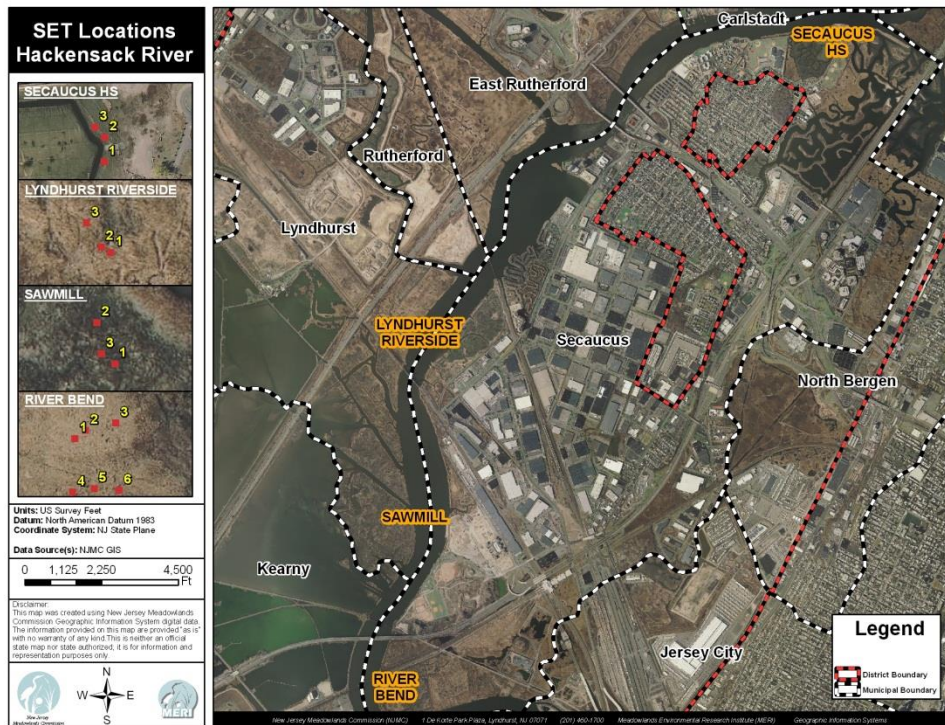


Measuring Elevation Change in Meadowlands Marshes Using Surface Elevation Tables (SETs) and Marker Horizons

Meadowlands Environmental Research Institute (April, 2014)

The surface elevation table (SET) provides a constant plane in space from which the distance to a marsh surface can be measured by means of pins lowered to the surface (USGS 2010). During August of 2008, at five locations in the lower Hackensack River Meadowlands, benchmark rods were established, marker horizons of feldspar were emplaced and baseline readings were taken. Periodic monitoring will determine rates of accretion in marsh areas, and track and compare both shallow and deep subsidence. Each site was revisited and readings taken annually except 2009. This report is a summary of those measurements taken up to the spring of 2014.

Figure 1: Study Area



Locations were chosen to span several miles of tidal wetlands and represent different vegetation and marsh regimes. The five sites selected include a restored *Spartina alterniflora* low marsh (Secaucus High School, SHS), a *Spartina alterniflora* low marsh (Saw Mill, SM), a *Spartina patens* dominated high marsh (Rivrebend-Patens, RBP), a mixed *Spartina patens* and *Phragmites australis* high marsh (Riverbend Mixed, RBM) and a *Phragmites australis* dominated high marsh (Lyndhurst Riverside, LR). At each site, three replicate plots were installed. At each plot, nine pins are lowered to the marsh surface. Readings are taken in each of four directions resulting in a total of 108 measurements for each of the 5 sites. At the time of each subsequent reading, results obtained from each pin are compared. The average of the resulting differences becomes one data point that represents the level of the marsh surface elevation.

