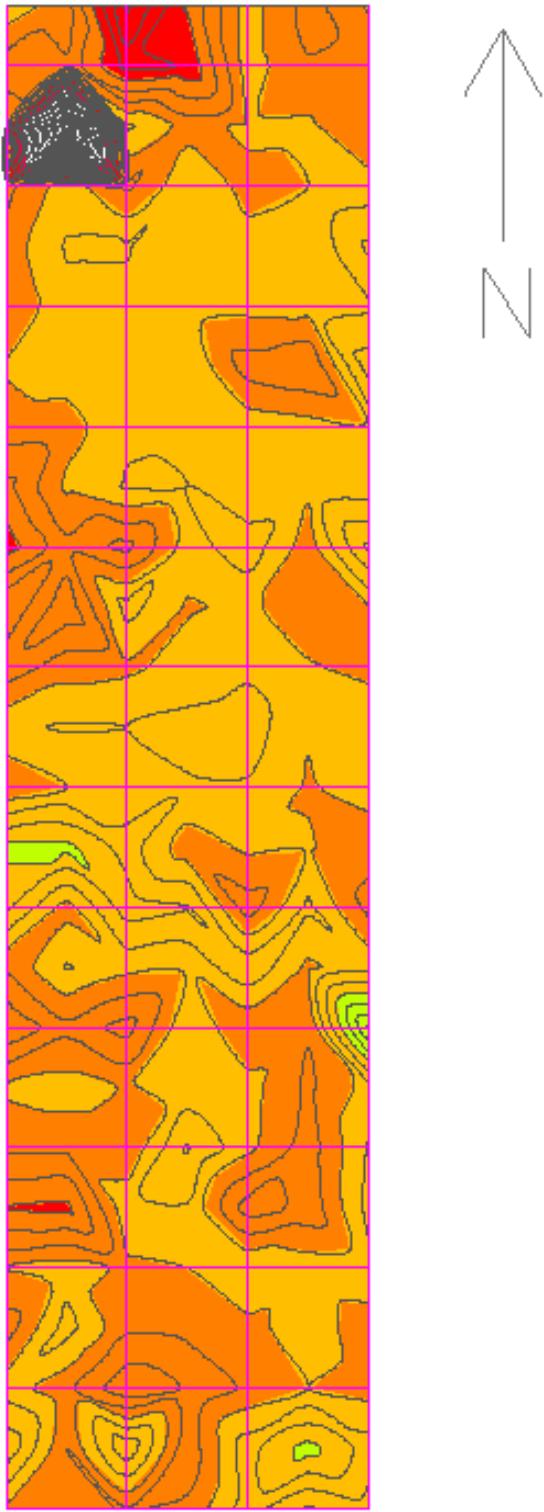


Figure E.65: Section G – Difference between 4/10/2012 and 5/9/2012

APPENDIX F. PLOTS OF HALF-CELL POTENTIAL MEASUREMENTS FOR FIELD TESTING OF MITIGATION PRODUCTS

Figure F-1 through Figure F-35 show plots of the half-cell potential measurements at the date indicated.

Figure F-36 through Figure F-70 show plots of the differences between half-cell measurements at the dates indicated.

