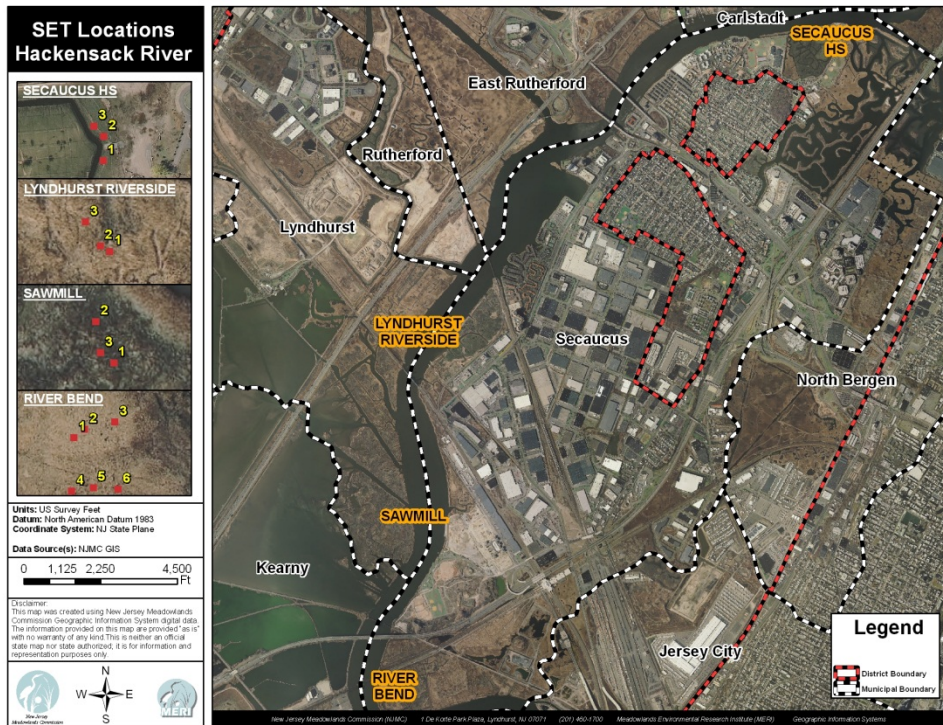


# Measuring Elevation Change in Meadowlands Marshes Using Surface Elevation Tables (SETs) and Marker Horizons

Meadowlands Environmental Research Institute (November, 2011)

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 were taken in the fall of 2011. This report is a summary of those measurements.

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 (SHS), a *Spartina alterniflora* high marsh (SM), a *Spartina patens* dominated high marsh (RBP), a mixed *Spartina patens* and *Phragmites australis* high marsh (RBM) and a *Phragmites australis* dominated high marsh (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 site. 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	Subsequent Date	Days	Years
RBP and RBM	8/26/2008	11/4/2011	1165	3.19
SM	8/28/2008	11/22/2011	1181	3.24
LR	8/29/2008	11/21/2011	1179	3.23
SHS	8/28/2008	11/7/2011	1166	3.20

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

**Table 2: SETs Locations and Measurements – Fall 2011 sampling**

SETs Locations				
Location		Marsh Type	Dominant Vegetation	Rate of Elevation Change from 2008 to 2011(mm/yr.)
RBP	Riverbend Patens	High Marsh	<i>Spartina patens</i>	6.92
RBM	Riverbend Mixed	High Marsh	<i>Phragmites australis</i> / <i>Spartina patens</i>	8.34
SM	Sawmill	High Marsh	<i>Spartina alterniflora</i>	6.28
LR	Lyndhurst Riverside	High Marsh	<i>Phragmites australis</i>	6.25
SHS	Secaucus HS	Low Marsh	<i>Spartina alterniflora</i>	6.83