Table 1: Time Elapsed Between Readings

Location	Initial Date	Most Recent Date	Days	Years
RBP and RBM	8/26/2008	4/22/2014	2065	5.66
SM	8/28/2008	4/24/2014	2065	5.66
LR	8/29/2008	4/24/2014	2064	5.66
SHS	8/28/2008	4/25/2014	2066	5.66

Table 1 provides the dates for each reading and the time elapsed in days and years

Table 2: Average Elevation Change (mm) – Spring 2014

Riverbend Patens		Riverbend Mixed		Sawmill	
All Platforms	20.81	All Platforms	20.52	All Platforms	32.26
Std Error	1.88	Std Error	3.03	Std Error	42.27
RB-1	24.56	RB-4	26.58	SM-1	39.61
Std Error	3.23	Std Error	5.90	Std Error	13.07
RB-2	19.00	RB-5	17.31	SM-2	101.53
Std Error	2.86	Std Error	6.28	Std Error	19.07
RB-3	18.86	RB-6	17.67	SM-3	-44.36
Std Error	2.85	Std Error	8.01	Std Error	2.81
RB-1 pos 1	25.00	RB-4 pos 1	39.67	SM-1 pos 2	1.44
RB-1 pos 3	27.44	RB-4 pos 3	12.89	SM-1 pos 4	56.11
RB-1 pos 5	30.33	RB-4 pos 5	32.33	SM-1 pos 6	57.00
RB-1 pos 7	15.44	RB-4 pos 7	21.44	SM-1 pos 8	43.89
RB-2 pos 1	15.44	RB-5 pos 2	19.22	SM-2 pos 1	98.56
RB-2 pos 3	22.89	RB-5 pos 4	28.33	SM-2 pos 3	128.22
RB-2 pos 5	12.89	RB-5 pos 6	-0.67	SM-2 pos 5	48.67
RB-2 pos 7	24.78	RB-5 pos 8	22.33	SM-2 pos 7	130.67
RB-3 pos 1	24.00	RB-6 pos 2	2.56	SM-3 pos 1	-39.44
RB-3 pos 3	21.22	RB-6 pos 4	20.33	SM-3 pos 3	-48.78
RB-3 pos 5	10.78	RB-6 pos 6	39.00	SM-3 pos 5	-39.56
RB-3 pos 7	19.44	RB-6 pos 8	8.78	SM-3 pos 7	-49.67

Lyndhurst Riverside	
All Platforms	20.65
Std Error	2.97
LR-1	20.39
Std Error	9.03
LR-2	15.64
Std Error	6.10
LR-3	25.92
Std Error	8.49
LR-1 pos 1	6.89
LR-1 pos 3	11.11
LR-1 pos 5	46.78
LR-1 pos 7	16.78
LR-2 pos 1	31.44
LR-2 pos 3	2.56
LR-2 pos 5	11.00
LR-2 pos 7	17.56
LR-3 pos 1	5.78
LR-3 pos 3	34.11
LR-3 pos 5	44.56
LR-3 pos 7	19.22

Secaucus HS	
All Platforms	34.85
Std Error	15.68
SHS-1	47.2
Std Error	9.10
SHS-2	3.72
Std Error	6.12
SHS-3	53.6
Std Error	10.9
SHS-1 pos 2	67.7
SHS-1 pos 4	56.9
SHS-1 pos 6	35.7
SHS-1 pos 8	28.56
SHS-2 pos 1	17.67
SHS-2 pos 3	-3.7
SHS-2 pos 5	9.89
SHS-2 pos 7	-9.00
SHS-3 pos 2	61.8
SHS-3 pos 4	21.3
SHS-3 pos 6	69.6
SHS-3 pos 8	61.89

Table 2a: SETs Locations and Measurements – Spring 2014 sampling

Location		Marsh Type	Dominant Vegetation	Rate of Elevation Change from 2008 to 2013(mm/yr.)
RBP	Riverbend Patens	High Marsh	<i>Spartina patens</i>	3.68
RBM	Riverbend Mixed	High Marsh	<i>Phragmites australis</i> / <i>Spartina patens</i>	3.63
SM	Sawmill	High Marsh	<i>Spartina alterniflora</i>	5.70
LR	Lyndhurst Riverside	High Marsh	<i>Phragmites australis</i>	3.65
SHS	Secaucus HS	Low Marsh	<i>Spartina alterniflora</i>	6.16

The above two tables, Tables 2 and 2a, are summaries of the changes in elevation measured at each location.