Section A – MCI-2018

Section B – Protectosil CIT and Ferrogard 903

Section C – Protectosil CIT

Section D – Ferrogard 903

Section E – Duralprep 3020

Section F – Chemtrete 40

Section G – Control

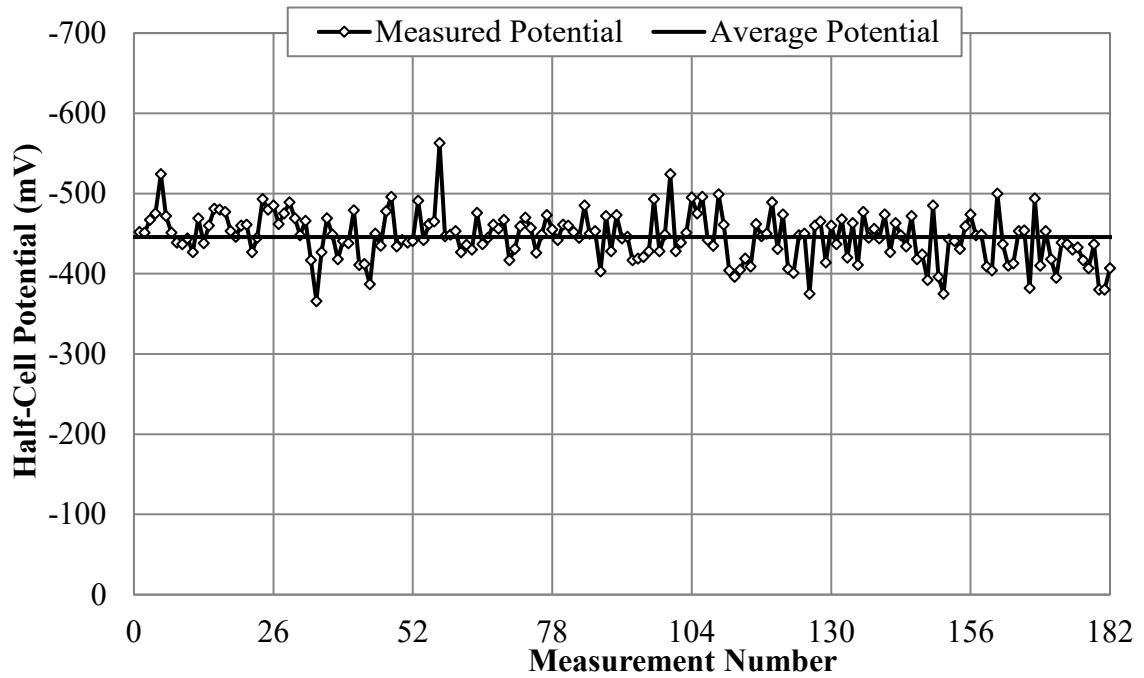


Figure F.1: Section A – Half-cell potential on 8/25/11

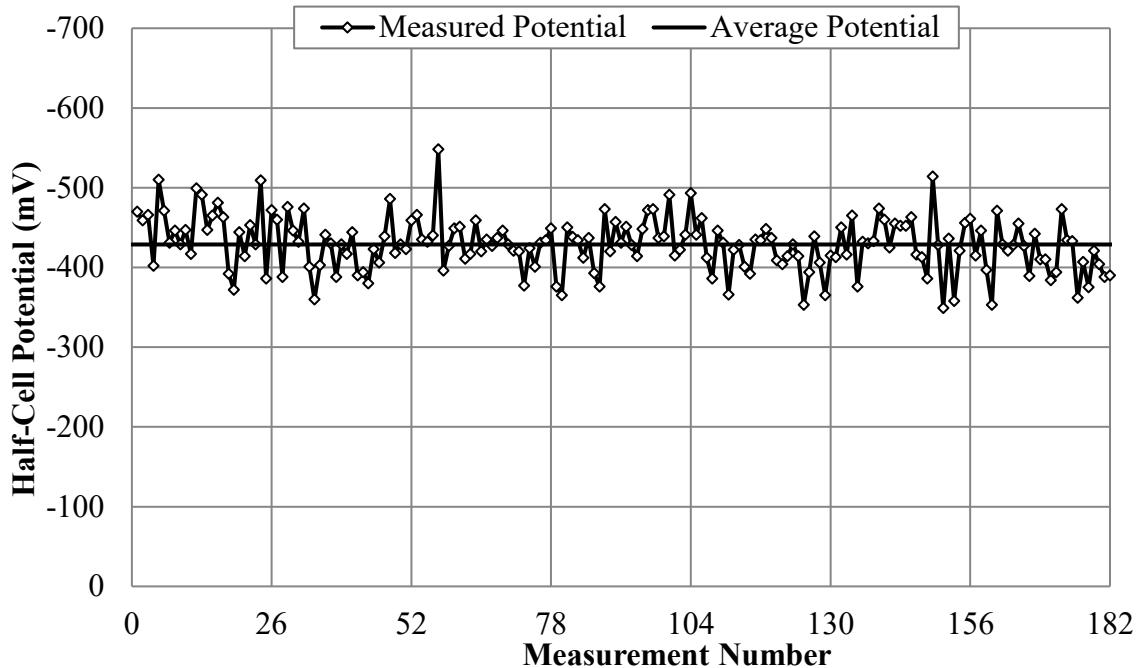


Figure F.2: Section A – Half-cell potential on 10/6/11

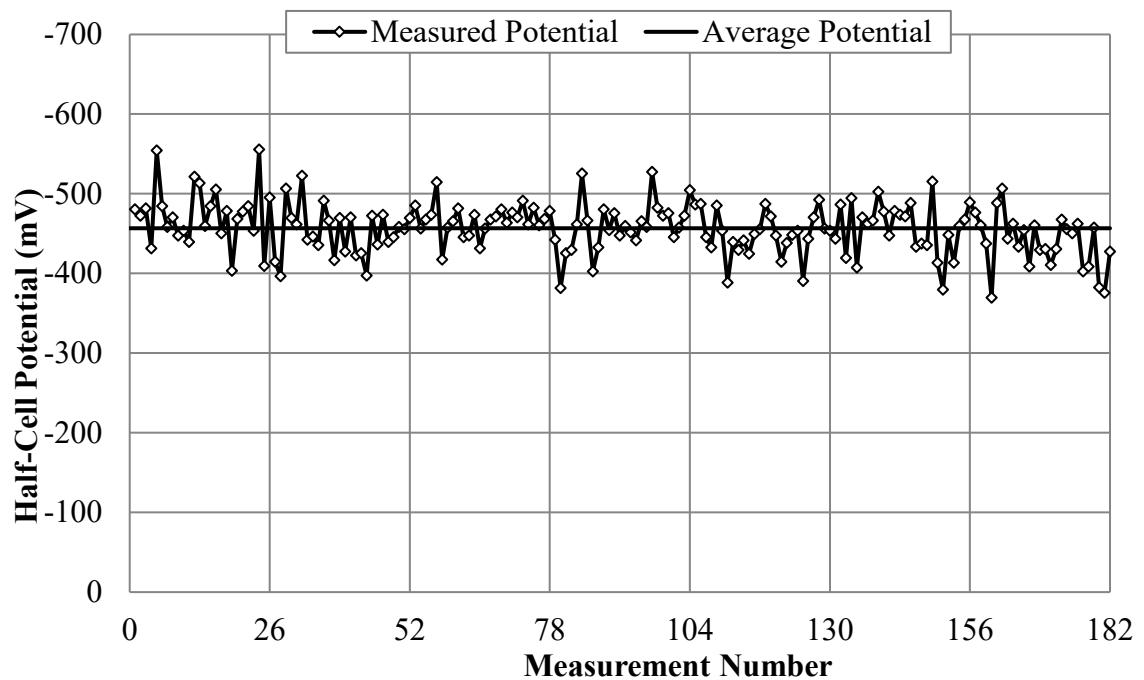


Figure F.3: Section A – Half-cell potential on 10/27/11

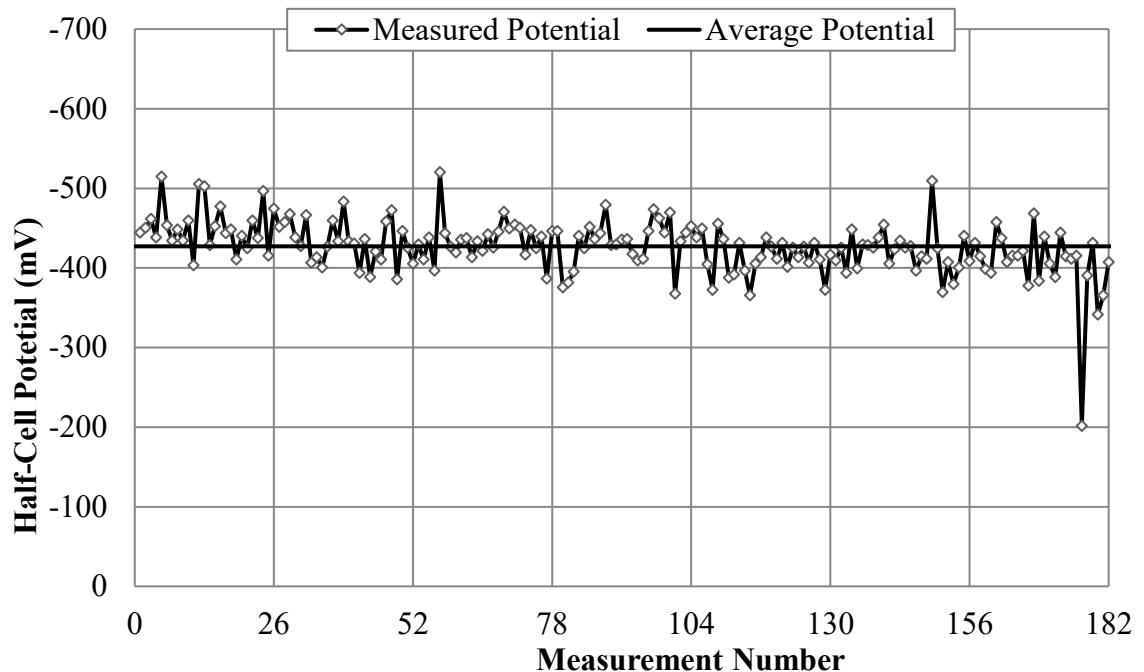


Figure F.4: Section A – Half-cell potential on 4/10/12

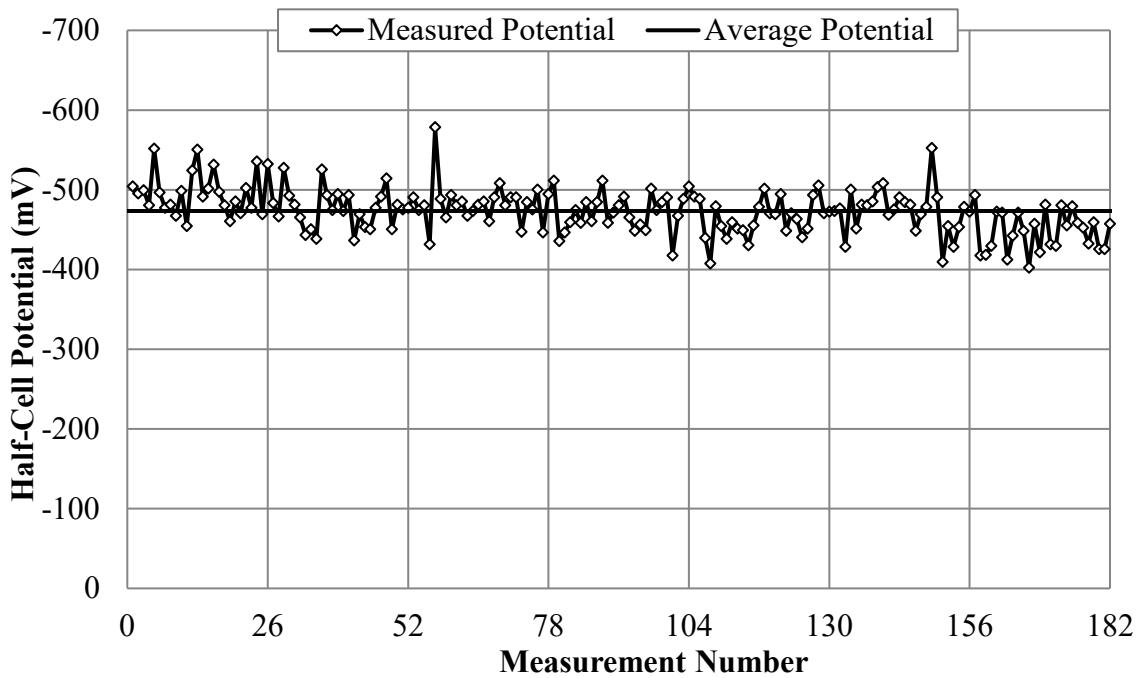


Figure F.5: Section A – Half-cell potential on 5/9/12

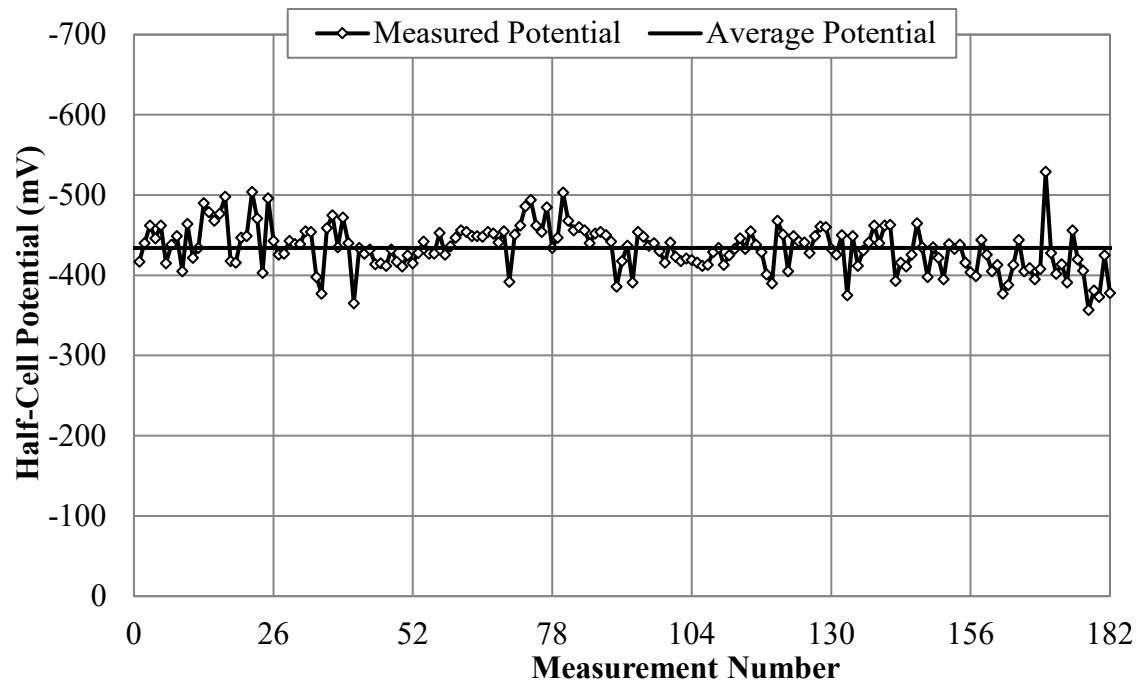


Figure F.6: Section B – Half-cell potential on 8/25/11

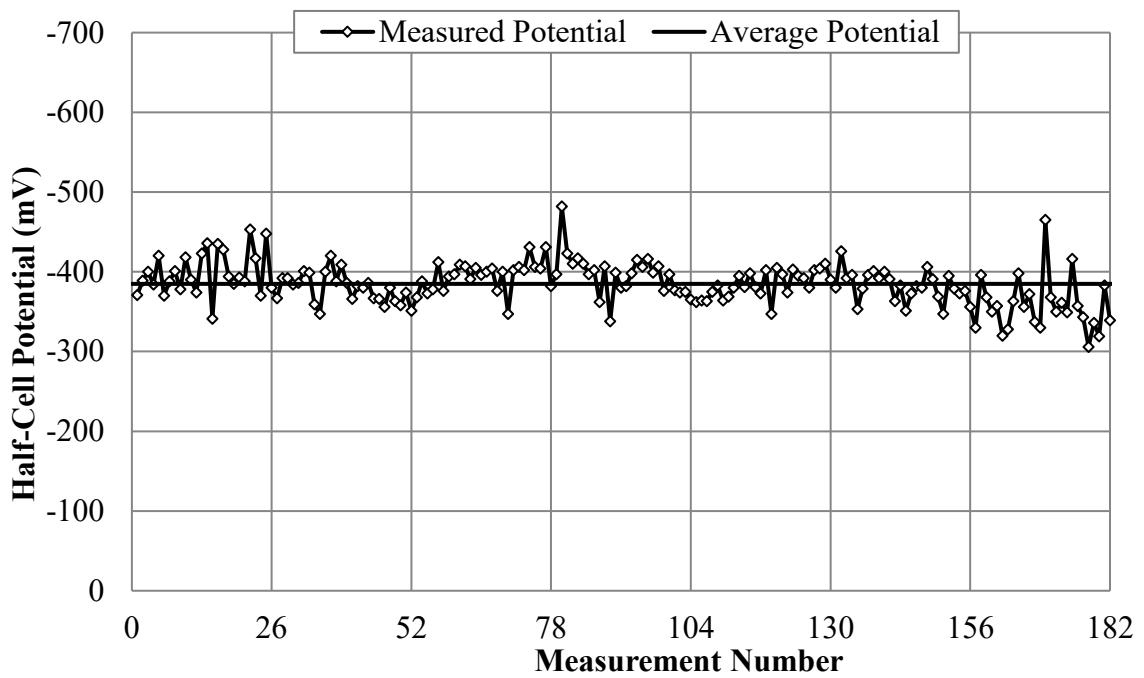


Figure F.7: Section B – Half-cell potential on 10/6/11

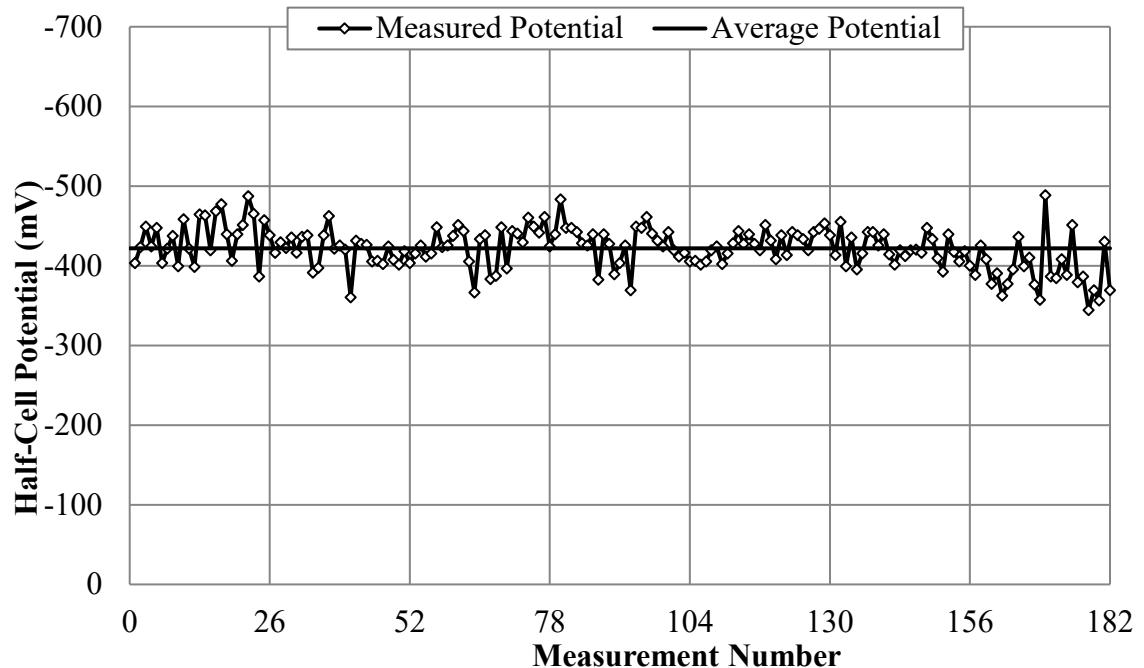


Figure F.8: Section B – Half-cell potential in 10/27/11

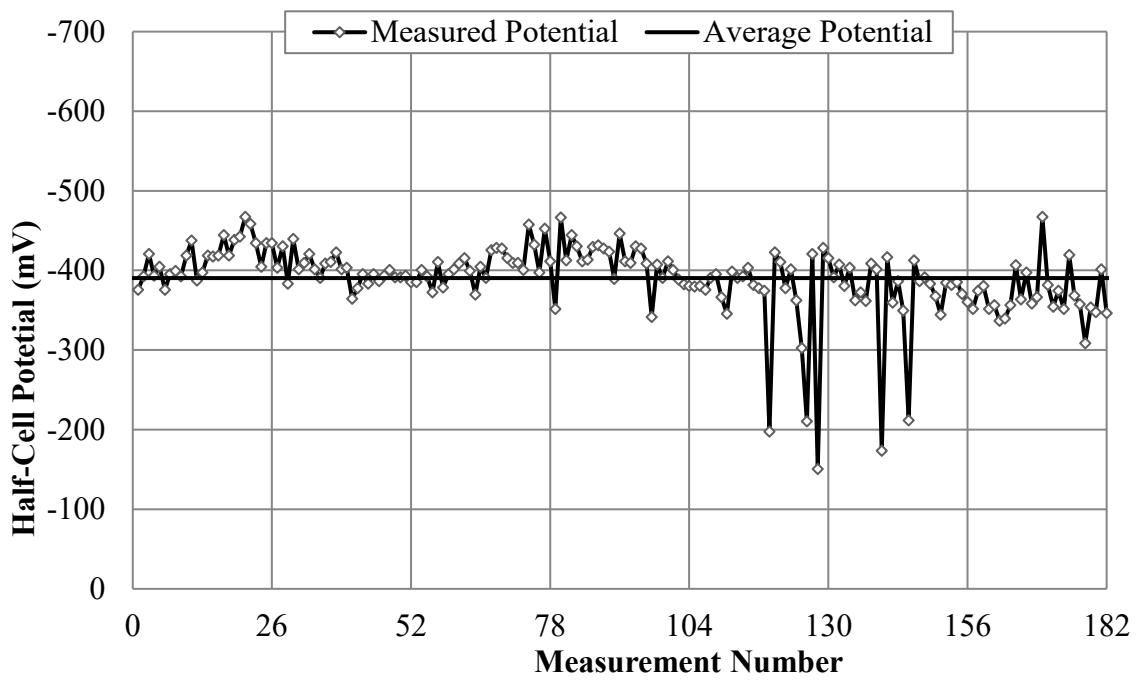


Figure F.9: Section B – Half-cell potential on 4/10/12

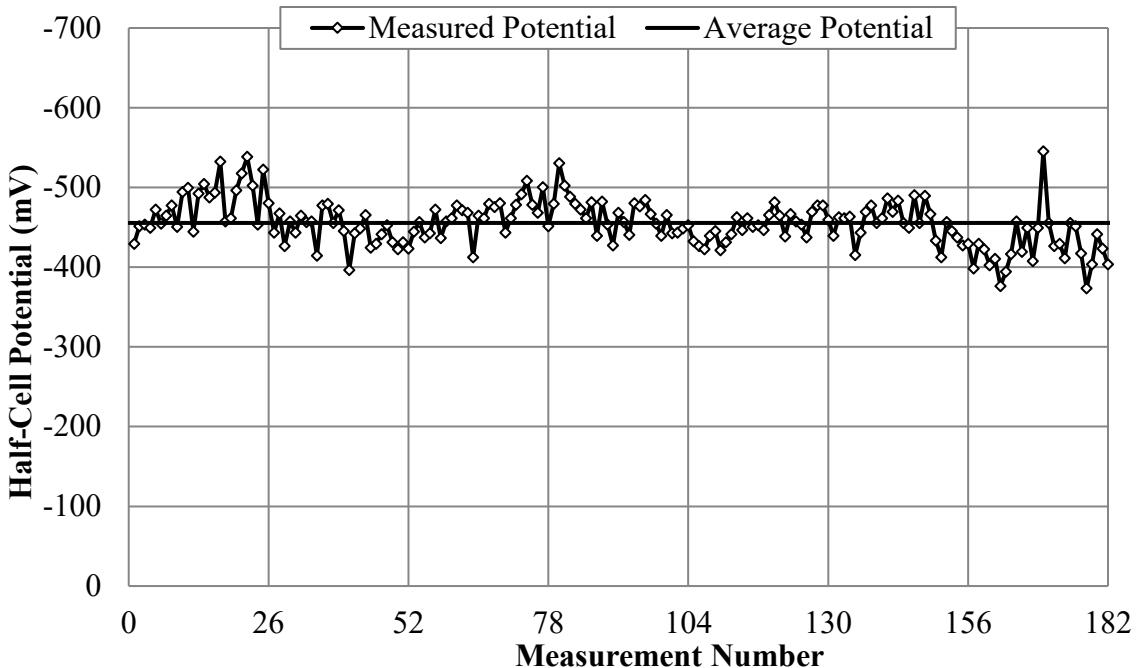