**Table 2a: Average Elevation Change (mm)**

Riverbend High Marsh		Riverbend Mixed Marsh		Sawmill	
All Platforms	22.08	All Platforms	26.63	All Platforms	20.31
Std Error	1.31	Std Error	2.42	Std Error	10.75
RB-1	24.69	RB-4	29.61	SM-1	30.69
Std Error	6.85	Std Error	7.29	Std Error	16.56
RB-2	20.72	RB-5	28.44	SM-2	31.42
Std Error	2.30	Std Error	3.52	Std Error	4.45
RB-3	20.83	RB-6	21.83	SM-3	-1.19
Std Error	1.85	Std Error	4.08	Std Error	15.23
RB-1 pos 1	21.89	RB-4 pos 1	46.67	SM-1 pos 2	-18.89
RB-1 pos 3	24.00	RB-4 pos 3	15.67	SM-1 pos 4	44.78
RB-1 pos 5	43.00	RB-4 pos 5	36.67	SM-1 pos 6	47.44
RB-1 pos 7	9.89	RB-4 pos 7	19.44	SM-1 pos 8	49.44
RB-2 pos 1	23.11	RB-5 pos 2	27.67	SM-2 pos 1	39.33
RB-2 pos 3	25.11	RB-5 pos 4	32.33	SM-2 pos 3	38.89
RB-2 pos 5	14.56	RB-5 pos 6	18.89	SM-2 pos 5	23.22
RB-2 pos 7	20.11	RB-5 pos 8	34.89	SM-2 pos 7	24.22
RB-3 pos 1	24.67	RB-6 pos 2	10.89	SM-3 pos 1	36.00
RB-3 pos 3	17.89	RB-6 pos 4	28.67	SM-3 pos 3	-25.78
RB-3 pos 5	17.44	RB-6 pos 6	20.33	SM-3 pos 5	-26.44
RB-3 pos 7	23.33	RB-6 pos 8	27.44	SM-3 pos 7	11.44

Lyndhurst Riverside	
All Platforms	20.20
Std Error	9.54
LR-1	11.08
Std Error	9.89
LR-2	10.25
Std Error	9.59
LR-3	39.28
Std Error	12.22
LR-1 pos 1	-6.11
LR-1 pos 3	3.22
LR-1 pos 5	39.44
LR-1 pos 7	7.78
LR-2 pos 1	33.44
LR-2 pos 3	14.33
LR-2 pos 5	6.00
LR-2 pos 7	-12.78
LR-3 pos 1	8.11
LR-3 pos 3	48.67
LR-3 pos 5	65.89
LR-3 pos 7	34.44

Secaucus HS	
All Platforms	21.96
Std Error	13.19
SHS-1	35.6
Std Error	12.27
SHS-2	-4.42
Std Error	6.13
SHS-3	34.7
Std Error	10.0
SHS-1 pos 2	49.9
SHS-1 pos 4	48.4
SHS-1 pos 6	45.1
SHS-1 pos 8	-1.11
SHS-2 pos 1	9.67
SHS-2 pos 3	-19.4
SHS-2 pos 5	-0.33
SHS-2 pos 7	-7.56
SHS-3 pos 2	18.9
SHS-3 pos 4	17.6
SHS-3 pos 6	58.7
SHS-3 pos 8	43.8

*The above two tables, Tables 2 and 2A, are summaries of the changes in elevation measured at each location. The complete data set is found in Appendices at the end of the report.*

The complete data set for elevation is found in appendices at the end of the report. As shown in table 2, values ranged from a subsidence rate of 6.25 mm/yr. at Lyndhurst Riverside to a maximum rise in elevation of 8.34 mm/yr. at the Riverbend Mixed site. All of the sites have around the same increases in elevation.

**Table 3: Feldspar Horizon Measurements 2009/2011**

Site	Positive Accretion (Percent)	Accretion Rate (mm/yr.)
Riverbend Patens	100	7.2
Riverbend Mixed	100	7.3
Sawmill	89	12.0
Lyndhurst Riverside	100	4.7
Secaucus HS	67	8.2

**Table 3a: Average Accretion (mm) – Fall 2011 sampling**

Riverbend Patens	
All Platforms	2.31
Std Error	0.02
RB-1	2.33
Std Error	0.30
RB-2	2.27
Std Error	0.03
RB-3	2.33
Std Error	0.10
RB-1	
A	2.4
B	2.6
C	2.0
RB-2	
A	2.3
B	2.2
C	2.3
RB-3	
A	2.5
B	2.3
C	2.2

Riverbend Mixed	
All Platforms	2.33
Std Error	0.07
RB-4	2.37
Std Error	0.05
RB-5	2.43
Std Error	0.12
RB-6	2.20
Std Error	0.80
RB-4	
A	2.6
B	2.3
C	2.2
RB-5	
A	2.5
B	2.6
C	2.2
RB-6	
A	2.8
B	1.2
C	2.6

Sawmill	
All Platforms	3.89
Std Error	0.22
SM-1	4.33
Std Error	0.83
SM-2	3.67
Std Error	0.33
SM-3	3.67
Std Error	1.86
SM-1	
A	6.0
B	3.5
C	3.5
SM-2	
A	4.0
B	4.0
C	3.0
SM-3	
A	5.0
B	0.0
C	6.0