Table 2 contains the averages of elevation changes obtained at each of the three plots as well as at each of the 4 orientation positions. The averages of measurements from all 108 platforms at each site are also included in Table 2. The average of all platforms is then divided by the time elapsed since the initial date (Table 1) to derive the rate of elevation change in mm/yr (Table 2a). The complete data set for elevation can be found in appendices at the end of the report. As shown in table 2a, values ranged from a subsidence rate of 3.63 mm/yr. at the Riverbend Mixed site to a maximum rise in elevation of 6.16 mm/yr. at the Secaucus HS site.

Table 3: Average Accretion (mm) – Spring 2014 sampling

Riverbend Patens	
All Platforms	2.84
Std Error	0.15
RB-1	2.73
Std Error	0.35
RB-2	3.13
Std Error	0.23
RB-3	2.67
Std Error	0.25
RB-1	
A	2.5
B	3.2
C	2.5
RB-2	
A	3.2
B	3.5
C	2.7
RB-3	
A	2.2
B	2.7
C	3.1

Riverbend Mixed	
All Platforms	2.86
Std Error	0.16
RB-4	2.53
Std Error	0.10
RB-5	2.97
Std Error	0.09
RB-6	3.07
Std Error	0.50
RB-4	
A	3.4
B	2.2
C	2.0
RB-5	
A	3.0
B	2.8
C	3.1
RB-6	
A	3.5
B	2.5
C	3.2

Sawmill	
All Platforms	4.75
Std Error	0.88
SM-1	5.50
Std Error	0.70
SM-2	5.75
Std Error	0.25
SM-3	3.00
Std Error	3.00
SM-1	
A	6.2
B	NA
C	4.8
SM-2	
A	5.5
B	NA
C	6.0
SM-3	
A	NA
B	5.0
C	6.0

Lyndhurst Riverside	
All Platforms	1.94
Std Error	0.46
LR-1	2.87
Std Error	0.15
LR-2	1.47
Std Error	0.22
LR-3	1.50
Std Error	0.90
LR-1	
A	2.9
B	3.0
C	2.7
LR-2	
A	1.9
B	1.3
C	1.2
LR-3	
A	2.5
B	0.7
C	1.3

Secaucus HS	
All Platforms	5.02
Std Error	0.85
SHS-1	6.50
Std Error	1.50
SHS-2	5.00
Std Error	0.00
SHS-3	3.57
Std Error	0.23
SHS-1	
A	NA
B	8.0
C	5.0
SHS-2	
A	NA
B	NA
C	5.0
SHS-3	
A	4.0
B	3.2
C	3.5

Table 3a: Feldspar Horizon Measurements 2008/2014

Site	Positive Accretion (Percent)	Accretion Rate (mm/yr.)
Riverbend Patens	100	5.03
Riverbend Mixed	100	5.05
Sawmill	67	9.90
Lyndhurst Riverside	100	3.40
Secaucus HS	67	8.90

Tables 3 and 3a are summaries of the accretion measured by use of feldspar horizons emplaced at each benchmark location

Feldspar horizons were emplaced inside three corners of each benchmark plot. The sediment between the white feldspar marker and the horizon is measured. One reading is taken at each of the three corners resulting in a total of nine values associated with each marsh; the average of all readings produces a summary value (Table 3a). Not all horizons produced recognizable accretion; it is possible that the feldspar cannot be found and will need to be replaced and a new data set generated. Where negligible material accumulated above the horizon, “0.0 accretion” is designated. All recoverable values are included in the calculation for accretion rate.

To obtain a yearly rate, this value is divided by the number of days that have elapsed between establishment of the benchmark and the subsequent reading. Approximately five and two third years elapsed between the readings summarized in this report. Table 1 provides the dates for each reading and the time elapsed in days and years.