Figure F.10: Section B – Half-cell potential on 5/9/12

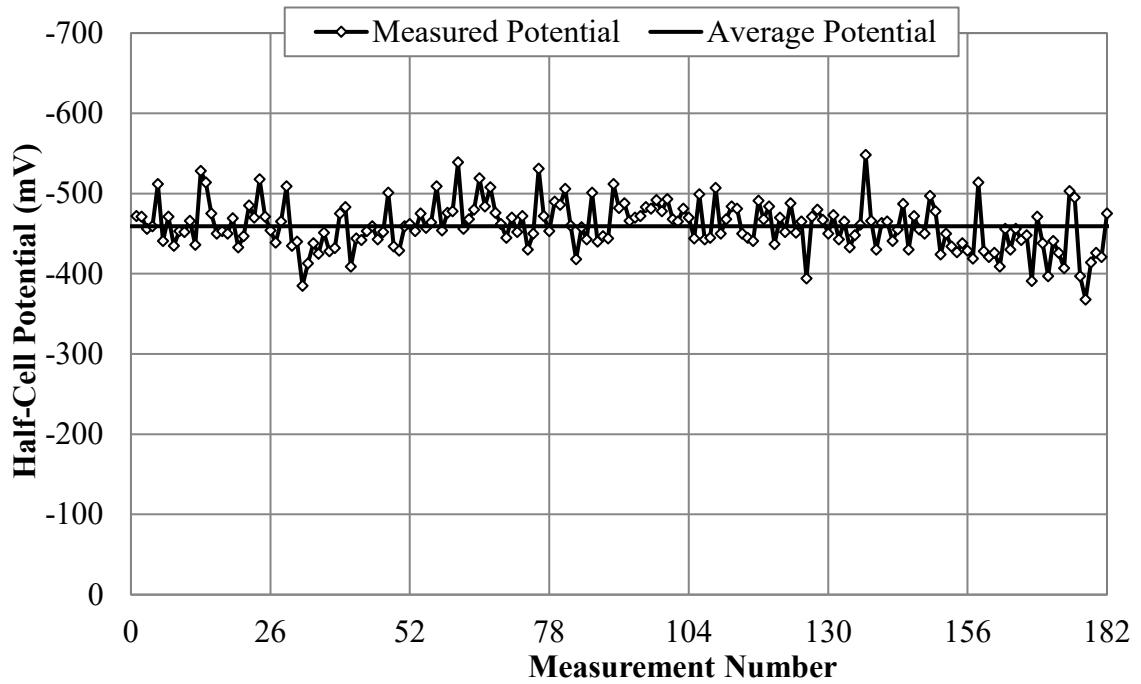


Figure F.11: Section C – Half-cell potential on 8/25/11

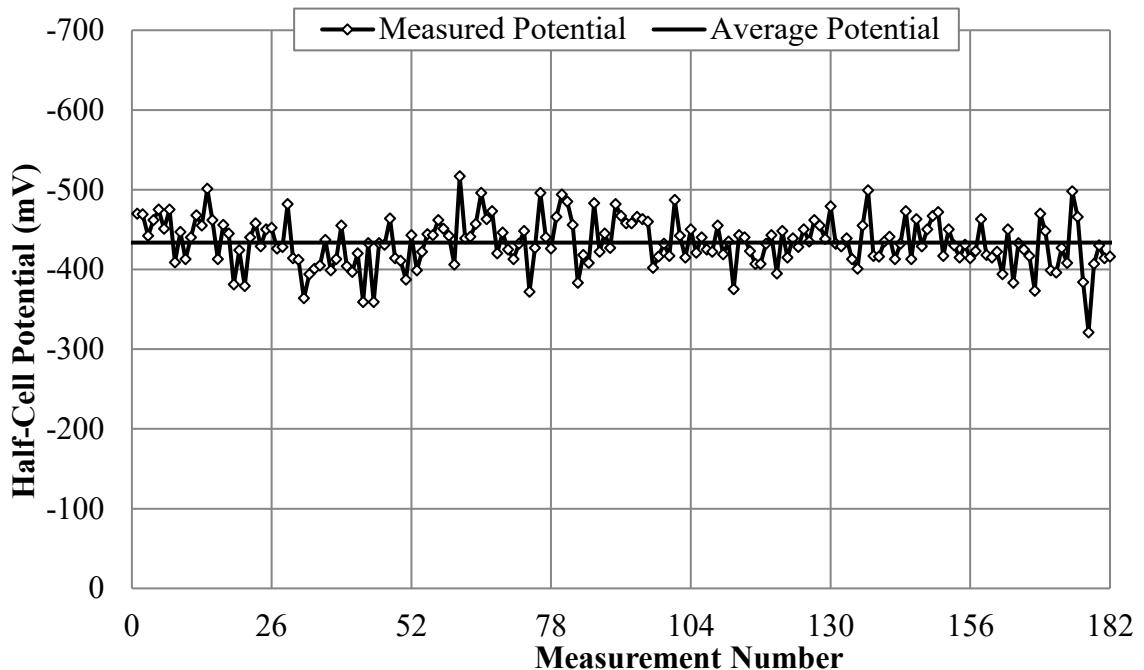


Figure F.12: Section C – Half-cell potential on 10/6/11

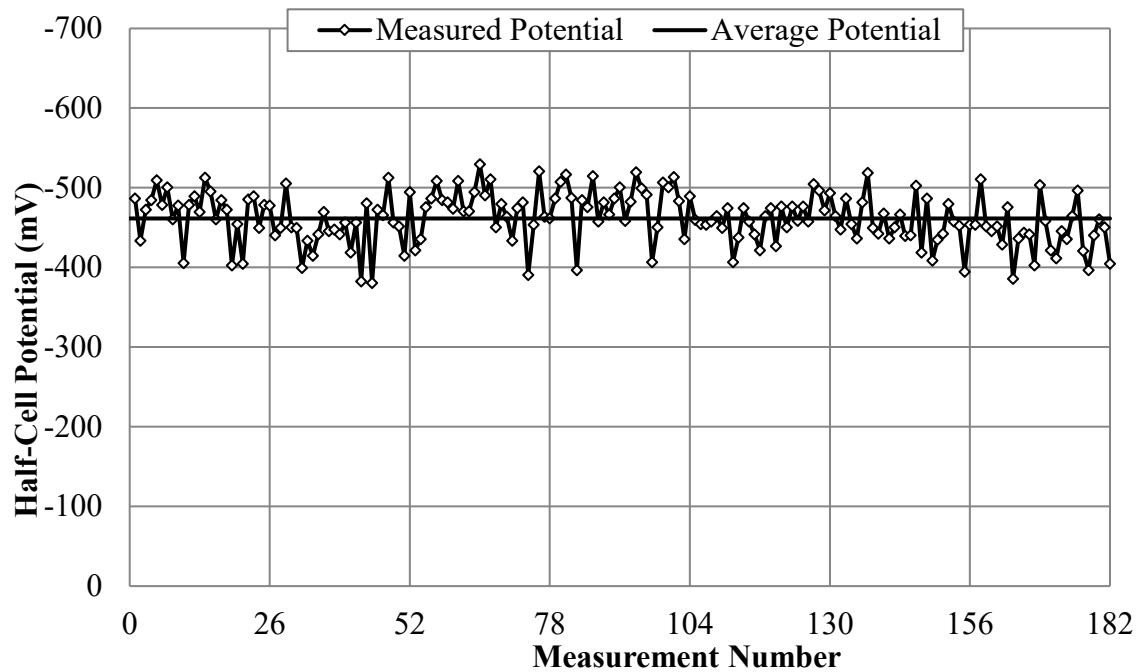


Figure F.13: Section C – Half-cell potential in 10/27/11

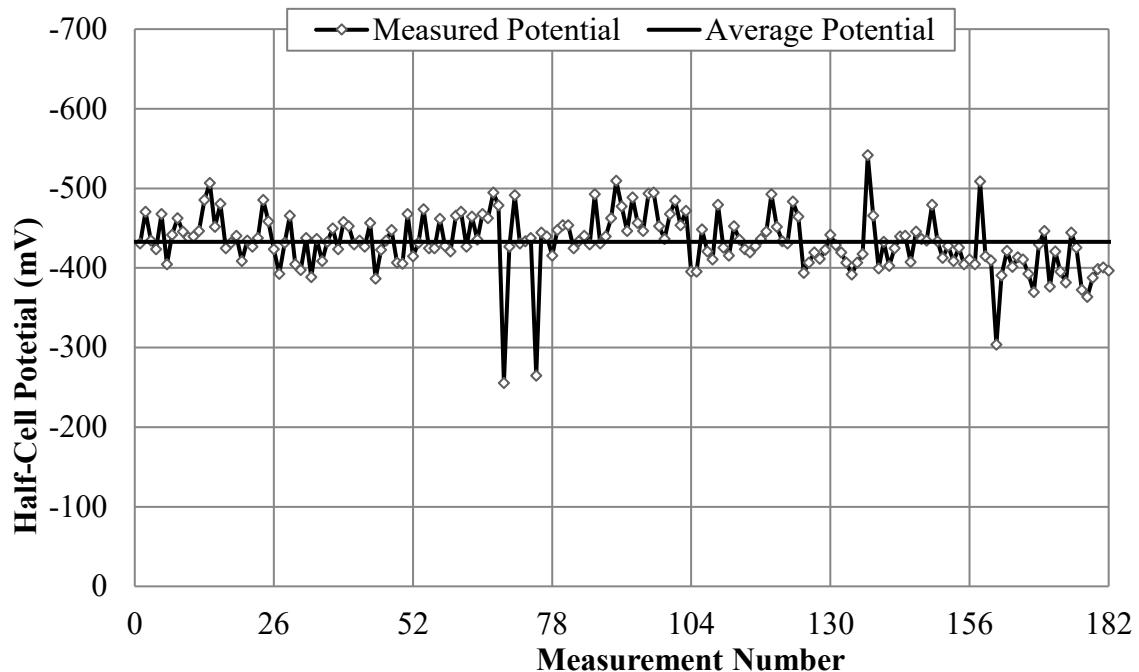


Figure F.14: Section C – Half-cell potential on 4/10/12

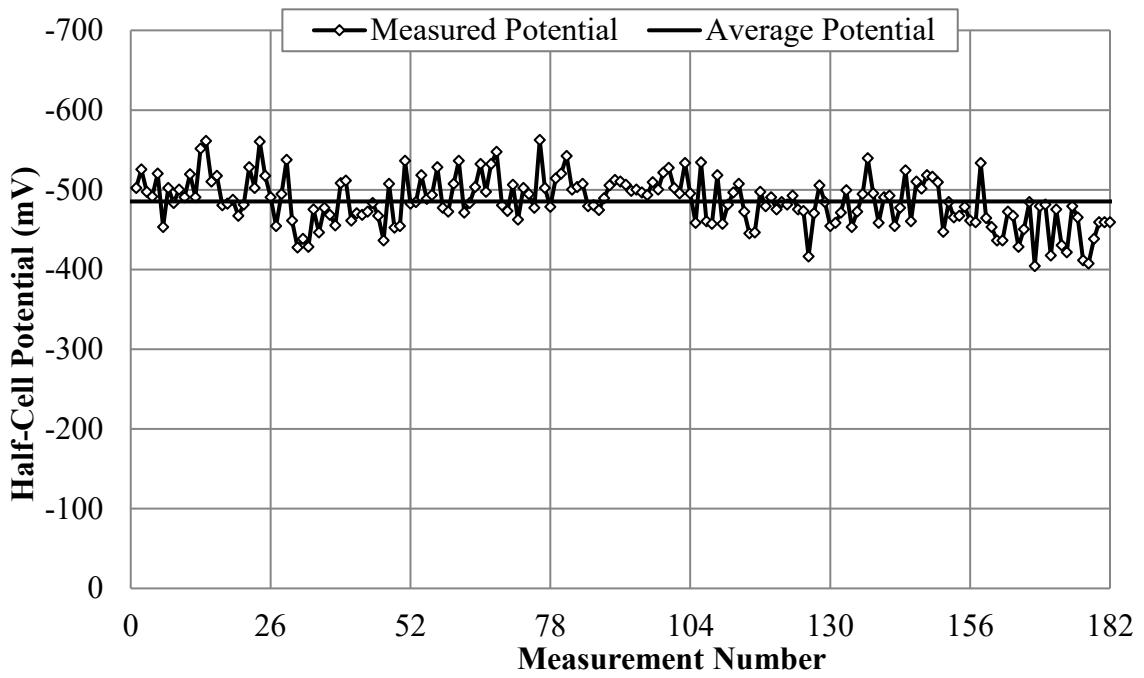


Figure F.15: Section C – Half-cell potential on 5/9/12

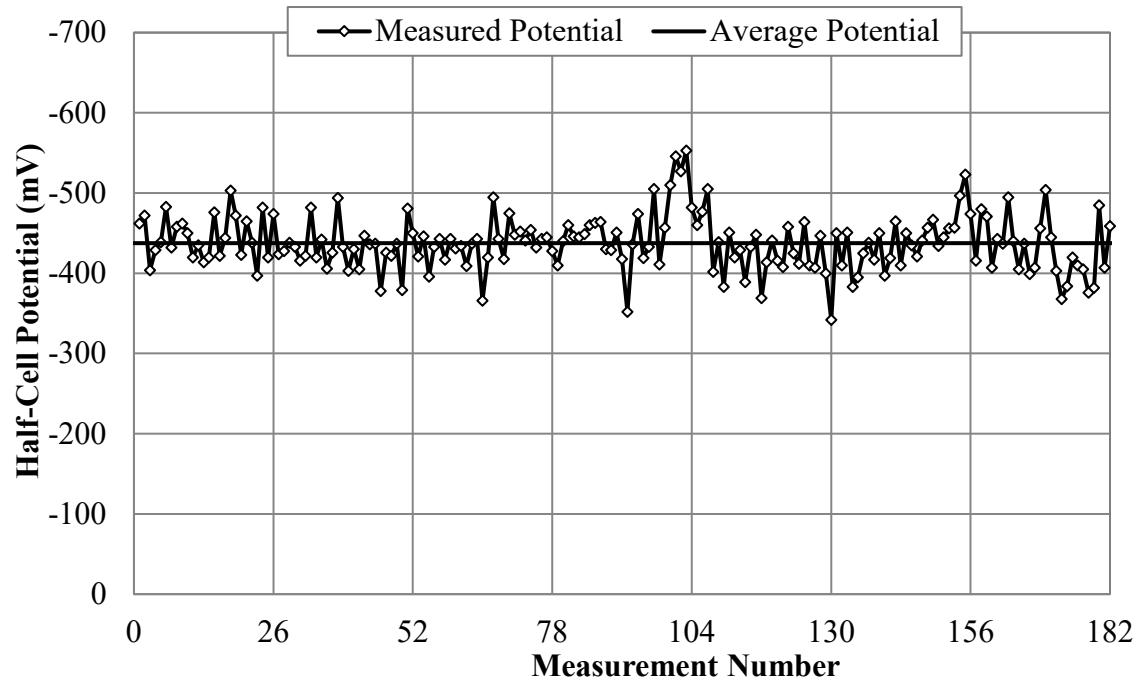


Figure F.16: Section D – Half-cell potential on 8/25/11

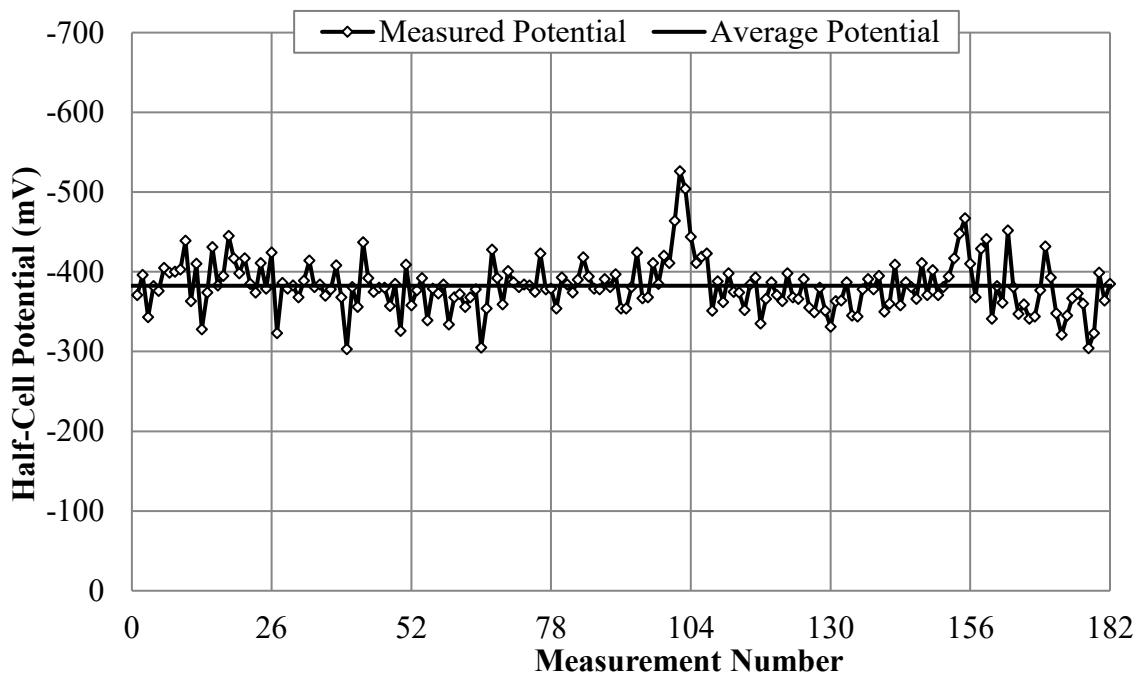


Figure F.17: Section D – Half-cell potential on 10/6/11

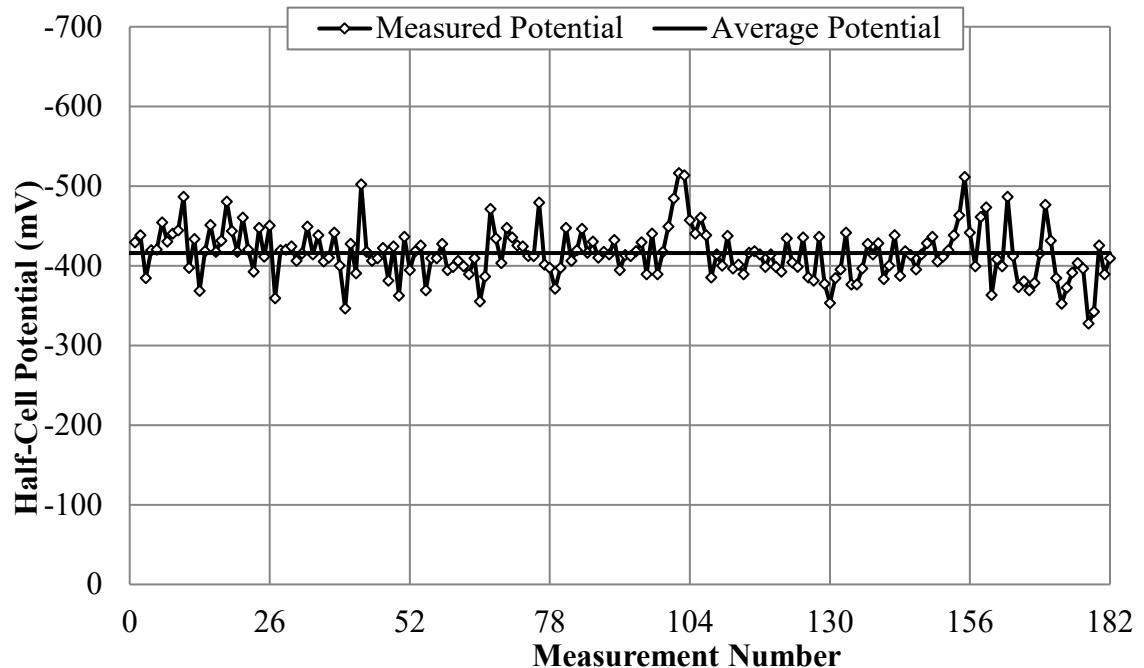


Figure F.18: Section D – Half-cell potential in 10/27/11

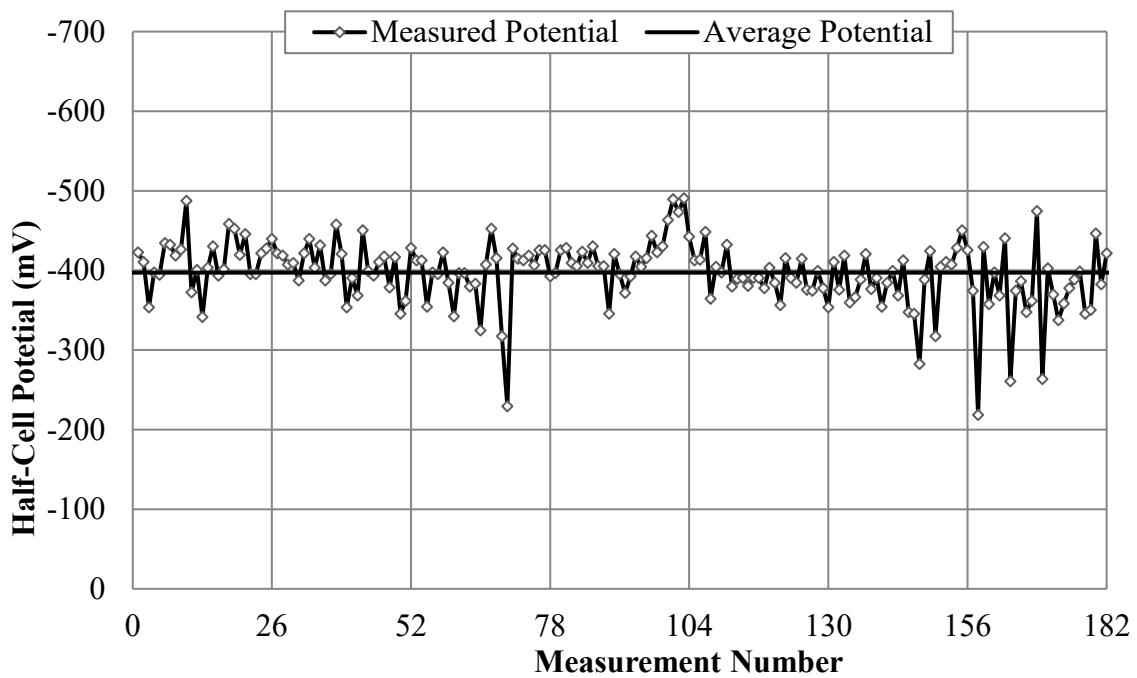


Figure F.19: Section D – Half-cell potential on 4/10/12

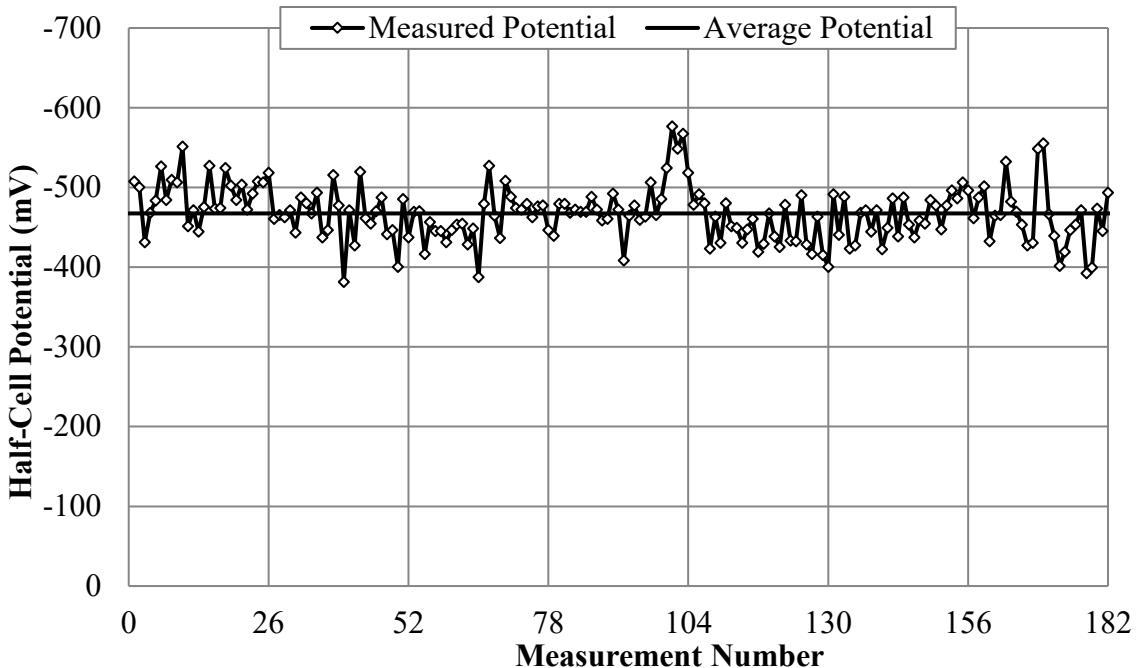


Figure F.20: Section D – Half-cell potential on 5/9/12

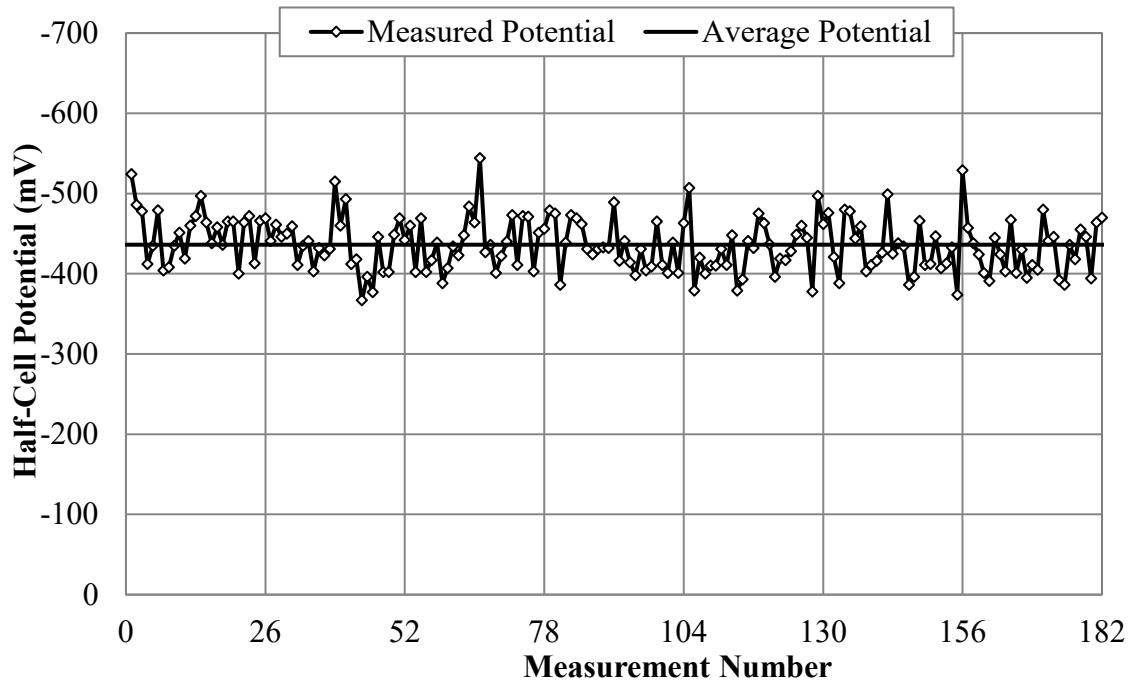


Figure F.21: Section E – Half-cell potential on 8/25/11