**Table 3a (Cont.): Average Accretion (mm)**

Lyndhurst Riverside	
All Platforms	1.51
Std Error	0.18
LR-1	1.87
Std Error	0.25
LR-2	1.33
Std Error	0.09
LR-3	1.33
Std Error	0.20
LR-1	
A	1.7
B	1.7
C	2.2
LR-2	
A	1.2
B	1.3
C	1.5
LR-3	
A	1.2
B	1.6
C	1.2

Secaucus HS	
All Platforms	2.62
Std Error	0.22
SHS-1	2.60
Std Error	0.40
SHS-2	3.00
Std Error	1.61
SHS-3	2.25
Std Error	0.75
SHS-1	
A	0.0
B	4.3
C	3.5
SHS-2	
A	5.5
B	0.0
C	3.5
SHS-3	
A	1.5
B	3.0
C	5.5

*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 3). 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 two and a half years elapsed between the readings summarized in this report. Table 3 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 Fall 2011**

<b>Riverbend High Marsh</b>					
<b>Days</b>	<b>0</b>	<b>632</b>	<b>819</b>	<b>980</b>	<b>1165</b>
<b>Sample Date</b>	<b>8/26/2008</b>	<b>5/20/2010</b>	<b>11/23/2010</b>	<b>5/3/2011</b>	<b>11/4/2011</b>
<b>Elevation Rate mm/yr.</b>	0.00	2.48	6.13	6.02	6.92
<b>Accretion Rate mm/yr.</b>	0.00	0.00	5.35	5.69	7.24

<b>Riverbend Mixed Marsh</b>					
<b>Days</b>	<b>0</b>	<b>632</b>	<b>819</b>	<b>980</b>	<b>1165</b>
<b>Sample Date</b>	<b>8/26/2008</b>	<b>5/20/2010</b>	<b>11/23/2010</b>	<b>5/3/2011</b>	<b>11/4/2011</b>
<b>Elevation Rate mm/yr.</b>	0.00	5.96	7.25	7.58	8.34
<b>Accretion Rate mm/yr.</b>	0.00	0.00	5.45	7.80	7.31

<b>Sawmill</b>					
<b>Days</b>	<b>0</b>	<b>631</b>	<b>813</b>	<b>980</b>	<b>1181</b>
<b>Sample Date</b>	<b>8/28/2008</b>	<b>5/21/2010</b>	<b>11/19/2010</b>	<b>5/5/2011</b>	<b>11/22/2011</b>
<b>Elevation Rate mm/yr.</b>	0.00	-4.66	6.60	5.51	6.28
<b>Accretion Rate mm/yr.</b>	0.00	0.00	7.70	13.80	12.00

<b>Lyndhurst Riverside</b>					
<b>Days</b>	<b>0</b>	<b>630</b>	<b>811</b>	<b>979</b>	<b>1179</b>
<b>Sample Date</b>	<b>8/29/2008</b>	<b>5/21/2010</b>	<b>11/18/2010</b>	<b>5/5/2011</b>	<b>11/21/2011</b>
<b>Elevation Rate mm/yr.</b>	0.00	8.79	9.63	6.38	6.25
<b>Accretion Rate mm/yr.</b>	0.00	2.74	4.63	3.94	4.70

<b>Secaucus HS</b>					
<b>Days</b>	<b>0</b>	<b>609</b>	<b>810</b>	<b>984</b>	<b>1166</b>
<b>Sample Date</b>	<b>8/28/2008</b>	<b>4/29/2010</b>	<b>11/16/2010</b>	<b>5/9/2011</b>	<b>11/7/2011</b>
<b>Elevation Rate mm/yr.</b>	0.00	13.28	6.71	5.00	6.83
<b>Accretion Rate mm/yr.</b>	0.00	2.74	5.26	5.05	8.20

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

**Table 5: Marsh Processes (USGS 2010)**

<b>2010)SURFACE PROCESSES:</b>
1) Sediment deposition
2) Sediment erosion
<b>SUBSURFACE PROCESSES:</b>
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, each site seems to have the same trends as far as more accretion rates in the fall, which leads to higher elevation increases. This is most likely due to the root growth and decomposition of the vegetation from the summer months.

The relatively lower accretion rates at Lyndhurst Riverside, compared to all the other sites, are the largest reason why the elevation rate is slowly dropping with each sampling period.

According to the data it seems like the two Riverbend sites are slowly increasing while all the other sites are staying the same or slowly decreasing in elevation. Riverbend is receiving a lot of deposition simply because it is on the deposition side of the meandering Hackensack River.