Table 4: Elevation Rate and Accretion Rate values – Fall 2008 to Spring 2014

Riverbend Patens					
Days	0	632	980	1555	2065
Sample Date	8/26/2008	5/20/2010	5/3/2011	11/28/2012	4/22/2014
Elevation Rate mm/yr	0.00	2.48	6.02	5.92	3.68
Accretion Rate mm/yr	0.00	0.00	5.69	6.39	5.03

Riverbend Mixed					
Days	0	632	980	1555	2065
Sample Date	8/26/2008	5/20/2010	5/3/2011	11/28/2012	4/22/2014
Elevation Rate mm/yr	0.00	5.96	7.58	6.99	3.63
Accretion Rate mm/yr	0.00	0.00	7.80	6.31	5.05

Sawmill					
Days	0	631	980	1566	2065
Sample Date	8/28/2008	5/21/2010	5/5/2011	12/11/2012	4/24/2014
Elevation Rate mm/yr	0.00	-4.66	5.51	7.94	5.70
Accretion Rate mm/yr	0.00	0.00	13.80	11.10	9.90

Lyndhurst Reserve					
Days	0	630	979	1557	2064
Sample Date	8/29/2008	5/21/2010	5/5/2011	12/3/2012	4/24/2014
Elevation Rate mm/yr	0	8.79	6.38	7.53	3.65
Accretion Rate mm/yr	0	2.74	3.94	4.20	3.40

Secaucus HS					
Days	0	609	984	1553	2066
Sample Date	8/28/2008	4/29/2010	5/9/2011	11/28/2012	4/25/2014
Elevation Rate mm/yr	0.00	9.97	5.03	6.52	6.16
Accretion Rate mm/yr	0.00	10.00	4.40	6.70	8.90

Table 4 shows the yearly elevation and accretion rate for every sampling event.

Table 5: Marsh Processes (USGS 2010)

2010)SURFACE PROCESSES:
1) Sediment deposition
2) Sediment erosion
SUBSURFACE PROCESSES:
3) Root Growth
4) Decomposition
5) Pore water Flux
6) Compaction

Table 5 explains both surface and subsurface interactions (USGS, 2010).

Discussion

Elevation change measured by the SET is influenced by both surface and subsurface processes occurring within the soil profile (USGS 2010). The marker horizons reveal surface processes only. One can surmise the relative contribution of these processes by looking at the difference between the rates obtained by each.

According to table 4, Sawmill and Secaucus HS have both a higher accretion rate and elevation rate. The higher rates are most likely because these sites are in a low marsh area and the high tide brings new sediment on top twice a day.

Table 4 also shows decreases in both accretion and elevation rates in all the sites except the accretion rate in Secaucus HS. This is because of the compaction of the sediment as time goes by. The first couple of years show larger changes in both accretion and elevation.

While it is tempting to try to draw conclusions from this data set, one must acknowledge that marsh sediment processes take place slowly over long periods of time. To quote Jim Lynch, USGS SETs methodology expert, "...It will take a long time to get enough data to see what's going on."(2010, personal communication).

Conclusions

The installation of the surface elevation tables and feldspar horizons provides an accurate method for determining changes in the marshes of the Hackensack River estuary. As more time passes, the accretion and elevation rates will become stable and there will not be large fluctuations in the measurements unless there is a large weather event or human impact on the sites.

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Appendix 1: Riverbend Patens Surface Elevation Table Readings (mm)