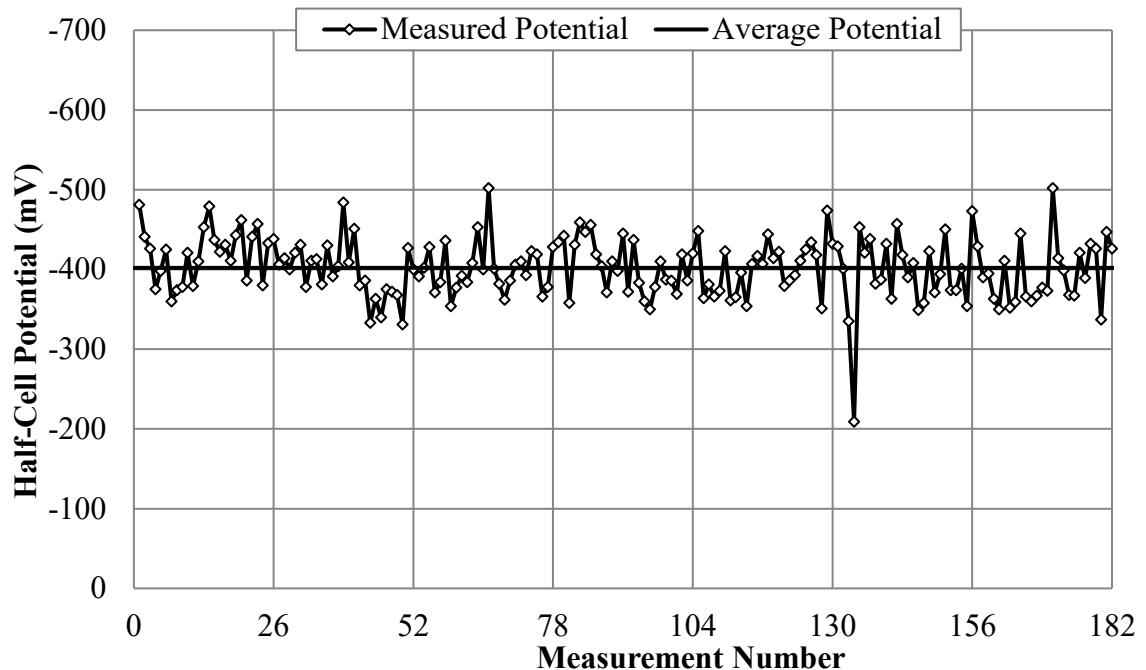


Figure F.22: Section E – Half-cell potential on 10/6/11

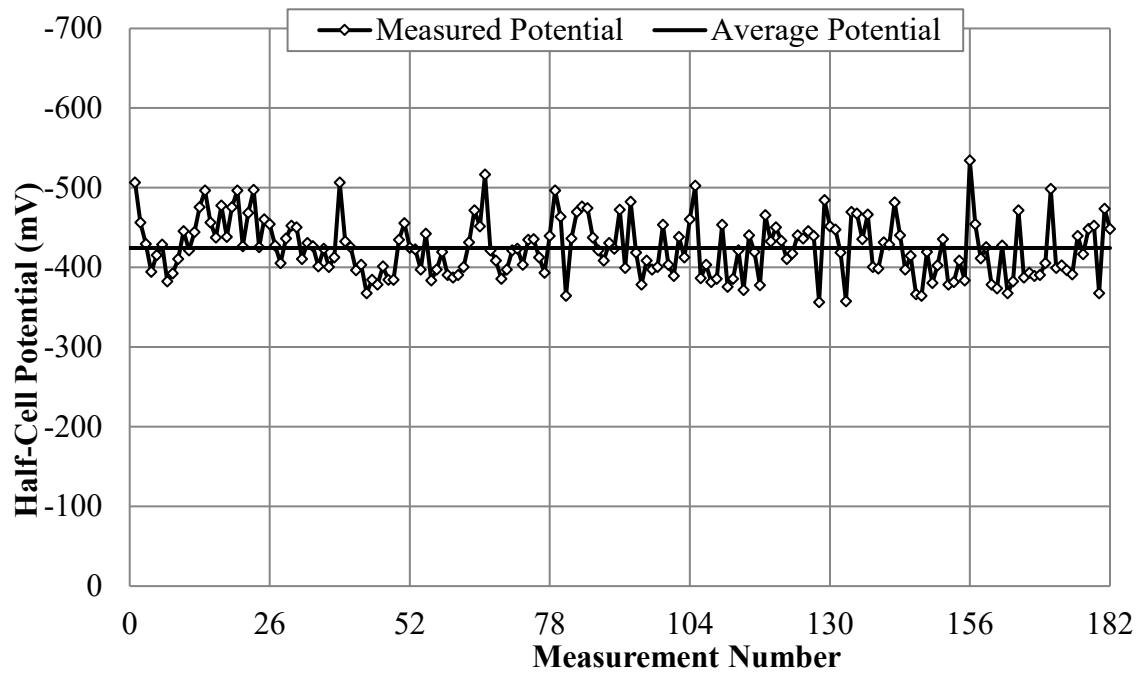


Figure F.23: Section E – Half-cell potential on 10/27/11

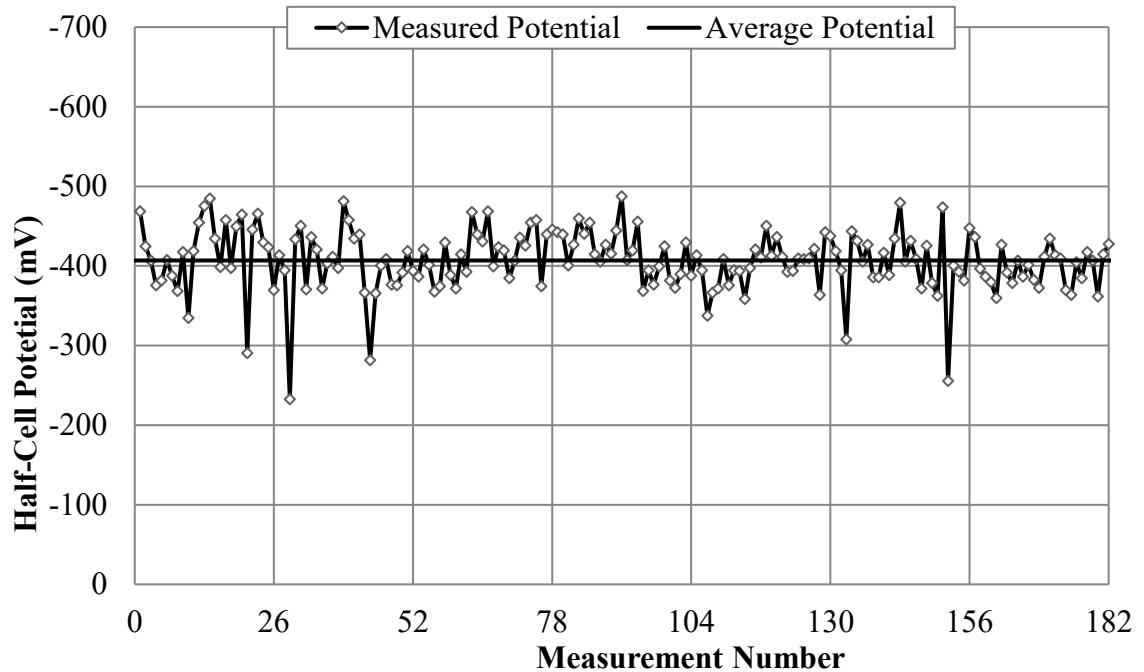


Figure F.24: Section E – Half-cell potential on 4/10/12

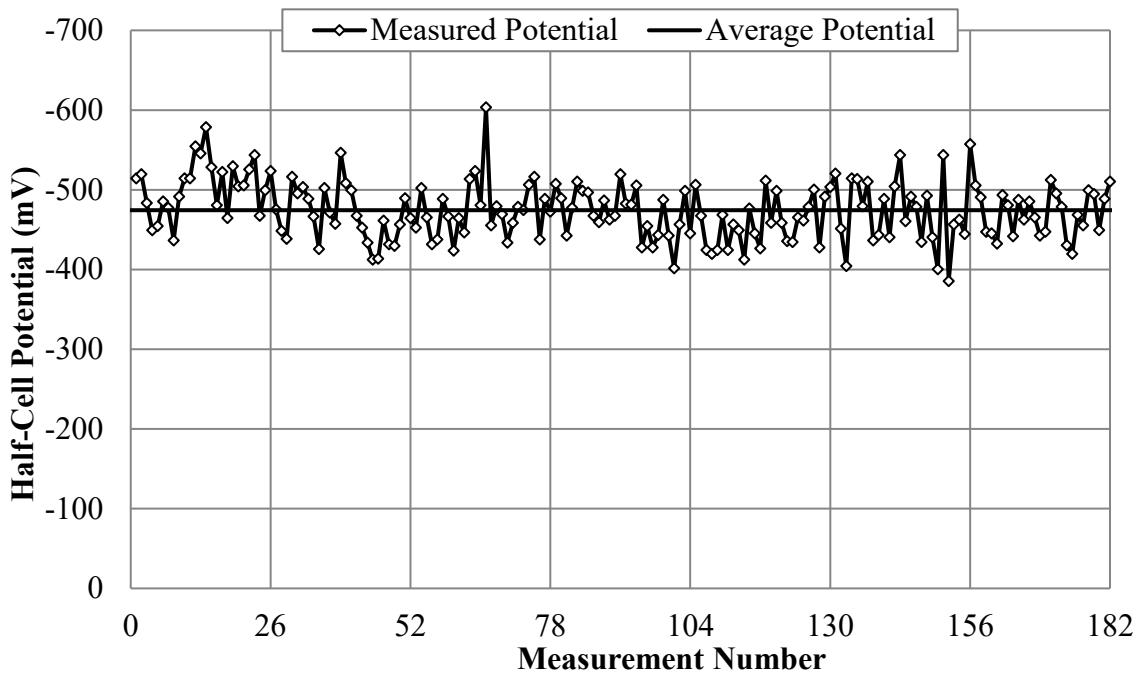


Figure F.25: Section E – Half-cell potential on 5/9/12

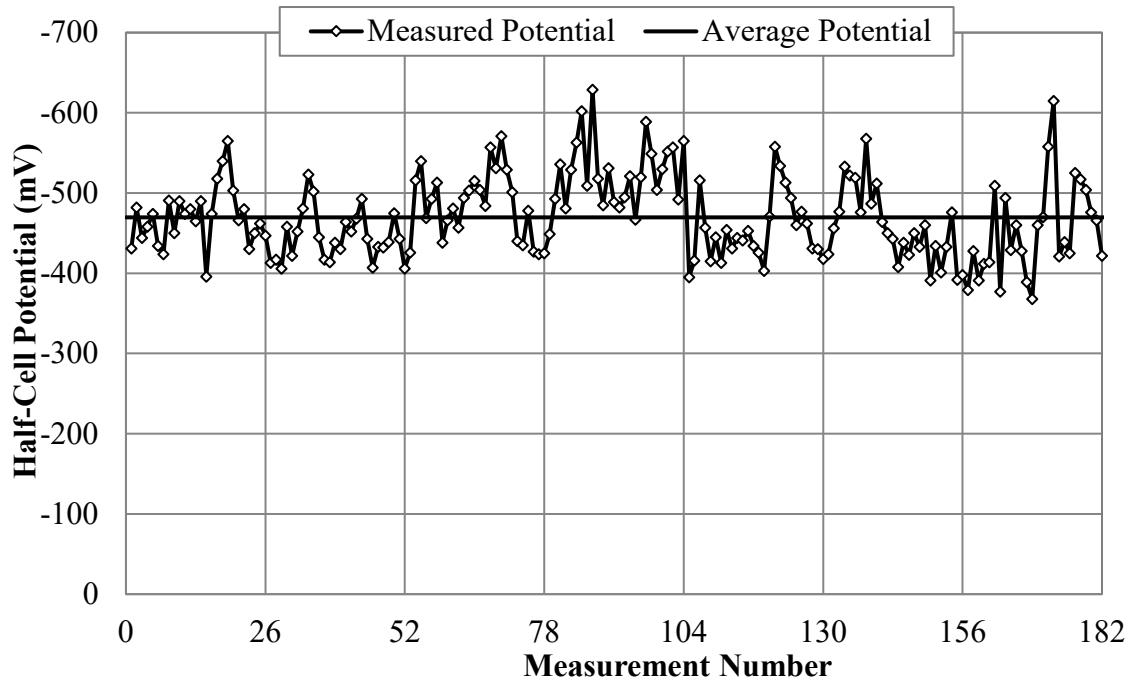


Figure F.26: Section F – Half-cell potential on 8/25/11

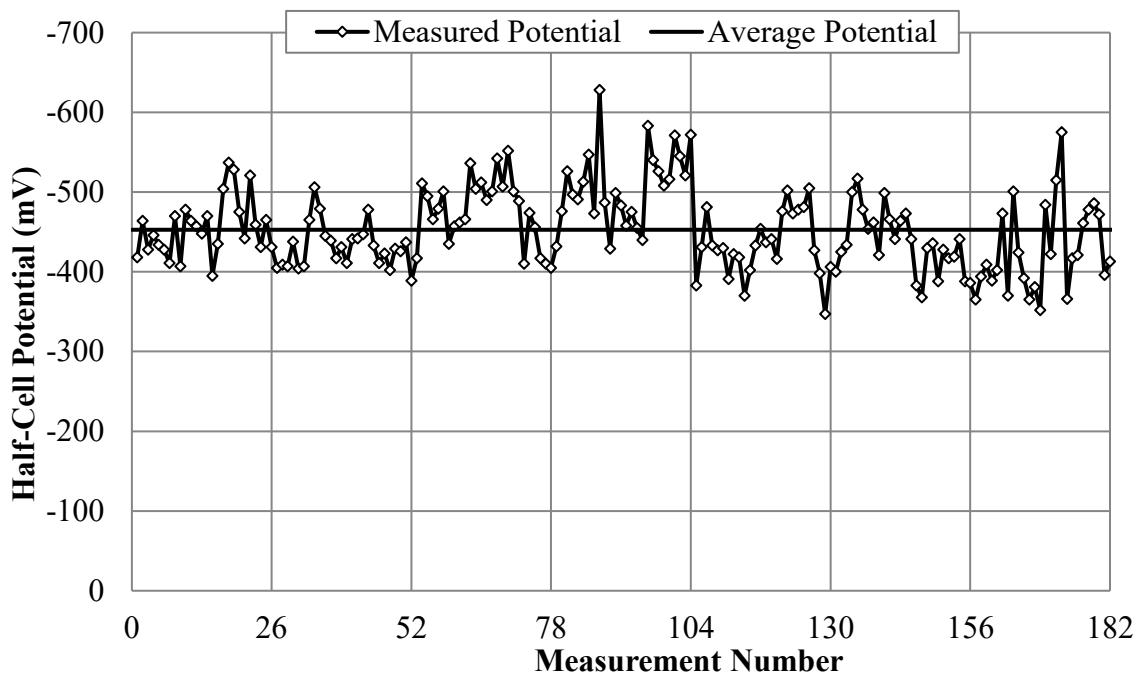


Figure F.27: Section F – Half-cell potential on 10/6/11

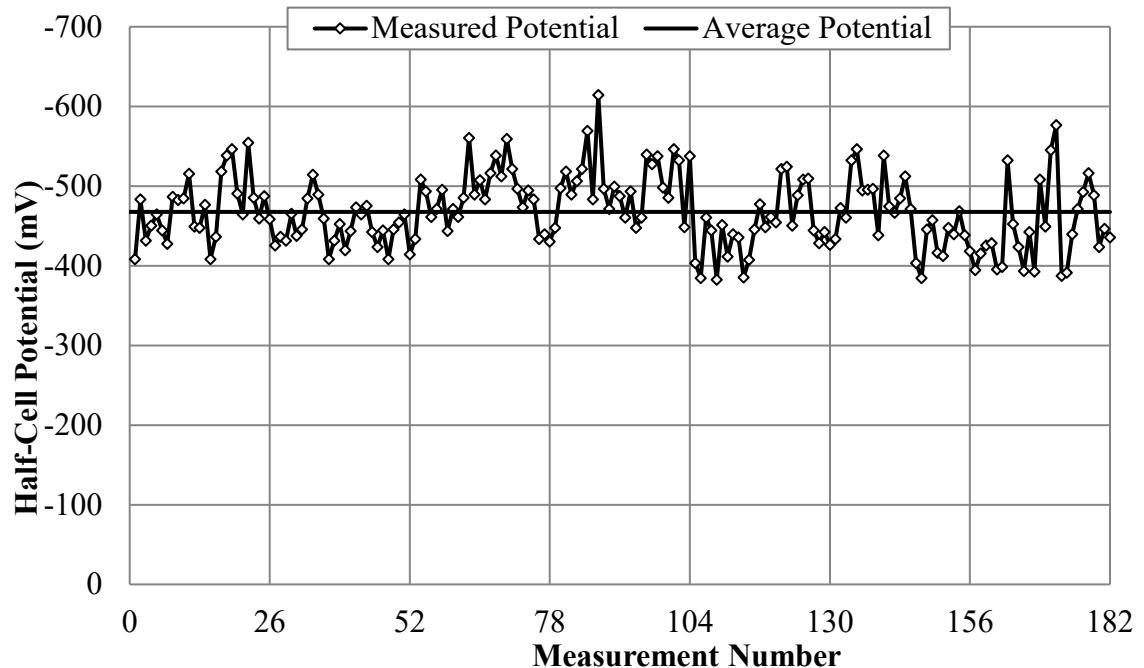


Figure F.28: Section F – Half-cell potential on 10/27/11

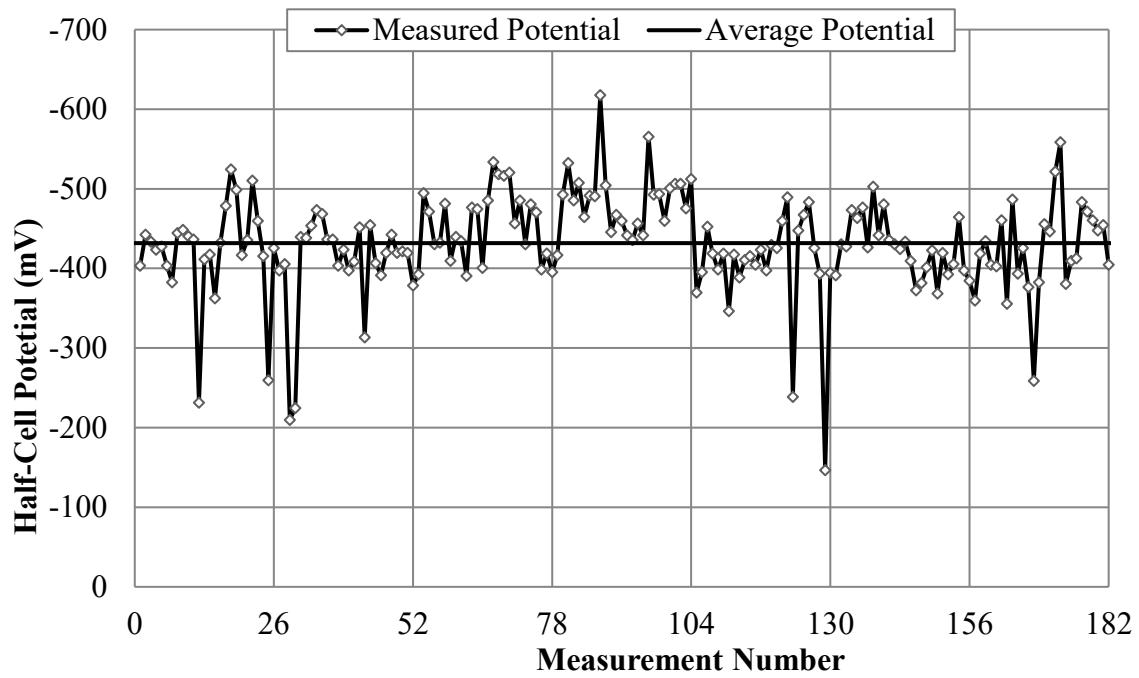


Figure F.29: Section F – Half-cell potential on 4/10/12

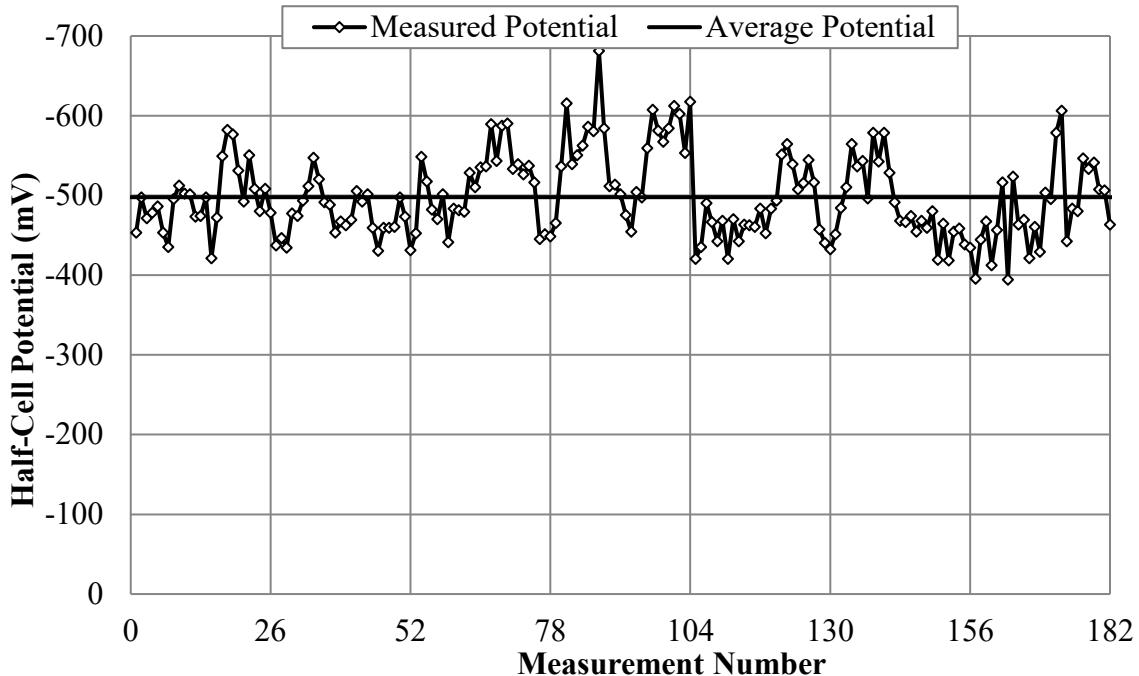


Figure F.30: Section F – Half-cell potential on 5/9/12

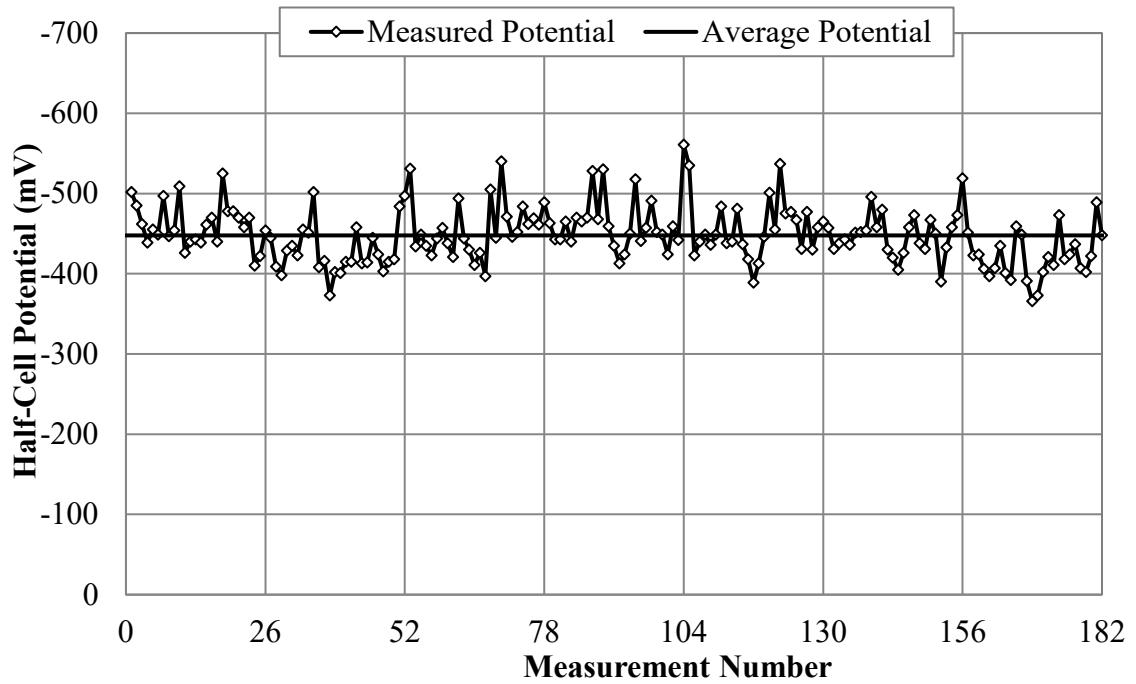


Figure F.31: Section G – Half-cell potential on 8/25/11

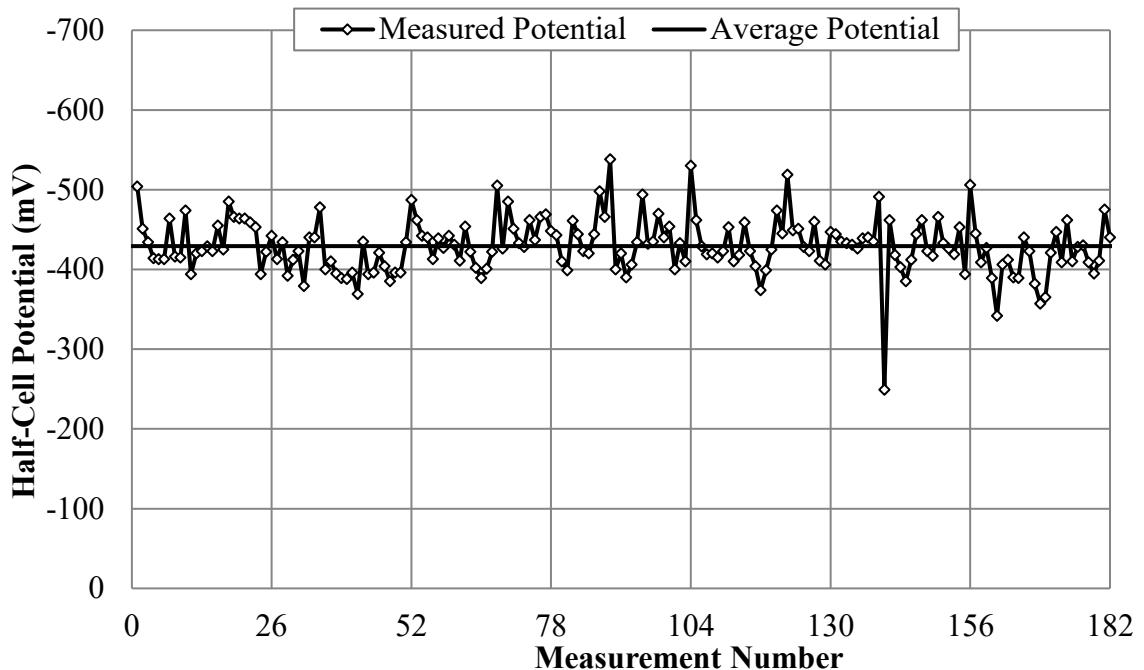


Figure F.32: Section G – Half-cell potential on 10/6/11

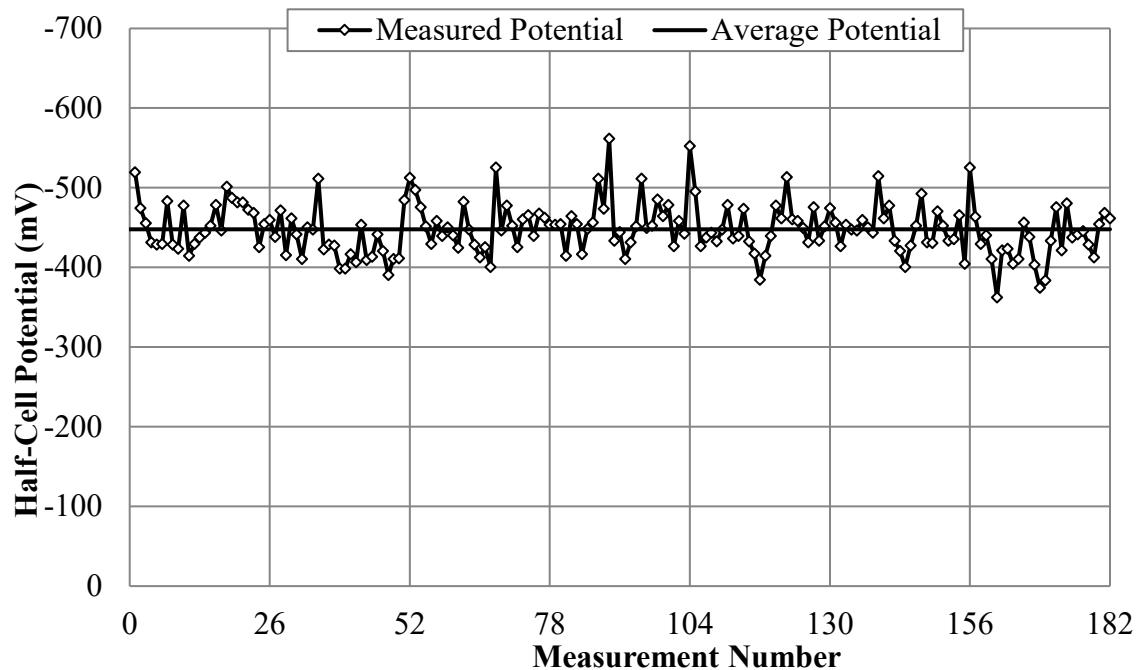