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. The data derived during the period covered in this report suggest surface and subsurface processes are at work; and the two methods indicate the relative contribution of each. The data also shows that there are seasonal effects on the surfaces of the marsh which cause changes in the readings. A longer timescale is necessary to confirm these initial observations.

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

		RB-1			RB-2			RB-3						
Position	Pin	8/26/2008	11/4/2011	Difference	Position	Pin	8/26/2008	11/4/2011	Difference	Position	Pin	8/26/2008	11/4/2011	Difference
1	1	197	235	38	1	1	145	159	14	1	1	192	220	28
	2	227	241	14		2	150	175	25		2	179	204	25
	3	213	239	26		3	157	180	23		3	180	202	22
	4	230	237	7		4	159	181	22		4	188	185	-3
	5	228	241	13		5	160	179	19		5	174	210	36
	6	222	238	16		6	160	180	20		6	177	197	20
	7	208	252	44		7	163	178	15		7	164	186	22
	8	226	246	20		8	161	190	29		8	158	190	32
	9	232	251	19		9	150	191	41		9	161	201	40
3	1	201	222	21	3	1	158	181	23	3	1	167	181	14
	2	203	234	31		2	155	172	17		2	196	205	9
	3	211	240	29		3	157	185	28		3	175	207	32
	4	218	240	22		4	143	189	46		4	182	220	38
	5	202	252	50		5	160	181	21		5	180	216	36
	6	220	223	3		6	162	194	32		6	192	193	1
	7	221	249	28		7	160	175	15		7	173	186	13
	8	223	237	14		8	165	189	24		8	191	205	14
	9	214	232	18		9	166	186	20		9	191	195	4
5	1	215	266	51	5	1	162	170	8	5	1	187	219	32
	2	208	272	64		2	165	168	3		2	195	215	20
	3	214	255	41		3	157	182	25		3	195	195	0
	4	208	249	41		4	158	175	17		4	204	202	-2
	5	216	242	26		5	155	176	21		5	193	208	15
	6	221	246	25		6	161	176	15		6	199	219	20
	7	219	262	43		7	143	149	6		7	200	220	20
	8	216	268	52		8	161	181	20		8	185	203	18
	9	227	271	44		9	165	181	16		9	152	186	34
7	1	216	239	23	7	1	160	178	18	7	1	130	181	51
	2	213	241	28		2	154	187	33		2	178	202	24
	3	215	210	-5		3	156	161	5		3	179	196	17
	4	216	205	-11		4	155	172	17		4	195	201	6
	5	221	243	22		5	156	171	15		5	176	197	21
	6	216	237	21		6	155	169	14		6	193	204	11
	7	212	209	-3		7	154	194	40		7	195	216	21
	8	217	225	8		8	153	178	25		8	192	228	36
	9	212	218	6		9	151	165	14		9	191	214	23

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

RB-4					RB-5					RB-6				
Position	Pin	8/26/2008	11/4/2011	Difference	Position	Pin	8/26/2008	11/4/2011	Difference	Position	Pin	8/26/2008	11/4/2011	Difference
1	1	196	226	30	2	1	148	170	22	2	1	180	184	4
	2	196	223	27		2	136	166	30		2	189	180	-9
	3	100	235	135		3	146	186	40		3	186	180	-6
	4	196	226	30		4	164	170	6		4	177	176	-1
	5	186	227	41		5	161	162	1		5	185	197	12
	6	206	232	26		6	106	175	69		6	181	200	19
	7	212	242	30		7	136	179	43		7	189	205	16
	8	190	239	49		8	155	160	5		8	178	197	19
	9	180	232	52		9	149	182	33		9	149	193	44
3	1	190	212	22	4	1	153	167	14	4	1	173	222	49
	2	192	210	18		2	137	185	48		2	182	206	24
	3	196	194	-2		3	134	153	19		3	168	203	35
	4	194	200	6		4	140	171	31		4	177	175	-2
	5	183	200	17		5	141	194	53		5	176	205	29
	6	193	205	12		6	160	186	26		6	185	210	25
	7	198	220	22		7	159	181	22		7	181	203	22
	8	190	222	32		8	144	186	42		8	192	225	33
	9	190	204	14		9	149	185	36		9	187	230	43
5	1	198	239	41	6	1	141	158	17	6	1	178	193	15
	2	172	229	57		2	164	149	-15		2	176	195	19
	3	195	225	30		3	149	185	36		3	149	185	36
	4	189	210	21		4	163	186	23		4	154	173	19
	5	198	238	40		5	162	193	31		5	151	182	31
	6	204	224	20		6	160	174	14		6	161	203	42
	7	209	239	30		7	162	178	16		7	168	170	2
	8	208	245	37		8	176	205	29		8	178	185	7
	9	177	231	54		9	170	189	19		9	148	160	12
7	1	193	227	34	8	1	138	150	12	8	1	134	152	18
	2	203	214	11		2	142	165	23		2	161	185	24
	3	201	215	14		3	145	170	25		3	163	180	17
	4	197	219	22		4	68	168	100		4	178	199	21
	5	201	221	20		5	126	181	55		5	175	202	27
	6	202	223	21		6	141	156	15		6	191	228	37
	7	199	227	28		7	139	166	27		7	192	249	57
	8	190	226	36		8	120	148	28		8	193	227	34
	9	203	192	-11		9	124	153	29		9	188	200	12