		RB-1					RB-2					RB-3		
Position	Pin	8/26/2008	4/22/2014	Difference	Position	Pin	8/26/2008	4/22/2014	Difference	Position	Pin	8/26/2008	4/22/2014	Difference
1	1	197	227	30	1	1	145	158	13	1	1	192	209	17
	2	227	243	16		2	150	163	13		2	179	205	26
	3	213	243	30		3	157	166	9		3	180	215	35
	4	230	252	22		4	159	178	19		4	188	189	1
	5	228	243	15		5	160	176	16		5	174	178	4
	6	222	257	35		6	160	176	16		6	177	206	29
	7	208	240	32		7	163	177	14		7	164	197	33
	8	226	254	28		8	161	176	15		8	158	191	33
	9	232	249	17		9	150	174	24		9	161	199	38
3	1	201	235	34	3	1	158	175	17	3	1	167	205	38
	2	203	245	42		2	155	195	40		2	196	195	-1
	3	211	244	33		3	157	179	22		3	175	215	40
	4	218	249	31		4	143	180	37		4	182	204	22
	5	202	225	23		5	160	189	29		5	180	198	18
	6	220	230	10		6	162	186	24		6	192	217	25
	7	221	245	24		7	160	169	9		7	173	194	21
	8	223	242	19		8	165	176	11		8	191	219	28
	9	214	245	31		9	166	183	17		9	191	191	0
5	1	215	236	21	5	1	162	173	11	5	1	187	209	22
	2	208	249	41		2	165	173	8		2	195	206	11
	3	214	248	34		3	157	177	20		3	195	199	4
	4	208	245	37		4	158	168	10		4	204	212	8
	5	216	246	30		5	155	177	22		5	193	188	-5
	6	221	248	27		6	161	173	12		6	199	206	7
	7	219	251	32		7	143	165	22		7	200	192	-8
	8	216	253	37		8	161	165	4		8	185	200	15
	9	227	241	14		9	165	172	7		9	152	195	43
7	1	216	248	32	7	1	160	173	13	7	1	130	203	73
	2	213	230	17		2	154	182	28		2	178	189	11
	3	215	240	25		3	156	184	28		3	179	200	21
	4	216	235	19		4	155	185	30		4	195	200	5
	5	221	220	-1		5	156	172	16		5	176	205	29
	6	216	240	24		6	155	182	27		6	193	196	3
	7	212	219	7		7	154	187	33		7	195	206	11
	8	217	230	13		8	153	185	32		8	192	205	13
	9	212	215	3		9	151	167	16		9	191	200	9

Appendix 2: Riverbend Mixed Surface Elevation Table Readings (mm)

		RB-4					RB-5					RB-6		
Position	Pin	8/26/2008	4/22/2014	Difference	Position	Pin	8/26/2008	4/22/2014	Difference	Position	Pin	8/26/2008	4/22/2014	Difference
1	1	196	225	29	2	1	148	176	28	1	1	180	179	-1
	2	196	222	26		2	136	136	0		2	189	201	12
	3	100	241	141		3	146	155	9		3	186	198	12
	4	196	226	30		4	164	161	-3		4	177	197	20
	5	186	228	42		5	161	175	14		5	185	168	-17
	6	206	222	16		6	106	175	69		6	181	189	8
	7	212	229	17		7	136	175	39		7	189	170	-19
	8	190	218	28		8	155	176	21		8	178	174	-4
	9	180	208	28		9	149	145	-4		9	149	161	12
3	1	190	213	23	4	1	153	171	18	3	1	173	190	17
	2	192	218	26		2	137	169	32		2	182	205	23
	3	196	205	9		3	134	175	41		3	168	210	42
	4	194	215	21		4	140	185	45		4	177	210	33
	5	183	226	43		5	141	176	35		5	176	207	31
	6	193	195	2		6	160	160	0		6	185	207	22
	7	198	194	-4		7	159	177	18		7	181	200	19
	8	190	195	5		8	144	179	35		8	192	196	4
	9	190	181	-9		9	149	180	31		9	187	179	-8
5	1	198	251	53	6	1	141	168	27	5	1	178	224	46
	2	172	221	49		2	164	149	-15		2	176	220	44
	3	195	215	20		3	149	145	-4		3	149	194	45
	4	189	235	46		4	163	151	-12		4	154	207	53
	5	198	229	31		5	162	175	13		5	151	196	45
	6	204	210	6		6	160	164	4		6	161	190	29
	7	209	229	20		7	162	160	-2		7	168	201	33
	8	208	230	22		8	176	158	-18		8	178	196	18
	9	177	221	44		9	170	171	1		9	148	186	38
7	1	193	211	18	8	1	138	165	27	7	1	134	185	51
	2	203	226	23		2	142	159	17		2	161	201	40
	3	201	228	27		3	145	153	8		3	163	195	32
	4	197	236	39		4	68	153	85		4	178	199	21
	5	201	220	19		5	126	130	4		5	175	178	3
	6	202	234	32		6	141	144	3		6	191	165	-26
	7	199	214	15		7	139	164	25		7	192	171	-21
	8	190	227	37		8	120	136	16		8	193	176	-17
	9	203	186	-17		9	124	140	16		9	188	184	-4