Figure F.33: Section G – Half-cell potential on 10/27/11

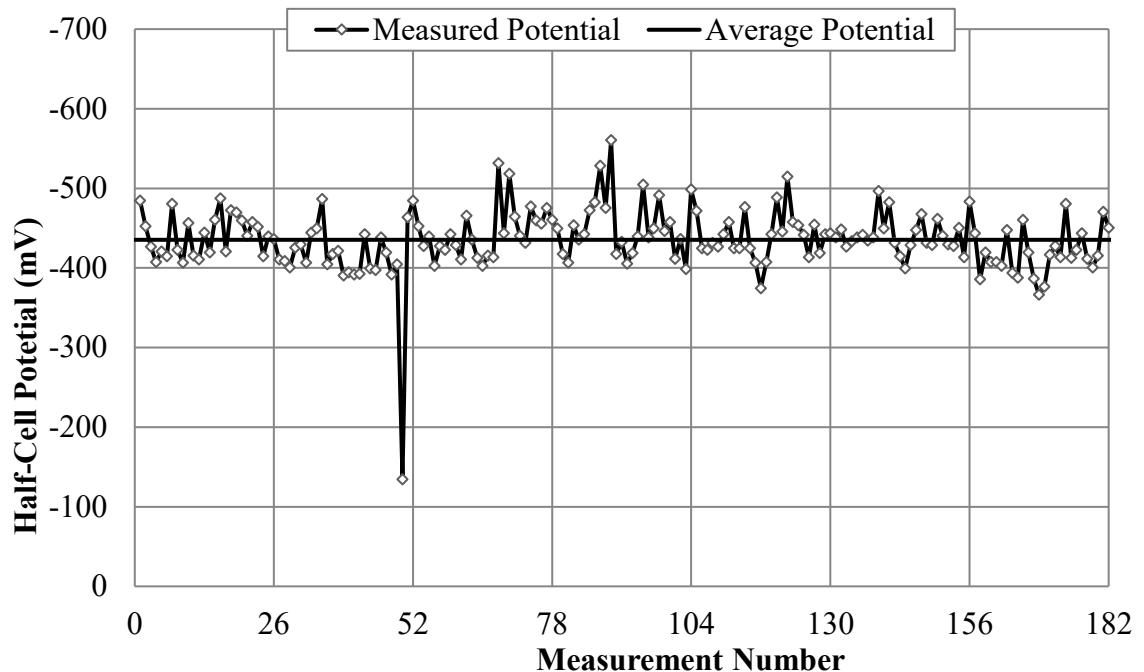


Figure F.34: Section G – Half-cell potential on 4/10/12

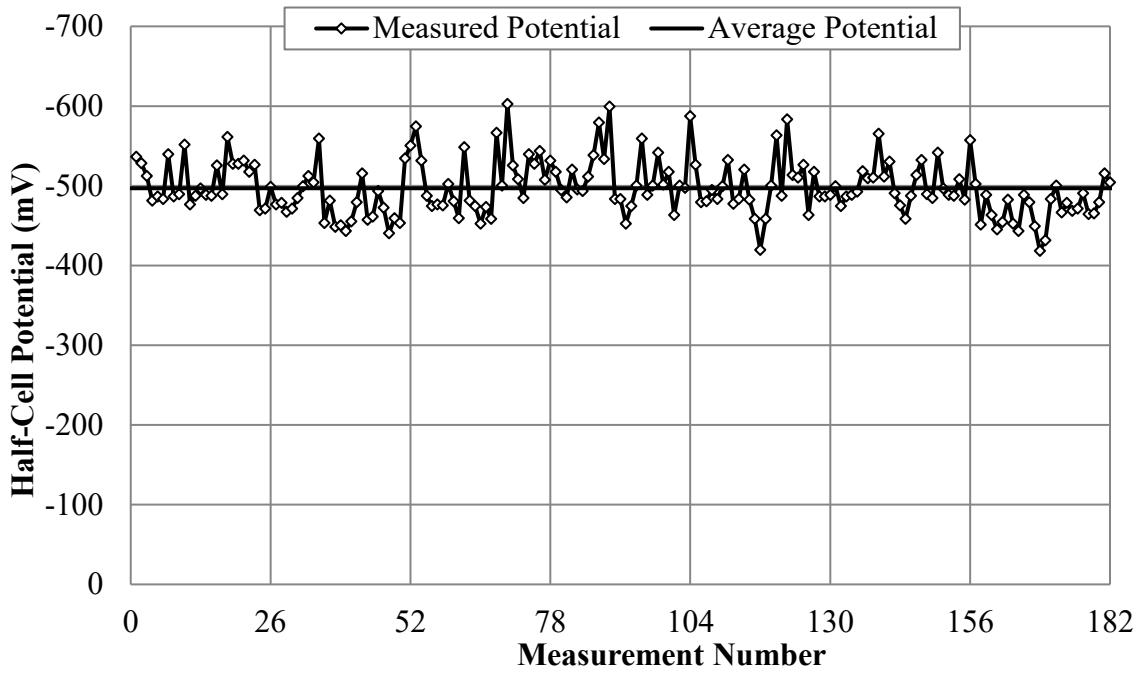


Figure F.35: Section G – Half-cell potential on 5/9/12

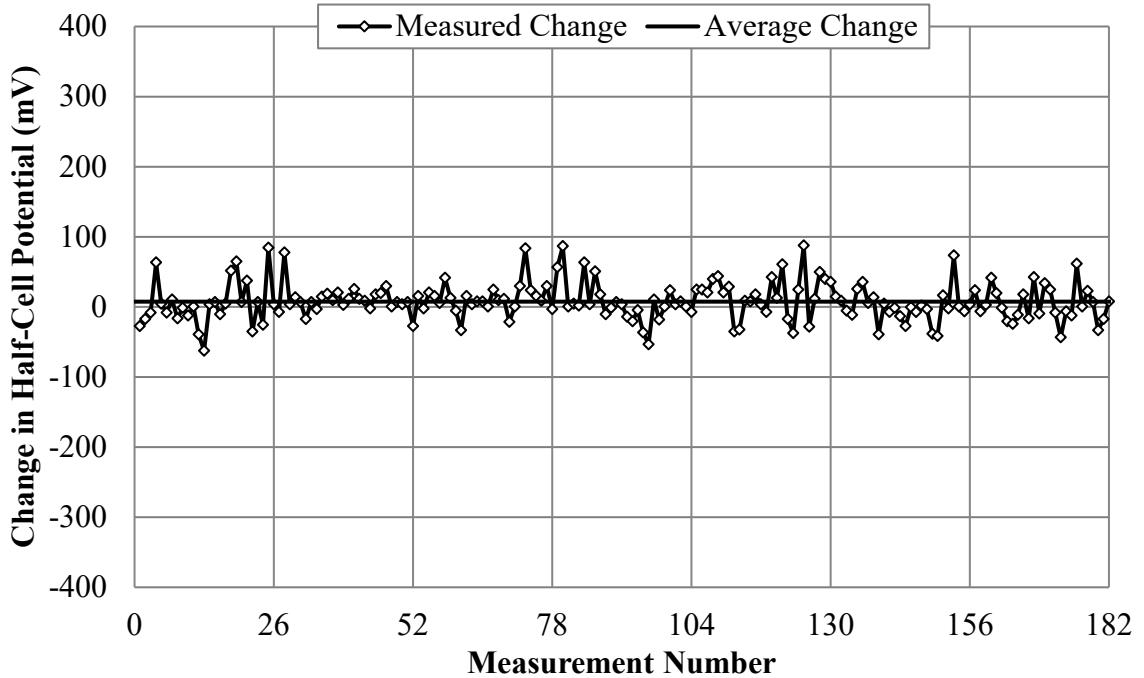


Figure F.36: Section A – Change in Half-cell potential from 8/25/11 to 10/6/11

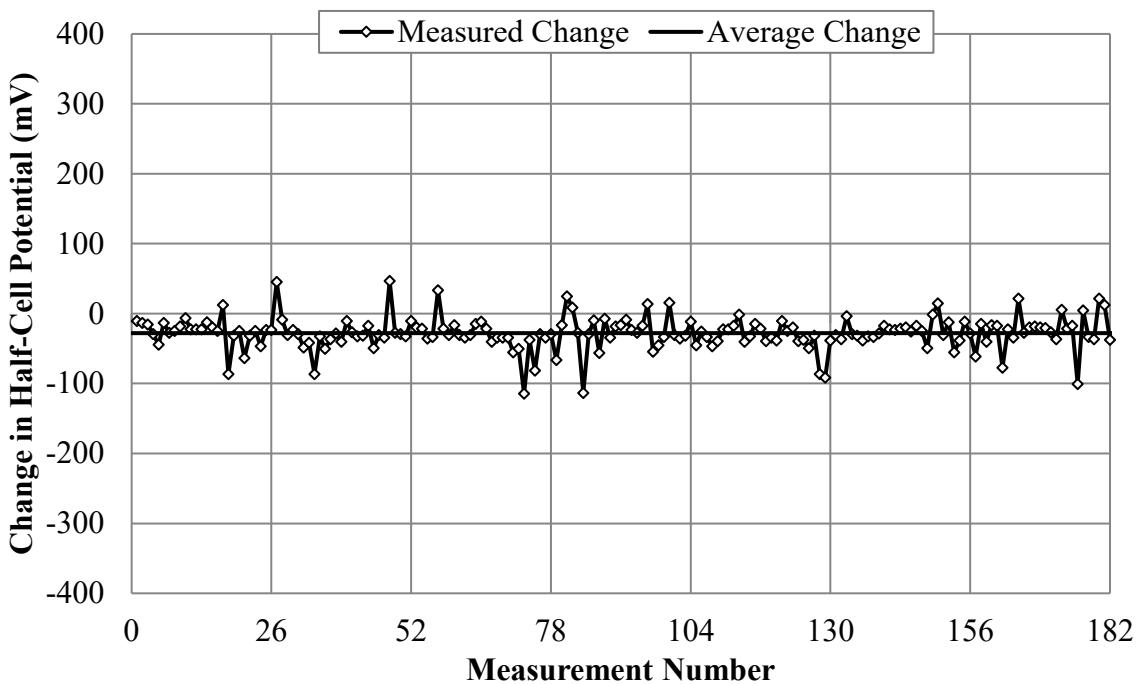


Figure F.37: Section A – Change in Half-cell potential from 10/6/11 to 10/27/11

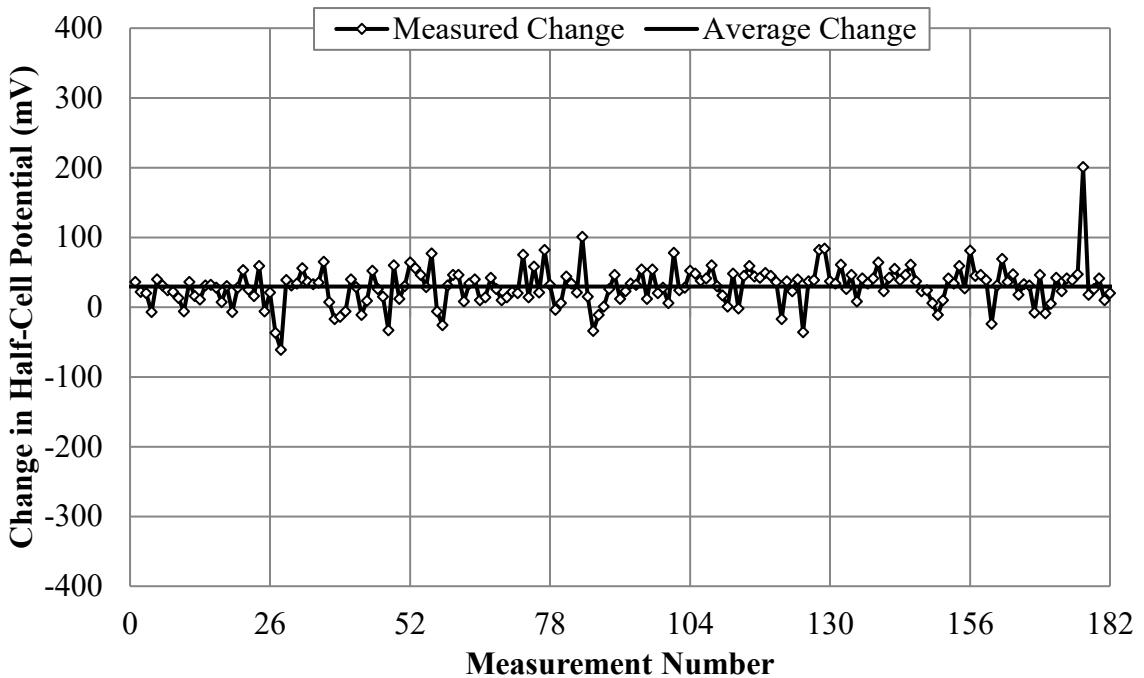


Figure F.38: Section A – Change in Half-cell potential from 10/27/11 to 4/10/12

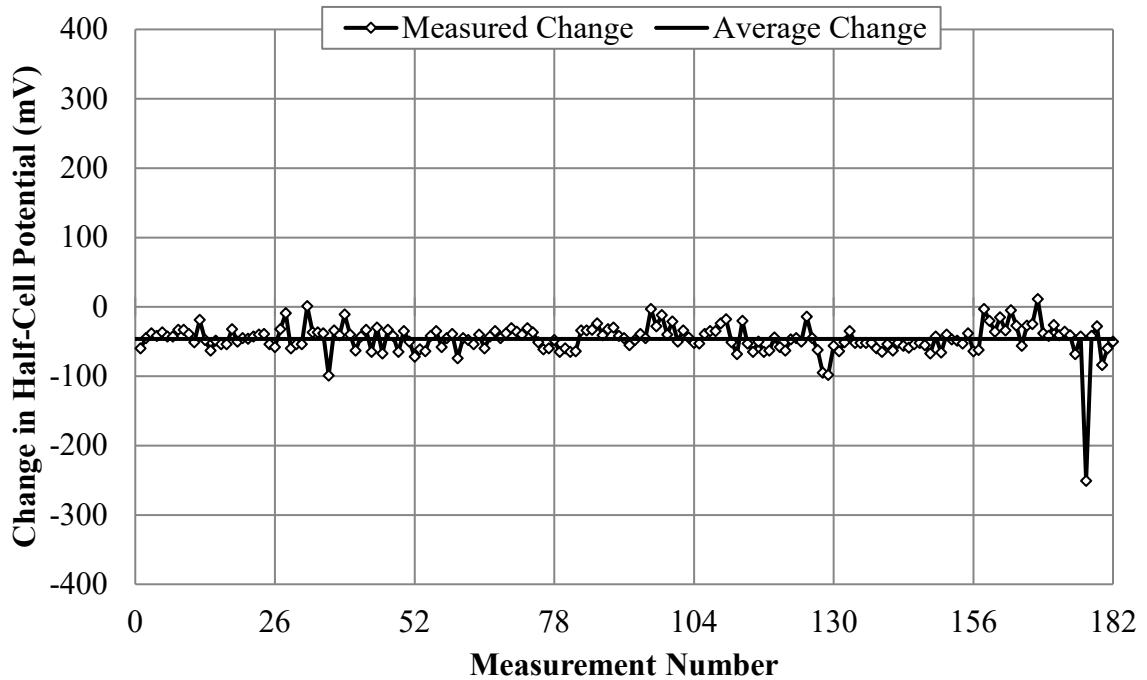


Figure F.39: Section A – Change in Half-cell potential from 4/10/12 to 5/9/12

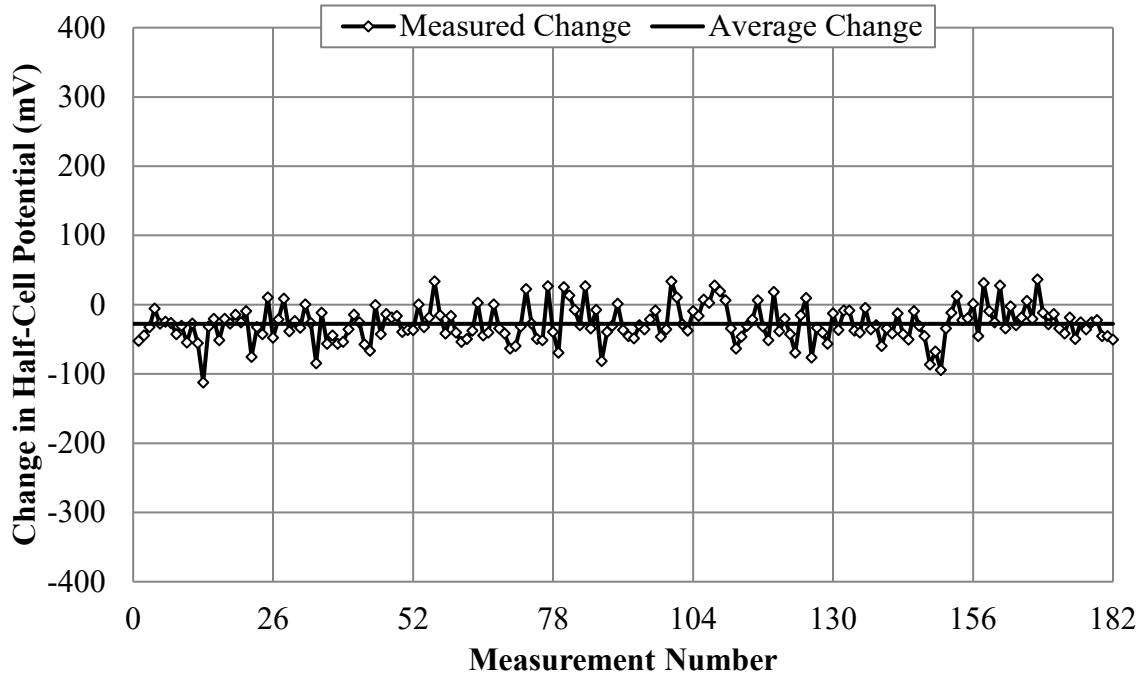


Figure F.40: Section A – Change in Half-cell potential from 8/25/11 to 5/9/12

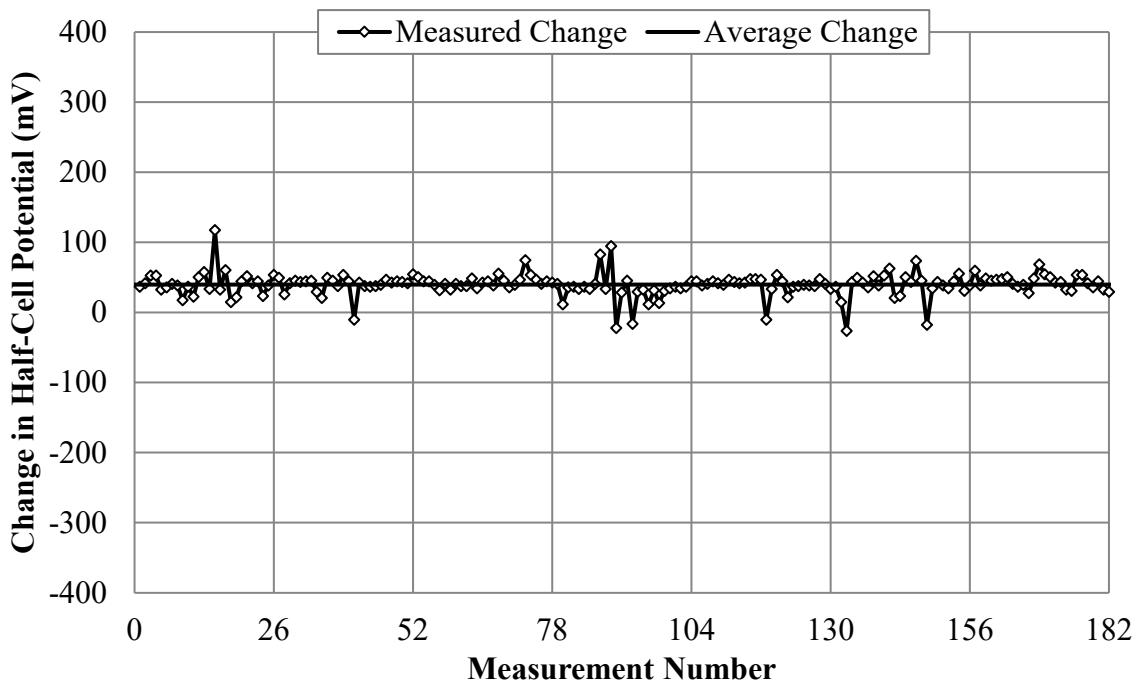


Figure F.41: Section B – Change in Half-cell potential from 8/25/11 to 10/6/11

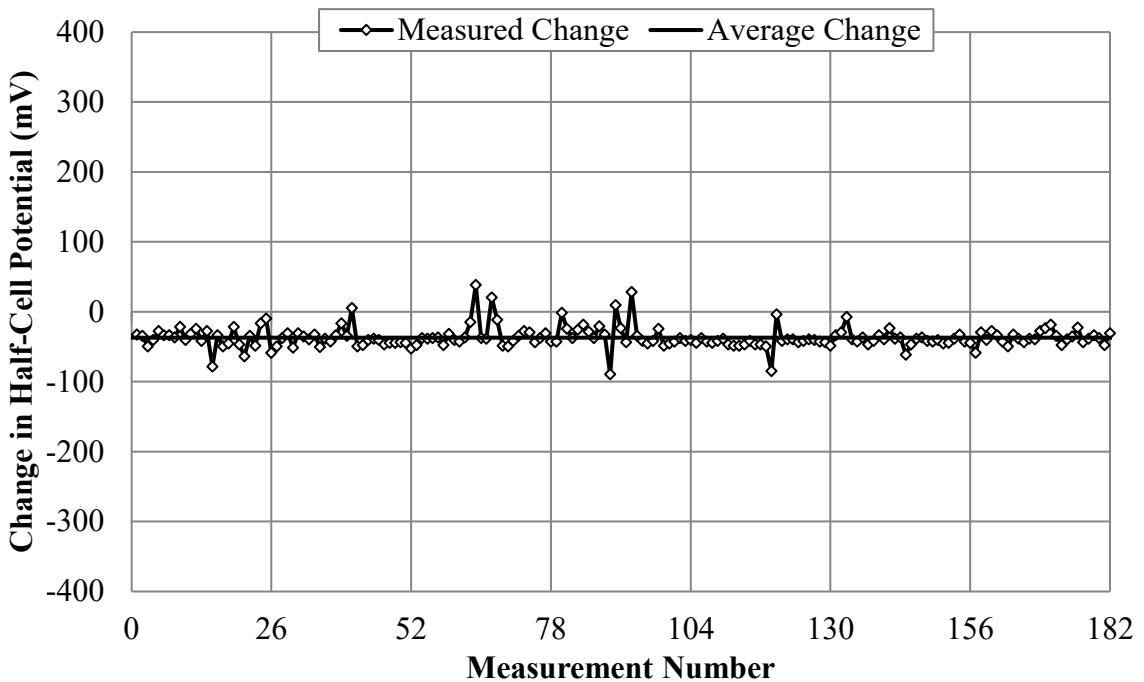


Figure F.42: Section B – Change in Half-cell potential from 10/6/11 to 10/27/11