**Appendix 3: Sawmill Surface Elevation Table Readings (mm)**

		SM-1			SM-2					SM-3				
Position	Pin	8/28/2008	11/22/2011	Difference	Position	Pin	8/28/2008	11/22/2011	Difference	Position	Pin	8/28/2008	11/22/2011	Difference
2	1	171	181	10	1	1	119	190	71	1	1	205	225	20
	2	178	156	-22		2	114	180	66		2	176	245	69
	3	170	179	9		3	145	181	36		3	196	190	-6
	4	172	166	-6		4	162	180	18		4	175	226	51
	5	144	145	1		5	152	190	38		5	206	260	54
	6	234	109	-125		6	152	192	40		6	219	211	-8
	7	169	146	-23		7	117	156	39		7	205	273	68
	8	182	160	-22		8	144	181	37		8	207	260	53
	9	202	210	8		9	135	144	9		9	238	261	23
4	1	70	156	86	3	1	149	176	27	3	1	218	138	-80
	2	127	171	44		2	135	145	10		2	203	135	-68
	3	127	184	57		3	85	216	131		3	200	191	-9
	4	155	175	20		4	111	83	-28		4	213	174	-39
	5	160	190	30		5	91	180	89		5	240	249	9
	6	156	170	14		6	140	192	52		6	226	158	-68
	7	161	220	59		7	150	175	25		7	203	229	26
	8	166	221	55		8	153	171	18		8	222	178	-44
	9	167	205	38		9	140	166	26		9	203	244	41
6	1	164	200	36	5	1	156	175	19	5	1	230	187	-43
	2	35	187	152		2	150	157	7		2	215	188	-27
	3	149	185	36		3	145	183	38		3	215	192	-23
	4	146	175	29		4	156	190	34		4	218	190	-28
	5	109	137	28		5	143	159	16		5	225	171	-54
	6	134	174	40		6	157	174	17		6	225	197	-28
	7	151	140	-11		7	175	199	24		7	215	174	-41
	8	121	159	38		8	176	195	19		8	216	235	19
	9	130	209	79		9	160	195	35		9	228	215	-13
8	1	155	209	54	7	1	115	200	85	7	1	232	241	9
	2	172	232	60		2	92	180	88		2	226	245	19
	3	153	222	69		3	100	114	14		3	205	195	-10
	4	122	195	73		4	132	130	-2		4	167	145	-22
	5	57	168	111		5	107	110	3		5	210	230	20
	6	129	162	33		6	116	74	-42		6	185	185	0
	7	50	90	40		7	164	198	34		7	200	228	28
	8	146	153	7		8	144	165	21		8	206	200	-6
	9	187	185	-2		9	155	172	17		9	147	212	65