Appendix 3: Sawmill Surface Elevation Table Readings (mm)

SM-1					SM-2					SM-3				
Position	Pin	8/28/2008	4/24/2014	Difference	Position	Pin	8/28/2008	4/24/2014	Difference	Position	Pin	8/28/2008	4/24/2014	Difference
2	1	171	179	8	1	1	119	226	107	1	1	205	174	-31
	2	178	201	23		2	114	230	116		2	176	175	-1
	3	170	205	35		3	145	234	89		3	196	163	-33
	4	172	194	22		4	162	216	54		4	175	85	-90
	5	144	141	-3		5	152	252	100		5	206	154	-52
	6	234	134	-100		6	152	234	82		6	219	181	-38
	7	169	162	-7		7	117	248	131		7	205	181	-24
	8	182	205	23		8	144	222	78		8	207	178	-29
	9	202	214	12		9	135	265	130		9	238	181	-57
4	1	70	180	110	3	1	149	256	107	3	1	218	151	-67
	2	127	171	44		2	135	242	107		2	203	167	-36
	3	127	187	60		3	85	247	162		3	200	159	-41
	4	155	185	30		4	111	249	138		4	213	160	-53
	5	160	195	35		5	91	265	174		5	240	182	-58
	6	156	200	44		6	140	265	125		6	226	170	-56
	7	161	225	64		7	150	225	75		7	203	191	-12
	8	166	227	61		8	153	295	142		8	222	149	-73
	9	167	224	57		9	140	264	124		9	203	160	-43
6	1	164	194	30	5	1	156	184	28	5	1	230	167	-63
	2	35	186	151		2	150	200	50		2	215	175	-40
	3	149	190	41		3	145	180	35		3	215	188	-27
	4	146	195	49		4	156	225	69		4	218	155	-63
	5	109	164	55		5	143	206	63		5	225	168	-57
	6	134	150	16		6	157	240	83		6	225	173	-52
	7	151	182	31		7	175	175	0		7	215	226	11
	8	121	185	64		8	176	210	34		8	216	206	-10
	9	130	206	76		9	160	236	76		9	228	173	-55
8	1	155	226	71	7	1	115	270	155	7	1	232	200	-32
	2	172	214	42		2	92	254	162		2	226	185	-41
	3	153	199	46		3	100	248	148		3	205	134	-71
	4	122	205	83		4	132	232	100		4	167	150	-17
	5	57	80	23		5	107	246	139		5	210	97	-113
	6	129	192	63		6	116	268	152		6	185	75	-110
	7	50	76	26		7	164	256	92		7	200	142	-58
	8	146	200	54		8	144	263	119		8	206	167	-39
	9	187	174	-13		9	155	264	109		9	147	181	34