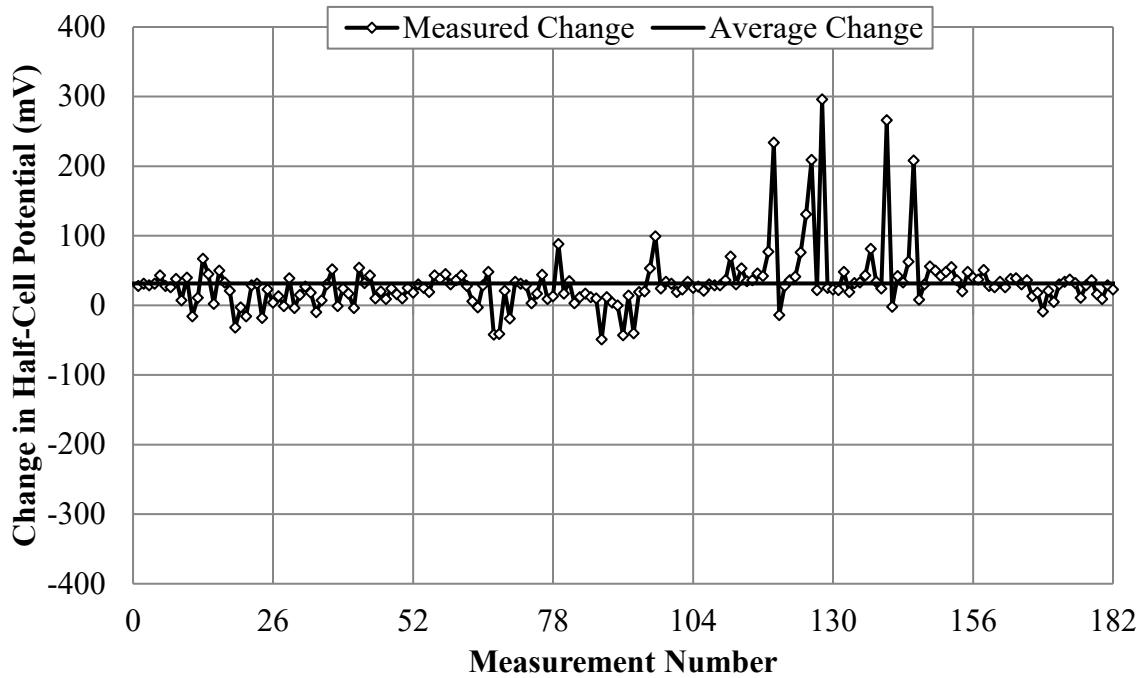


Figure F.43: Section B – Change in Half-cell potential from 10/27/11 to 4/10/12

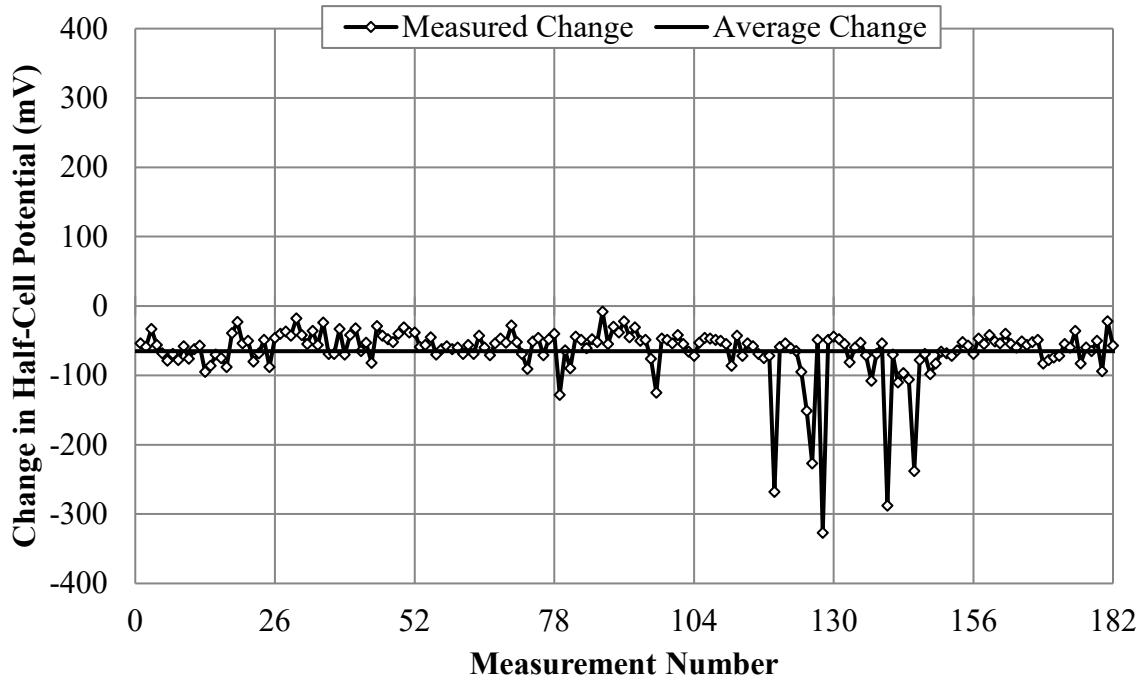


Figure F.44: Section B – Change in Half-cell potential from 4/10/12 to 5/9/12

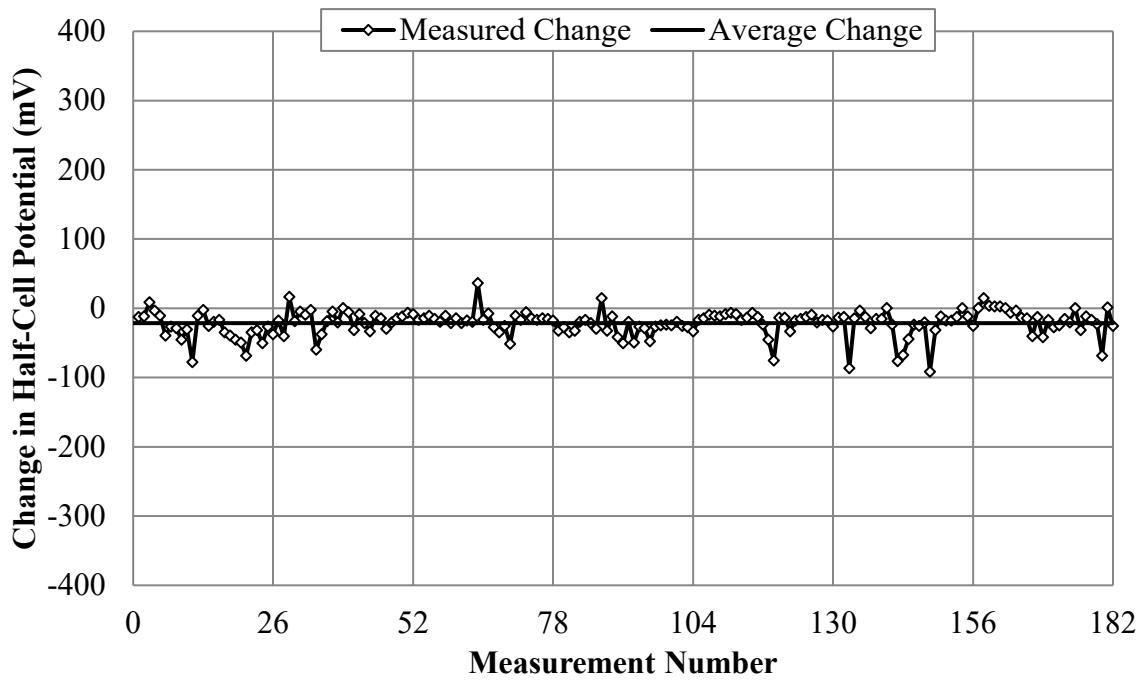


Figure F.45: Section B – Change in Half-cell potential from 8/25/11 to 5/9/12

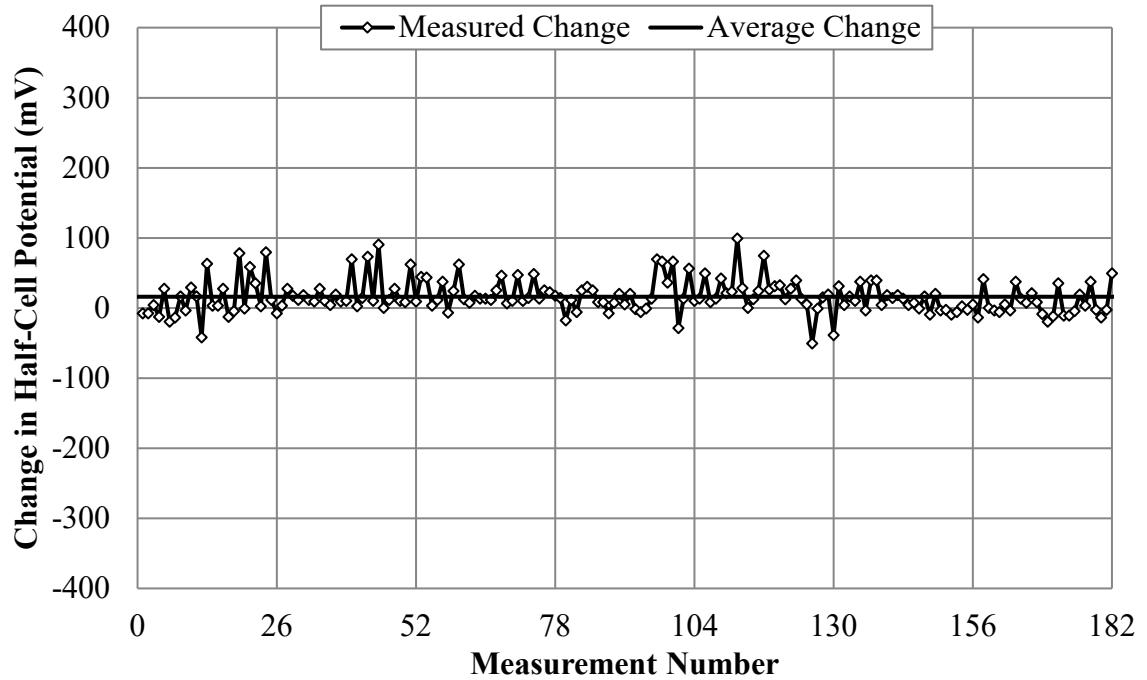


Figure F.46: Section C – Change in Half-cell potential from 8/25/11 to 10/6/11

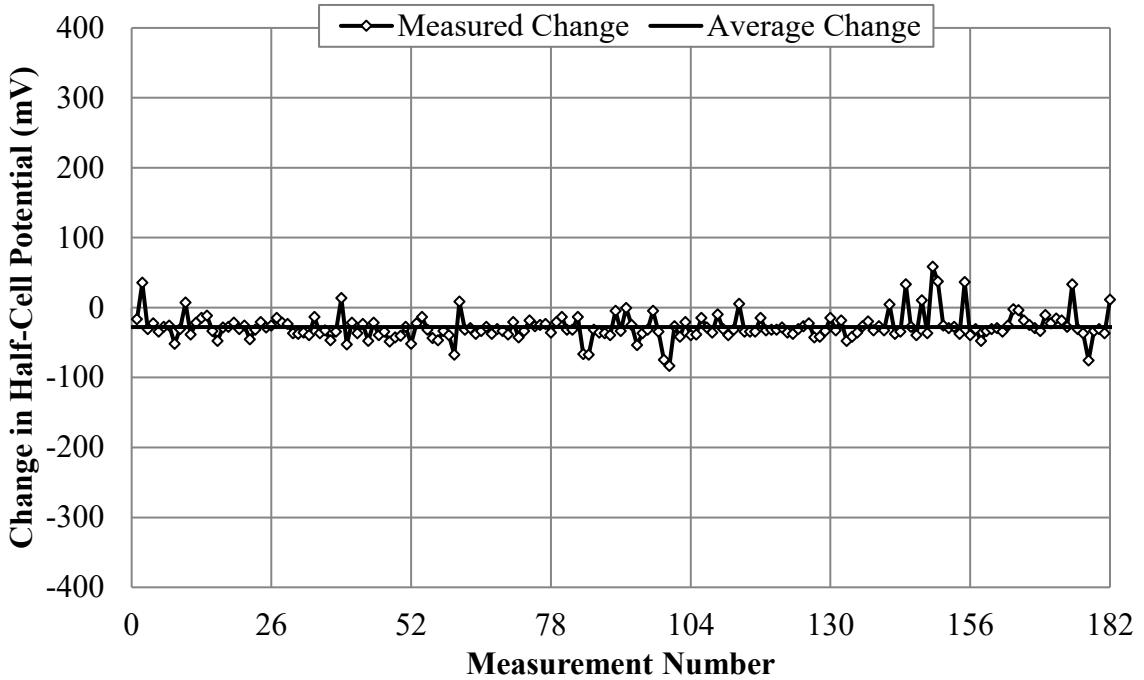


Figure F.47: Section C – Change in Half-cell potential from 10/6/11 to 10/27/11

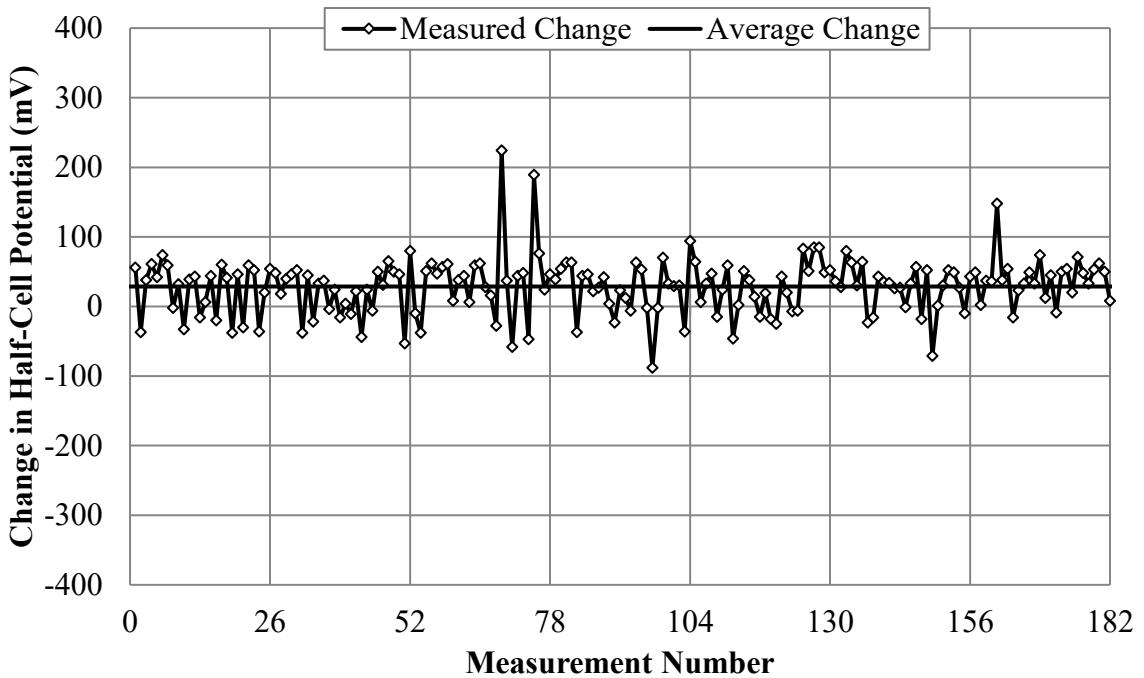


Figure F.48: Section C – Change in Half-cell potential from 10/27/11 to 4/10/12

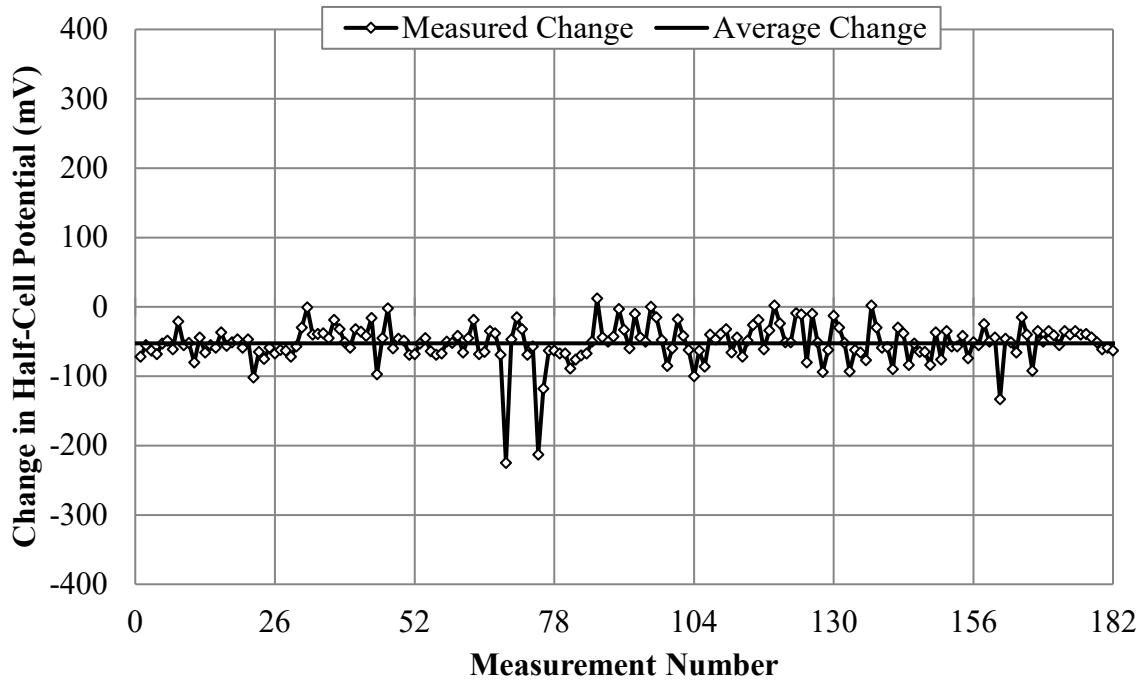


Figure F.49: Section C – Change in Half-cell potential from 4/10/12 to 5/9/12

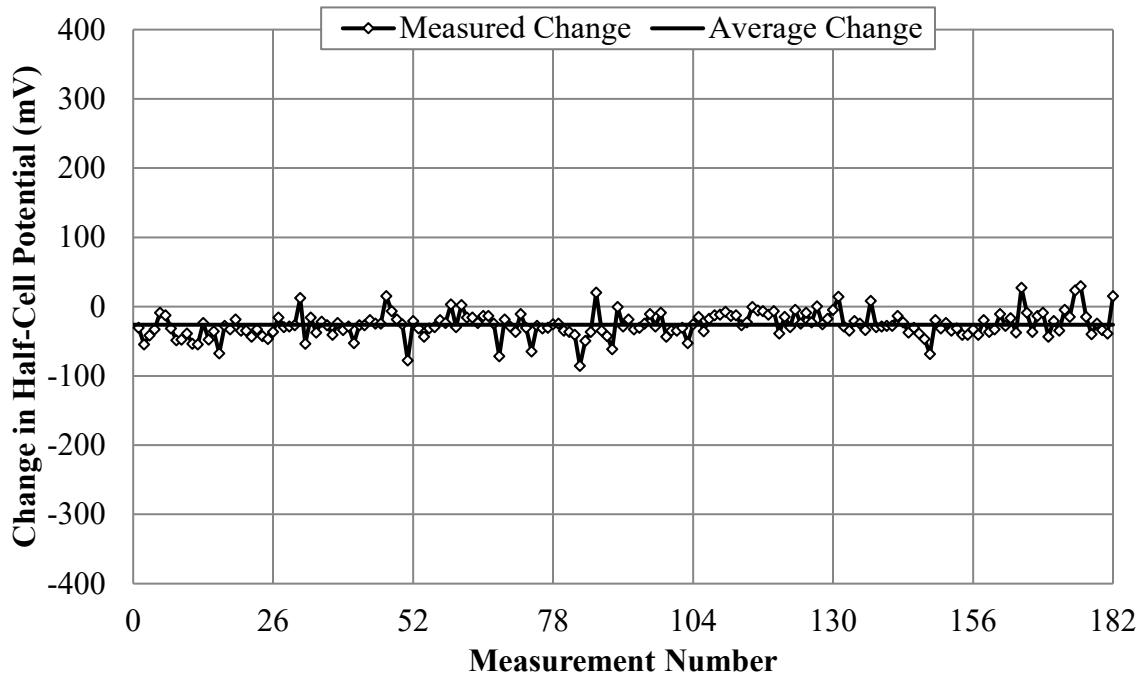


Figure F.50: Section C – Change in Half-cell potential from 8/25/11 to 5/9/12

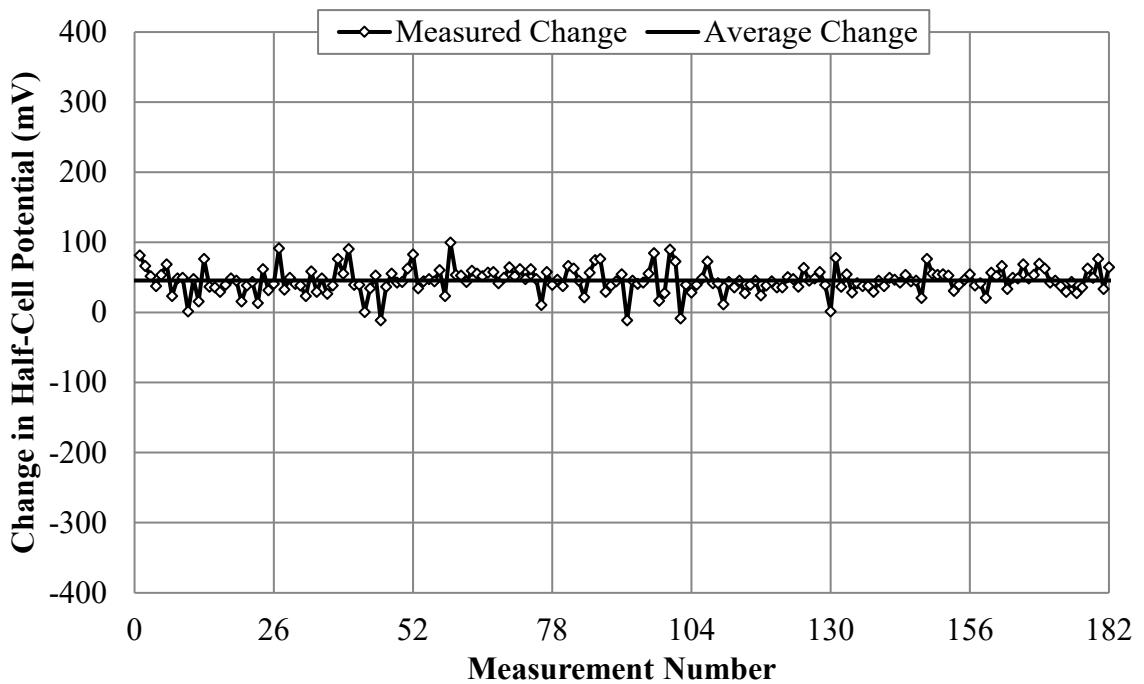


Figure F.51: Section D – Change in Half-cell potential from 8/25/11 to 10/6/11

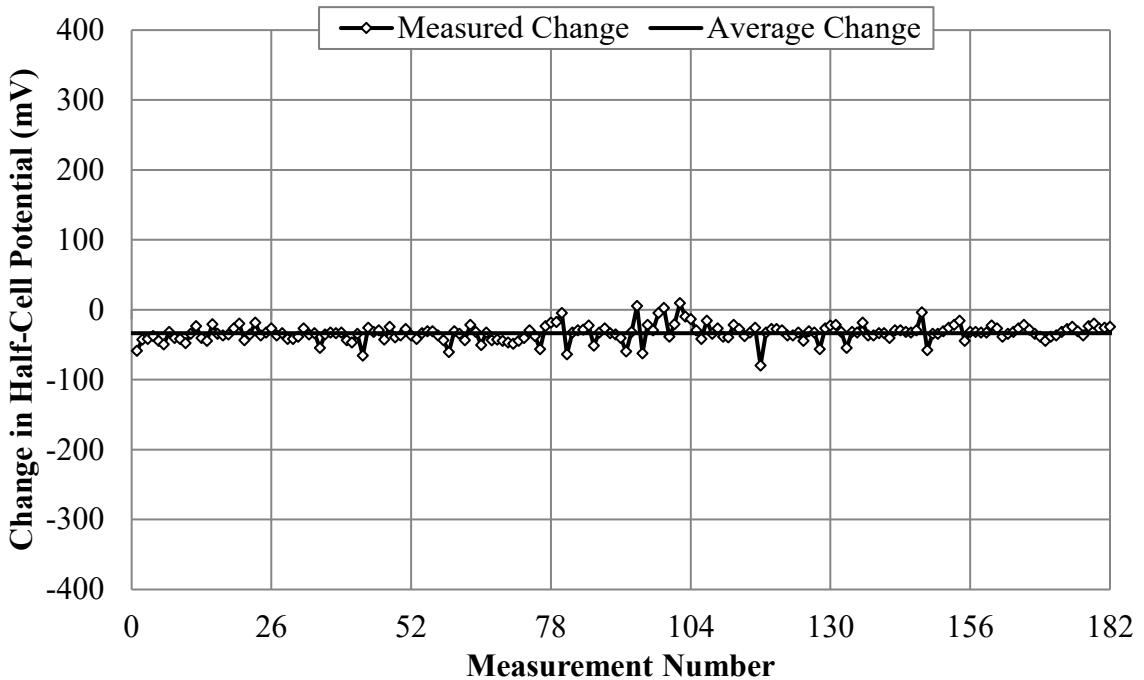