### Appendix 4: Lyndhurst Riverside Surface Elevation Table Readings

LR-1					LR-2					LR-3				
Position	Pin	8/29/2008	11/21/2011	Difference	Position	Pin	8/29/2008	11/21/2011	Difference	Position	Pin	8/29/2008	11/21/2011	Difference
1	1	218	230	12	1	1	116	140	24	1	1	226	216	-10
	2	241	230	-11		2	90	235	145		2	219	219	0
	3	244	232	-12		3	55	143	88		3	219	226	7
	4	248	226	-22		4	64	122	58		4	215	237	22
	5	231	224	-7		5	103	109	6		5	183	215	32
	6	223	214	-9		6	114	129	15		6	234	227	-7
	7	239	242	3		7	113	136	23		7	208	233	25
	8	228	214	-14		8	188	148	-40		8	225	224	-1
	9	217	222	5		9	168	150	-18		9	215	220	5
3	1	234	240	6	3	1	175	180	5	3	1	162	208	46
	2	210	260	50		2	179	176	-3		2	193	224	31
	3	237	226	-11		3	102	155	53		3	184	202	18
	4	233	262	29		4	137	162	25		4	118	193	75
	5	242	250	8		5	150	144	-6		5	153	220	67
	6	236	224	-12		6	82	146	64		6	137	187	50
	7	258	233	-25		7	125	156	31		7	138	193	55
	8	230	220	-10		8	185	152	-33		8	145	145	0
	9	225	219	-6		9	207	200	-7		9	95	191	96
5	1	122	207	85	5	1	190	170	-20	5	1	195	220	25
	2	182	233	51		2	150	159	9		2	174	185	11
	3	210	239	29		3	166	154	-12		3	134	185	51
	4	151	231	80		4	135	153	18		4	145	187	42
	5	210	228	18		5	137	159	22		5	72	195	123
	6	224	226	2		6	148	152	4		6	120	179	59
	7	208	240	32		7	145	143	-2		7	97	206	109
	8	206	233	27		8	122	146	24		8	131	210	79
	9	197	228	31		9	130	141	11		9	114	208	94
7	1	212	215	3	7	1	135	132	-3	7	1	165	231	66
	2	219	222	3		2	123	138	15		2	175	226	51
	3	213	221	8		3	135	132	-3		3	222	224	2
	4	211	235	24		4	116	67	-49		4	216	244	28
	5	200	211	11		5	100	50	-50		5	205	220	15
	6	205	215	10		6	98	65	-33		6	220	223	3
	7	207	210	3		7	110	114	4		7	169	236	67
	8	227	211	-16		8	115	114	-1		8	199	246	47
	9	190	214	24		9	115	120	5		9	196	227	31

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

Position	SHS-1				Position	SHS-2				Position	SHS-3			
	Pin	8/28/2008	11/7/2011	Difference		Pin	8/28/2008	11/7/2011	Difference		Pin	8/21/2008	11/7/2011	Difference
2	1	154	223	69	1	1	122	139	17	2	1	177	175	-2
	2	158	220	62		2	90	140	50		2	165	194	29
	3	172	231	59		3	174	144	-30		3	160	179	19
	4	160	211	51		4	164	135	-29		4	168	187	19
	5	183	196	13		5	127	126	-1		5	160	209	49
	6	172	211	39		6	155	142	-13		6	170	179	9
	7	178	225	47		7	147	150	3		7	165	165	0
	8	170	223	53		8	90	154	64		8	170	162	-8
	9	150	206	56		9	136	162	26		9	130	185	55
4	1	142	208	66	3	1	141	142	1	4	1	182	203	21
	2	127	192	65		2	144	132	-12		2	175	206	31
	3	134	224	90		3	156	129	-27		3	174	192	18
	4	165	225	60		4	132	129	-3		4	165	208	43
	5	176	217	41		5	130	120	-10		5	175	188	13
	6	156	200	44		6	135	107	-28		6	174	174	0
	7	148	165	17		7	116	96	-20		7	175	183	8
	8	167	204	37		8	118	85	-33		8	177	191	14
	9	163	179	16		9	120	77	-43		9	175	185	10
6	1	170	211	41	5	1	146	152	6	6	1	180	214	34
	2	173	224	51		2	145	146	1		2	149	216	67
	3	171	229	58		3	152	152	0		3	155	199	44
	4	178	202	24		4	150	151	1		4	174	195	21
	5	181	212	31		5	156	151	-5		5	160	219	59
	6	165	223	58		6	155	137	-18		6	135	221	86
	7	182	224	42		7	140	140	0		7	135	214	79
	8	185	234	49		8	120	132	12		8	148	226	78
	9	180	232	52		9	114	114	0		9	170	230	60
8	1	187	189	2	7	1	129	155	26	8	1	191	226	35
	2	183	172	-11		2	187	181	-6		2	175	222	47
	3	184	215	31		3	232	166	-66		3	175	236	61
	4	178	170	-8		4	180	171	-9		4	188	227	39
	5	185	175	-10		5	174	175	1		5	183	242	59
	6	199	176	-23		6	158	190	32		6	190	239	49
	7	182	181	-1		7	190	152	-38		7	185	230	45
	8	186	186	0		8	186	176	-10		8	200	220	20
	9	197	207	10		9	175	177	2		9	175	214	39