Appendix 4: Lyndhurst Riverside Surface Elevation Table Readings

LR-1					LR-2					LR-3				
Position	Pin	8/29/2008	4/24/2014	Difference	Position	Pin	8/29/2008	4/24/2014	Difference	Position	Pin	8/29/2008	4/24/2014	Difference
1	1	218	246	28	1	1	116	135	19	1	1	226	211	-15
	2	241	244	3		2	90	146	56		2	219	220	1
	3	244	237	-7		3	55	132	77		3	219	228	9
	4	248	237	-11		4	64	144	80		4	215	225	10
	5	231	245	14		5	103	135	32		5	183	228	45
	6	223	241	18		6	114	149	35		6	234	222	-12
	7	239	239	0		7	113	153	40		7	208	227	19
	8	228	239	11		8	188	154	-34		8	225	215	-10
	9	217	223	6		9	168	146	-22		9	215	220	5
3	1	234	241	7	3	1	175	153	-22	3	1	162	195	33
	2	210	256	46		2	179	169	-10		2	193	203	10
	3	237	247	10		3	102	150	48		3	184	203	19
	4	233	231	-2		4	137	151	14		4	118	184	66
	5	242	260	18		5	150	140	-10		5	153	182	29
	6	236	245	9		6	82	130	48		6	137	174	37
	7	258	245	-13		7	125	141	16		7	138	150	12
	8	230	230	0		8	185	153	-32		8	145	179	34
	9	225	250	25		9	207	178	-29		9	95	162	67
5	1	122	225	103	5	1	190	161	-29	5	1	195	196	1
	2	182	222	40		2	150	155	5		2	174	160	-14
	3	210	211	1		3	166	178	12		3	134	170	36
	4	151	242	91		4	135	154	19		4	145	176	31
	5	210	242	32		5	137	174	37		5	72	170	98
	6	224	238	14		6	148	145	-3		6	120	164	44
	7	208	240	32		7	145	164	19		7	97	182	85
	8	206	242	36		8	122	155	33		8	131	169	38
	9	197	269	72		9	130	136	6		9	114	196	82
7	1	212	226	14	7	1	135	145	10	7	1	165	216	51
	2	219	229	10		2	123	142	19		2	175	205	30
	3	213	226	13		3	135	135	0		3	222	214	-8
	4	211	217	6		4	116	115	-1		4	216	219	3
	5	200	225	25		5	100	121	21		5	205	217	12
	6	205	230	25		6	98	120	22		6	220	222	2
	7	207	235	28		7	110	127	17		7	169	216	47
	8	227	230	3		8	115	150	35		8	199	212	13
	9	190	217	27		9	115	150	35		9	196	219	23

Appendix 5: Secaucus HS Surface Elevation Table Readings (mm)

Position	SHS-1				SHS-2				SHS-3					
	Pin	8/28/2008	4/25/2014	Difference	Position	Pin	8/28/2008	4/25/2014	Difference	Position	Pin	8/21/2008	4/25/2014	Difference
2	1	154	230	76	1	1	122	115	-7	1	1	177	232	55
	2	158	226	68		2	90	125	35		2	165	230	65
	3	172	227	55		3	174	166	-8		3	160	227	67
	4	160	232	72		4	164	150	-14		4	168	226	58
	5	183	244	61		5	127	154	27		5	160	218	58
	6	172	223	51		6	155	178	23		6	170	189	19
	7	178	228	50		7	147	162	15		7	165	226	61
	8	170	256	86		8	90	150	60		8	170	236	66
	9	150	240	90		9	136	164	28		9	130	237	107
4	1	142	195	53	3	1	141	152	11	3	1	182	207	25
	2	127	181	54		2	144	144	0		2	175	184	9
	3	134	203	69		3	156	130	-26		3	174	189	15
	4	165	223	58		4	132	144	12		4	165	181	16
	5	176	207	31		5	130	144	14		5	175	200	25
	6	156	240	84		6	135	114	-21		6	174	195	21
	7	148	231	83		7	116	112	-4		7	175	197	22
	8	167	219	52		8	118	100	-18		8	177	199	22
	9	163	191	28		9	120	119	-1		9	175	212	37
6	1	170	195	25	5	1	146	161	15	5	1	180	195	15
	2	173	194	21		2	145	150	5		2	149	240	91
	3	171	228	57		3	152	160	8		3	155	226	71
	4	178	221	43		4	150	170	20		4	174	205	31
	5	181	226	45		5	156	154	-2		5	160	212	52
	6	165	189	24		6	155	146	-9		6	135	220	85
	7	182	237	55		7	140	135	-5		7	135	229	94
	8	185	233	48		8	120	162	42		8	148	250	102
	9	180	183	3		9	114	129	15		9	170	255	85
8	1	187	212	25	7	1	129	171	42	7	1	191	240	49
	2	183	222	39		2	187	167	-20		2	175	248	73
	3	184	251	67		3	232	177	-55		3	175	254	79
	4	178	210	32		4	180	175	-5		4	188	250	62
	5	185	205	20		5	174	176	2		5	183	257	74
	6	199	225	26		6	158	169	11		6	190	229	39
	7	182	213	31		7	190	161	-29		7	185	240	55
	8	186	224	38		8	186	163	-23		8	200	255	55
	9	197	176	-21		9	175	171	-4		9	175	246	71