Figure F.52: Section D – Change in Half-cell potential from 10/6/11 to 10/27/11

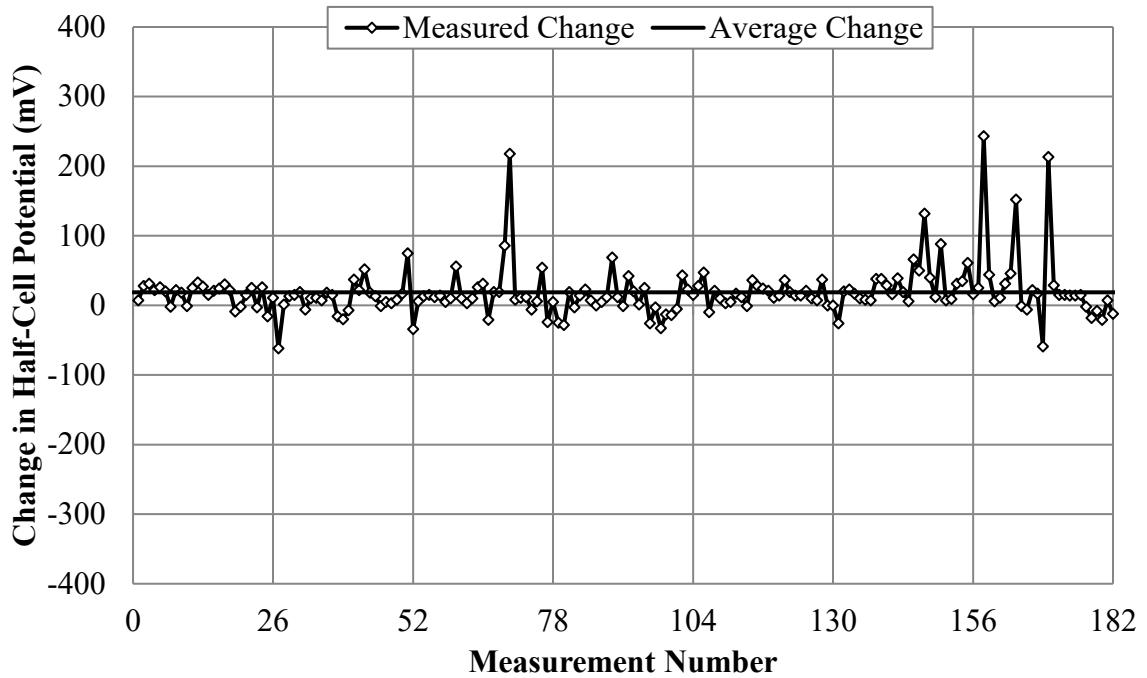


Figure F.53: Section D – Change in Half-cell potential from 10/27/11 to 4/10/12

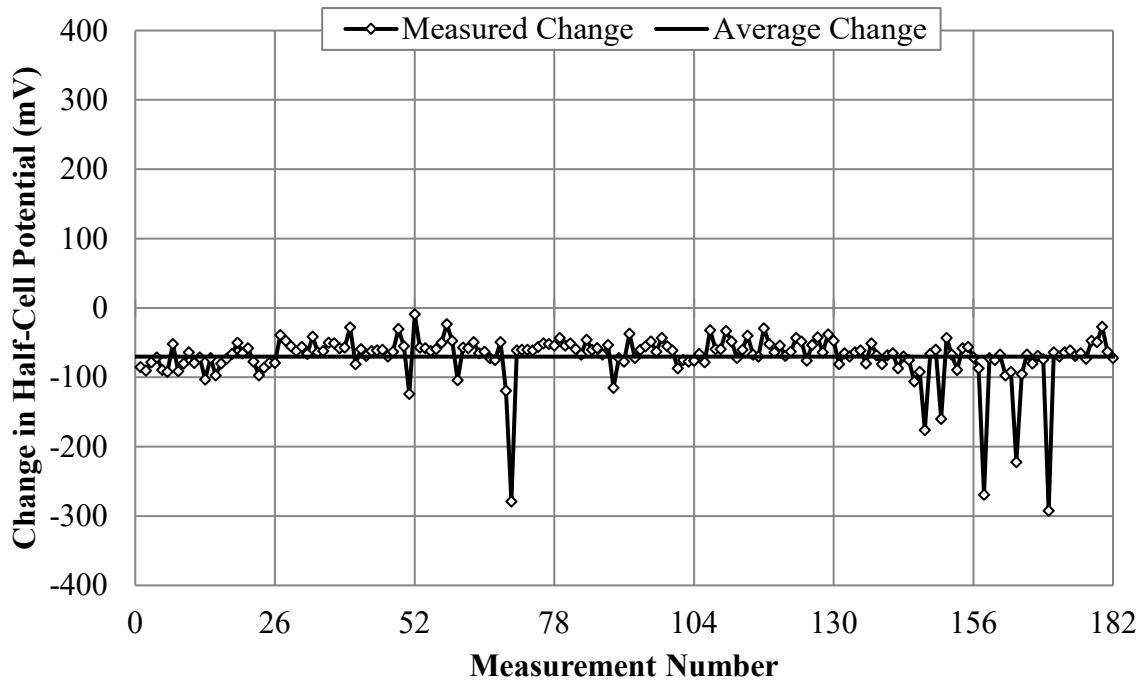


Figure F.54: Section D – Change in Half-cell potential from 4/10/12 to 5/9/12

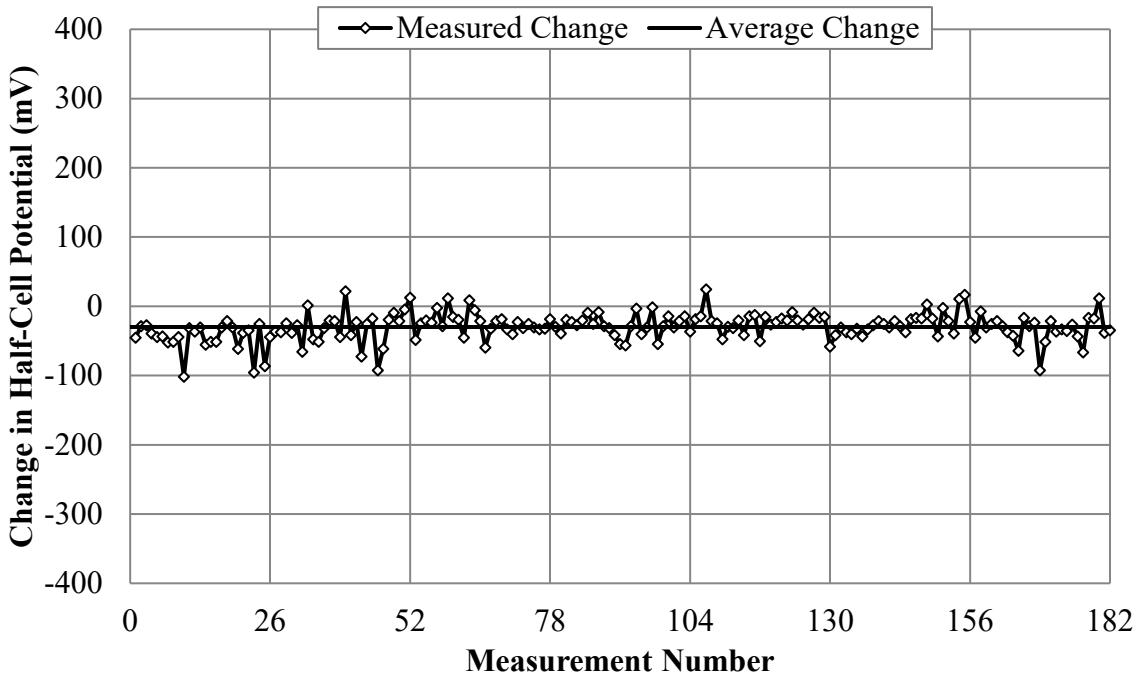


Figure F.55: Section D – Change in Half-cell potential from 8/25/11 to 5/9/12

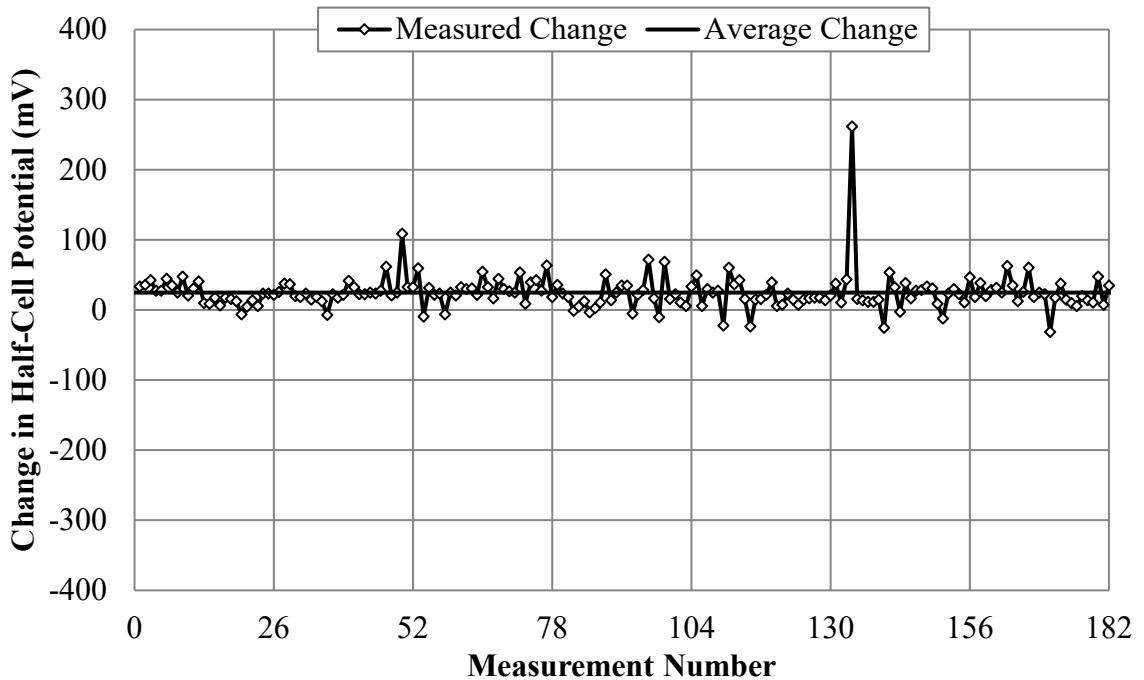


Figure F.56: Section E – Change in Half-cell potential from 8/25/11 to 10/6/11

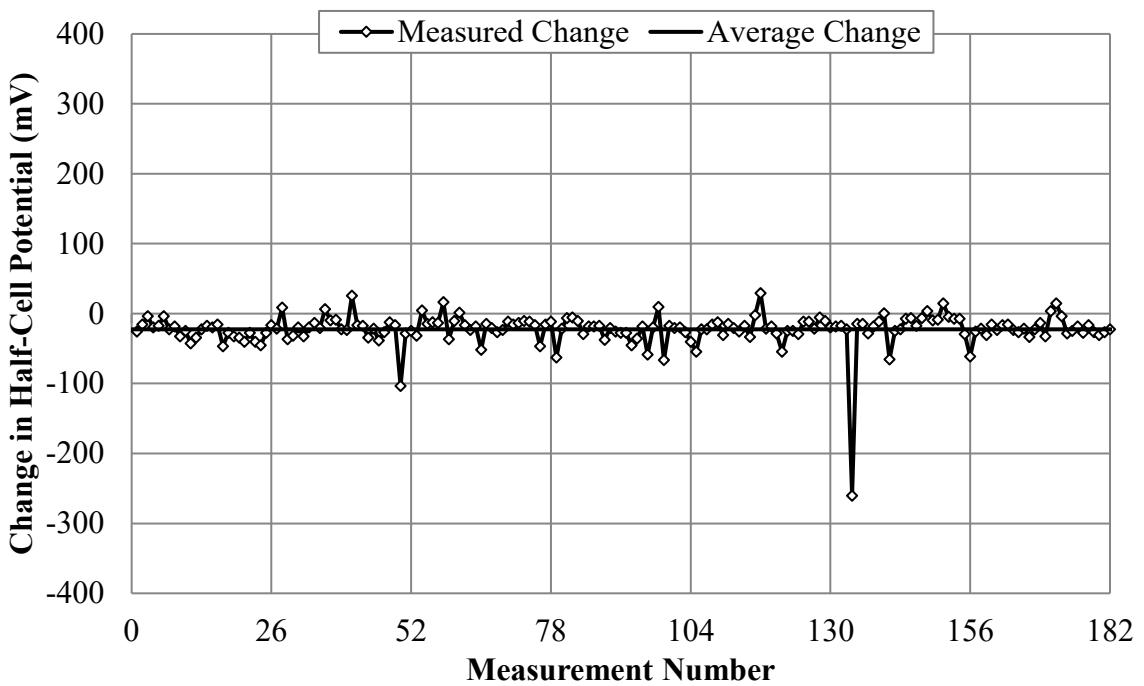


Figure F.57: Section E – Change in Half-cell potential from 10/6/11 to 10/27/11

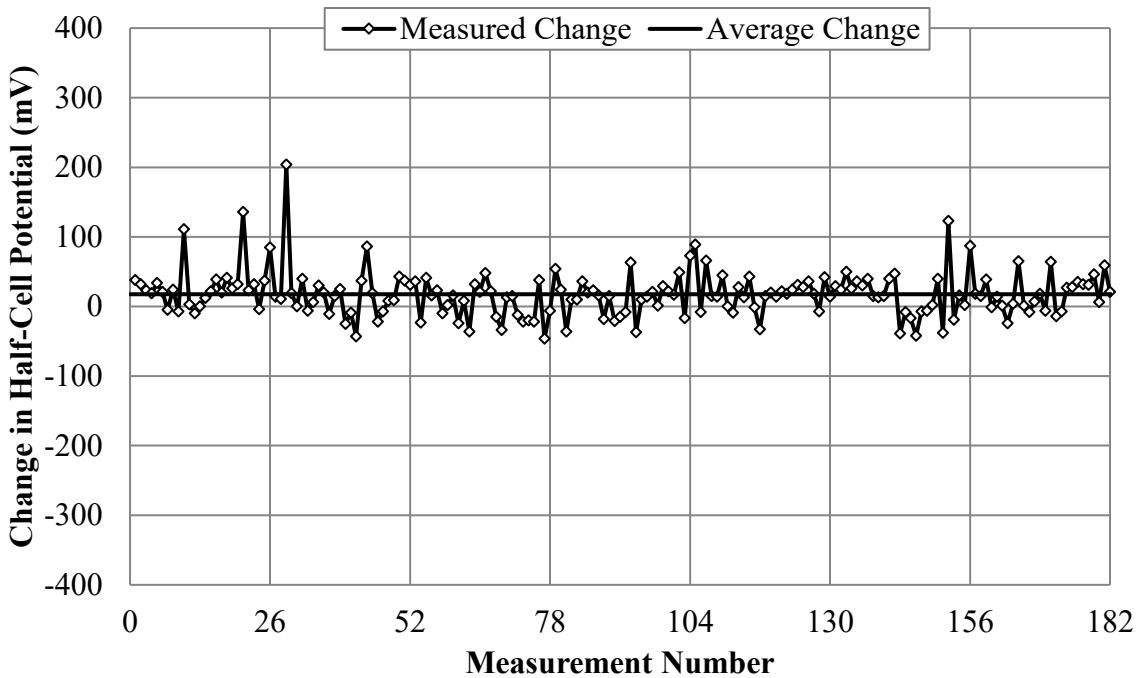


Figure F.58: Section E – Change in Half-cell potential from 10/27/11 to 4/10/12

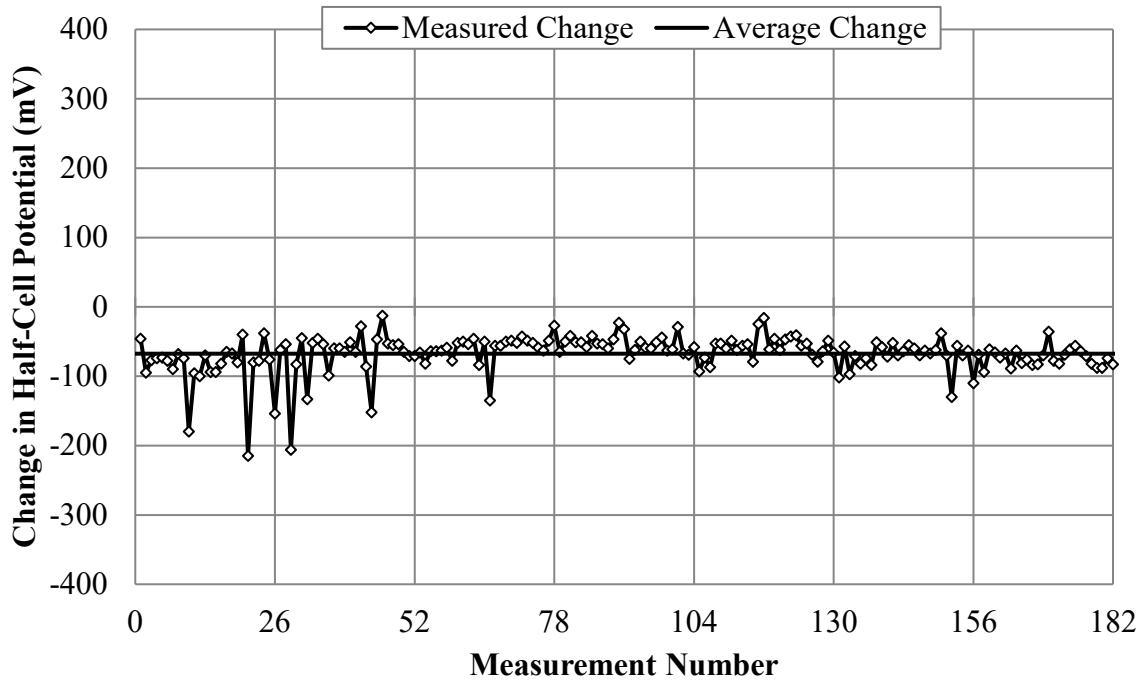


Figure F.59: Section E – Change in Half-cell potential from 4/10/12 to 5/9/12

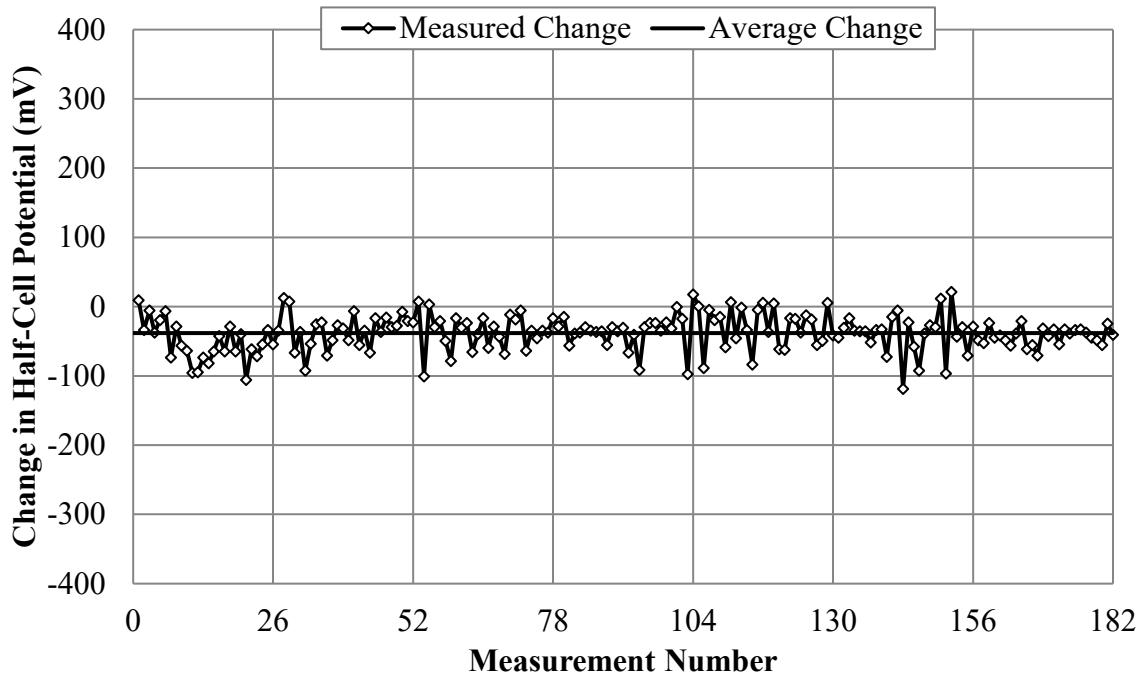


Figure F.60: Section E – Change in Half-cell potential from 8/25/11 to 5/9/12

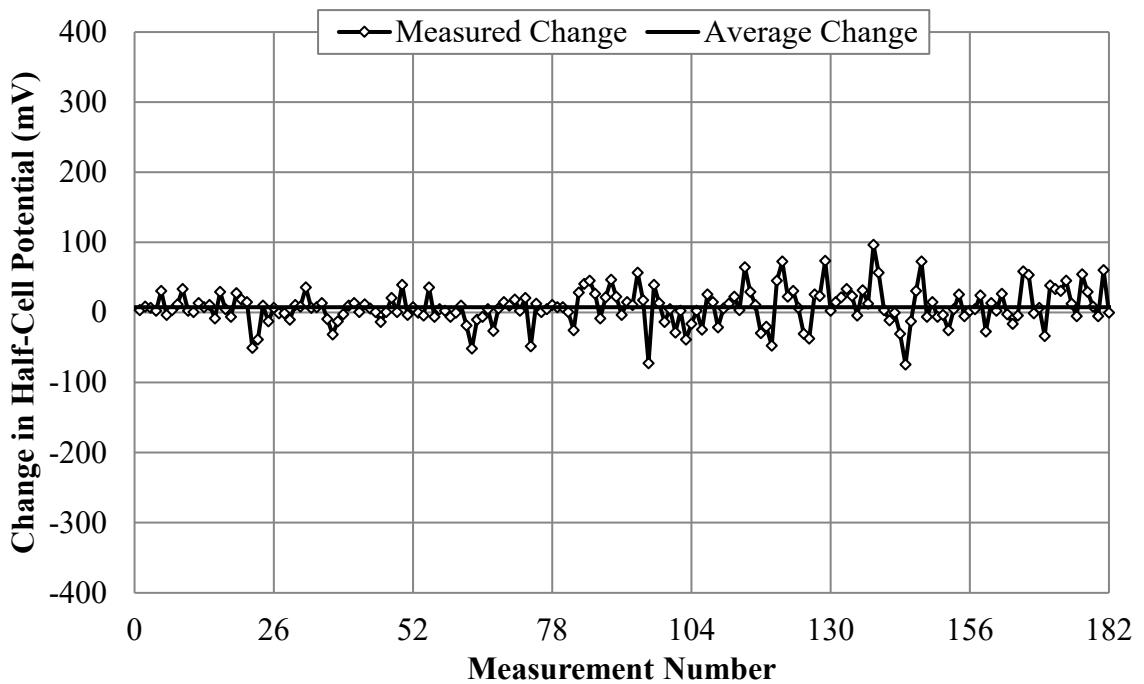


Figure F.61: Section F – Change in Half-cell potential from 8/25/11 to 10/6/11

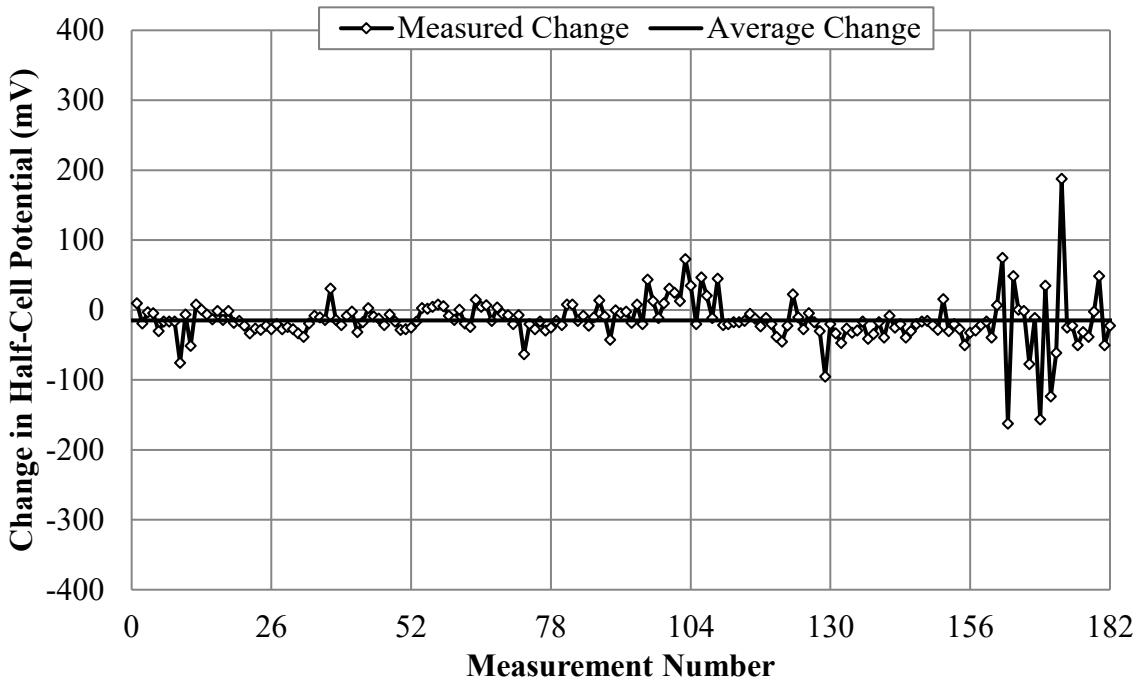


Figure F.62: Section F – Change in Half-cell potential from 10/6/11 to 10/27/11

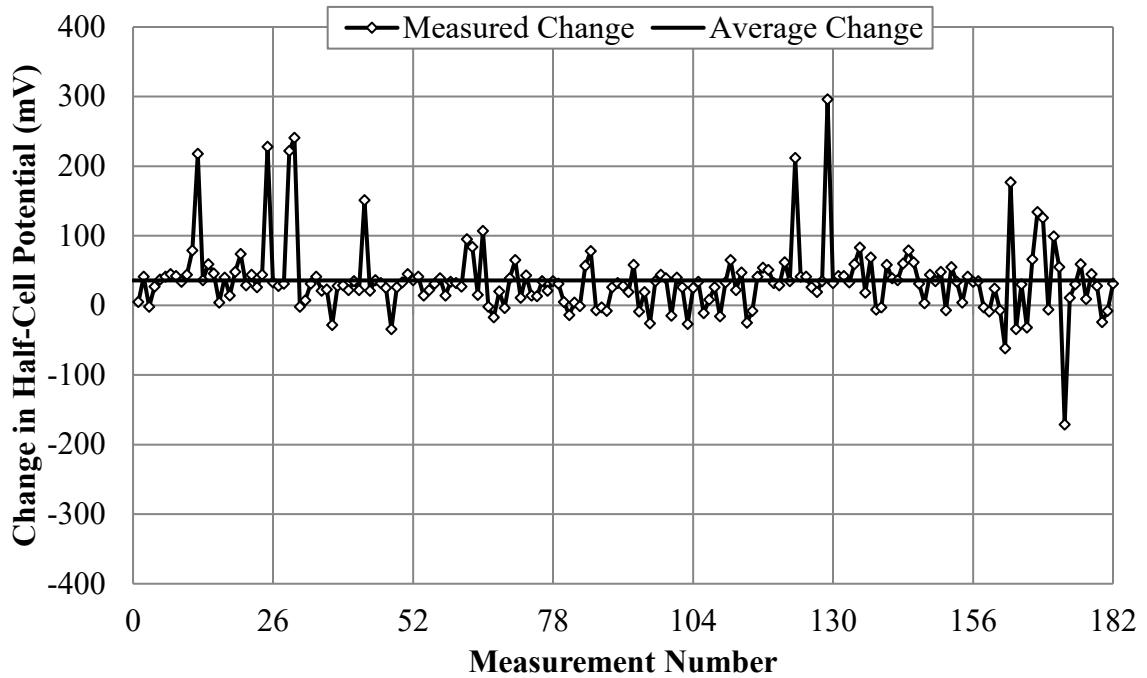


Figure F.63: Section F – Change in Half-cell potential from 10/27/11 to 4/10/12

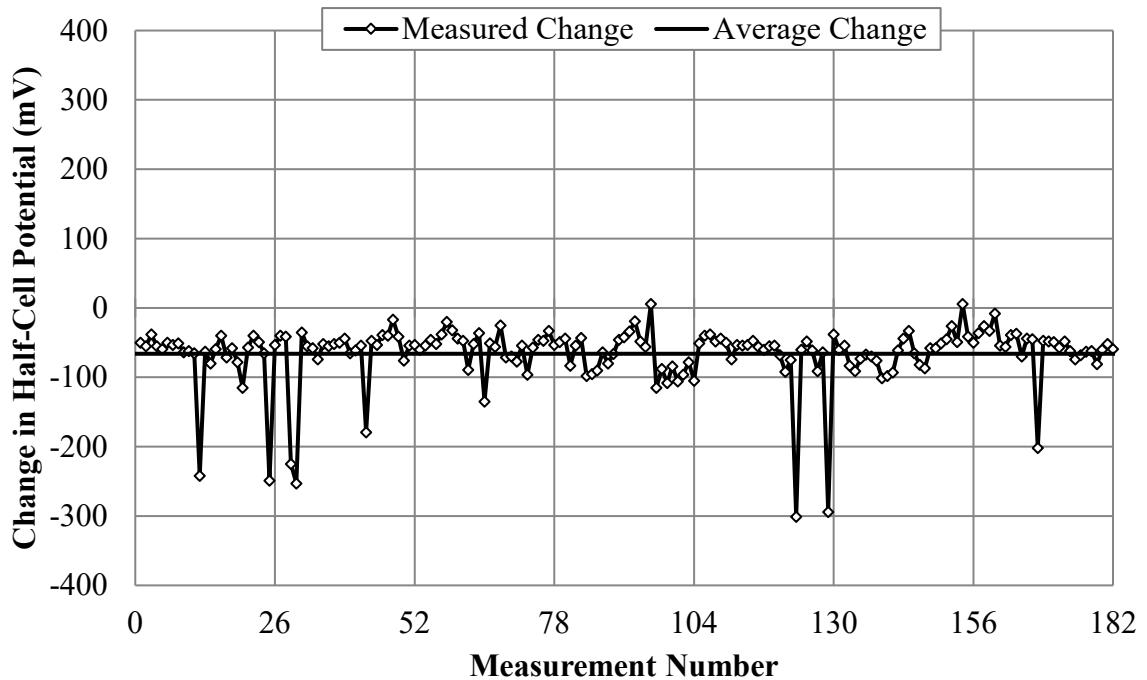


Figure F.64: Section F – Change in Half-cell potential from 4/10/12 to 5/9/12

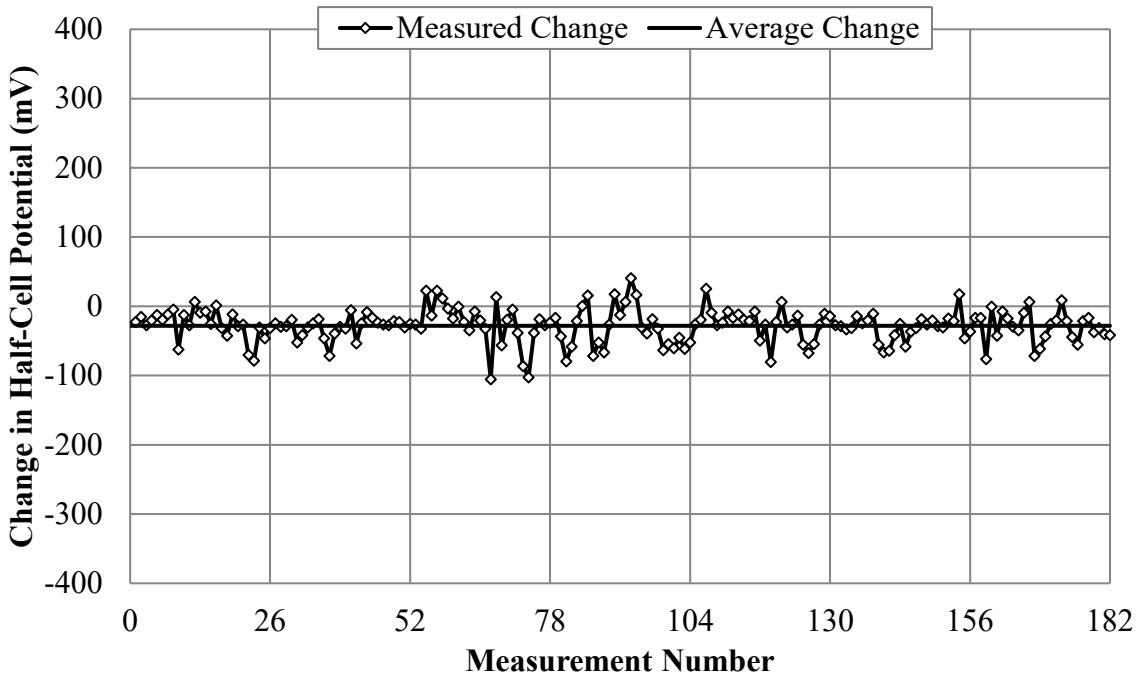


Figure F.65: Section F – Change in Half-cell potential from 8/25/11 to 5/9/12

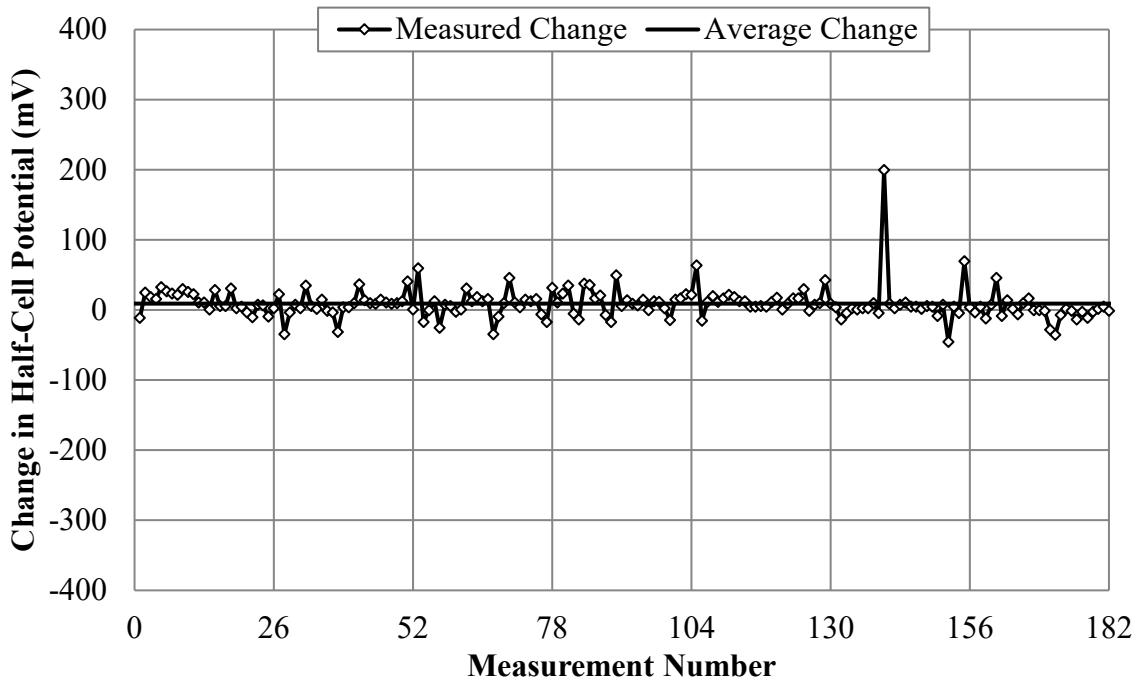


Figure F.66: Section G – Change in Half-cell potential from 8/25/11 to 10/6/11

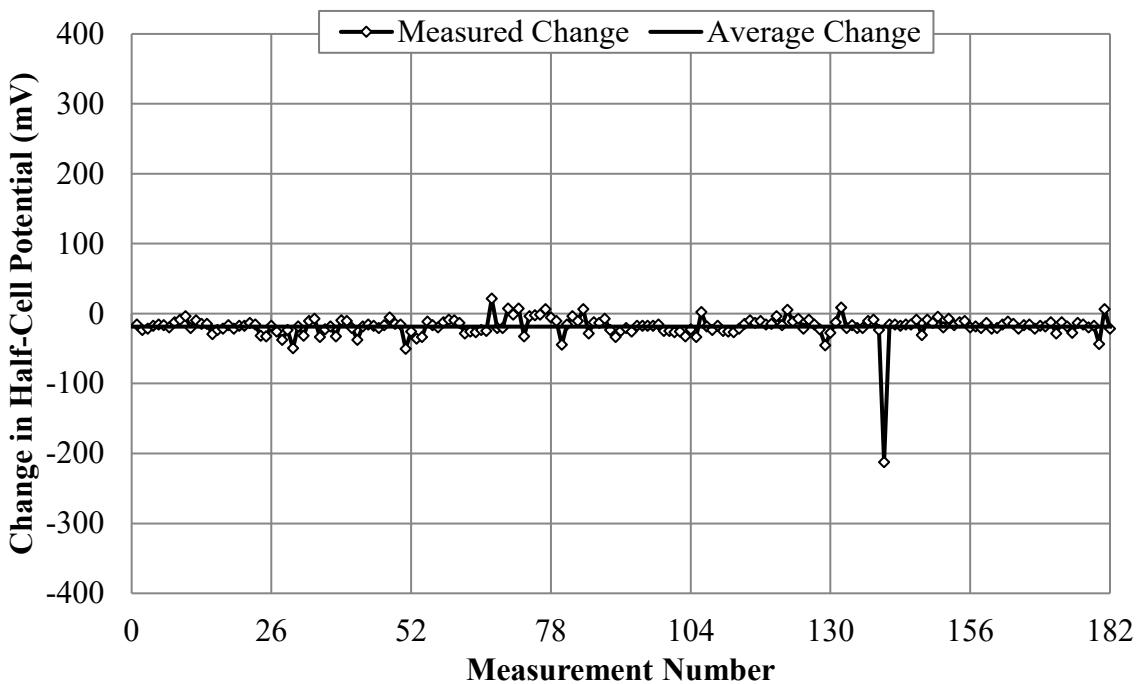


Figure F.67: Section G – Change in Half-cell potential from 10/6/11 to 10/27/11

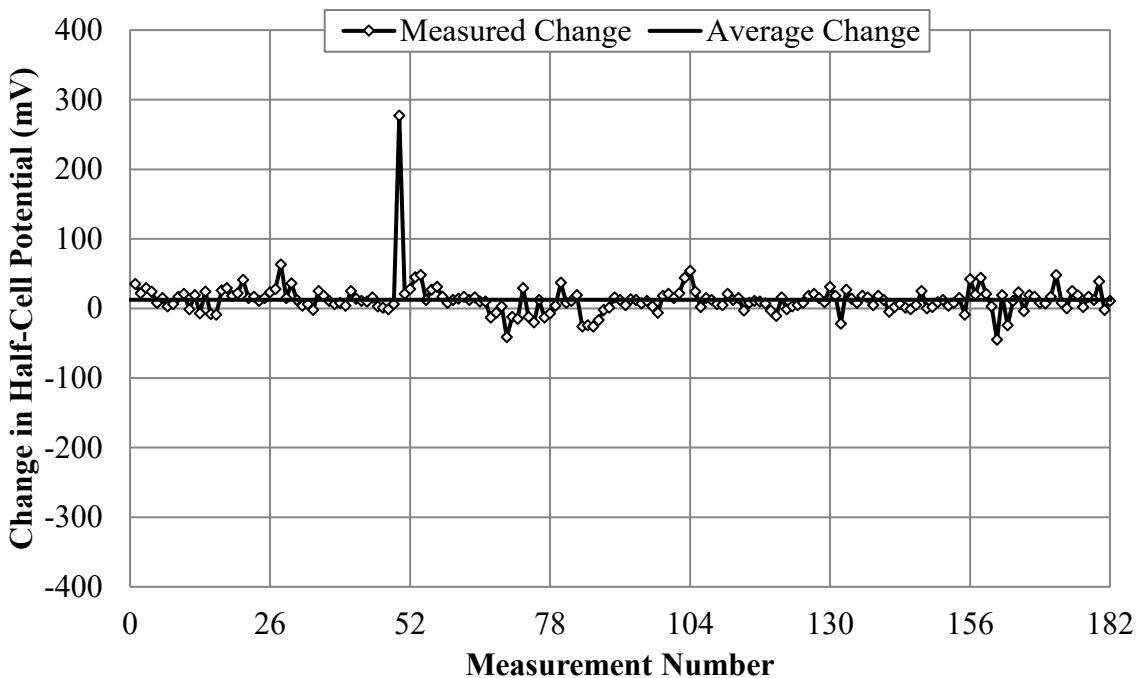


Figure F.68: Section G – Change in Half-cell potential from 10/27/11 to 4/10/12

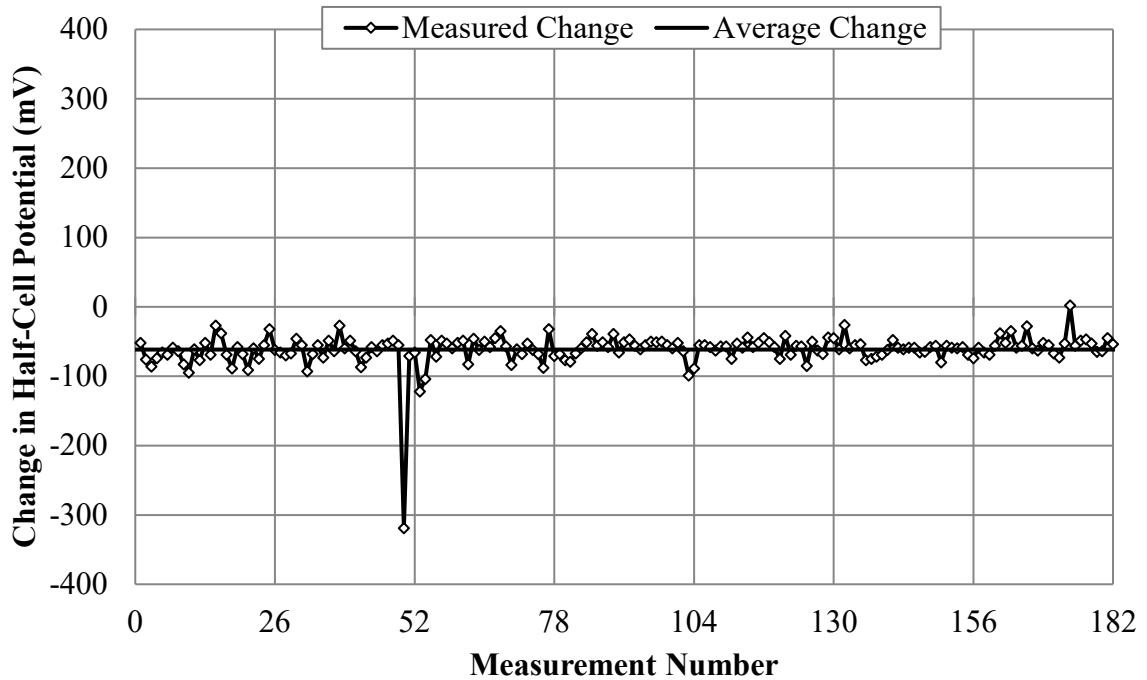


Figure F.69: Section G – Change in Half-cell potential from 4/10/12 to 5/9/12

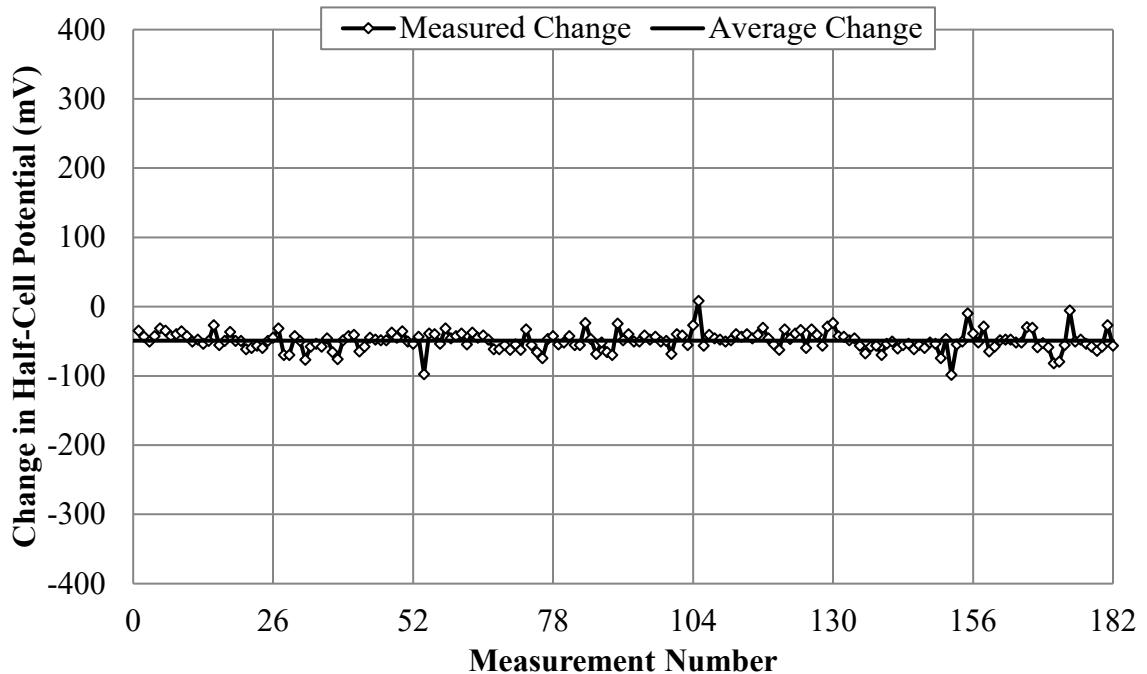


Figure F.70: Section G – Change in Half-cell potential from 8/25/11 to 5/9/12