NOTES:

1. ANTICIPATED BARGE TYPE – SPUD/ANCHOR BARGE.
2. ANTICIPATED NUMBER OF OPERATING BARGES – 4 WORK AND 4 MATERIAL BARGES.
3. MINIMUM UNDERKEEL CLEARANCE AT MLW – 2FT.
4. ANTICIPATED MAX. BARGE STATIONARY TIME – 1 WEEK.
5. MINIMUM DISTANCE FROM BREAKWATER CONSTRUCTION ENVELOPE TO FEDERAL NAVIGATION CHANNEL IS APPROXIMATELY 500 FEET.

PROPOSED OVERALL SITE PLAN

LEGEND

- MEAN HIGH WATER SPRING
- MEAN HIGH WATER
- NAVD88 EL. 0.0
- MEAN LOW WATER
- -6' MLW (NAVD88 EL. -8.62)
- BREAKWATER CONSTRUCTION ENVELOPE
- LIWMA
- FEMA V-ZONE

SCALE: 1"=1200'-0"

FOR PERMIT USE ONLY
NOT FOR CONSTRUCTION

DATUM: N.A.V.D. 88
APPLICATION BY: GOVERNOR'S OFFICE OF STORM RECOVERY
APPLICATION NO.:
AGENT: COM

PROPOSED CONSTRUCTION OF LIVING BREAKWATERS
WARD POINT BEND, RARITAN BAY
TOTTENVILLE, STATEN ISLAND
COUNTY OF RICHMOND
STATE OF NEW YORK

DATE: 09/08/2017
SHEET 3 OF 25
<table>
<thead>
<tr>
<th>BREAKWATER</th>
<th>TOTAL LENGTH AT EL. 0 NAVD88 (FT)</th>
<th>TOTAL FOOTPRINT (FT&lt;sup&gt;2&lt;/sup&gt;)</th>
<th>TOTAL FOOTPRINT (ACRES)</th>
<th>FOOTPRINT SHALLOWER THAN -6' MLW (FT&lt;sup&gt;2&lt;/sup&gt;)</th>
<th>FOOTPRINT SHALLOWER THAN -6' MLW (ACRES)</th>
<th>TOTAL VOLUME BELOW MHW (FT&lt;sup&gt;3&lt;/sup&gt;)</th>
<th>TOTAL VOLUME BELOW MHW (yd&lt;sup&gt;3&lt;/sup&gt;)</th>
<th>TOTAL VOLUME BELOW MHWS (FT&lt;sup&gt;3&lt;/sup&gt;)</th>
<th>TOTAL VOLUME BELOW MHWS (yd&lt;sup&gt;3&lt;/sup&gt;)</th>
<th>TOTAL VOLUME BELOW MHWS (ACRES)</th>
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<tbody>
<tr>
<td>A.1</td>
<td>450</td>
<td>59,600</td>
<td>1.4</td>
<td>59,600</td>
<td>1.4</td>
<td>269,000</td>
<td>254,200</td>
<td>256,700</td>
<td>9,970</td>
<td>9,420</td>
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<tr>
<td>A.2</td>
<td>450</td>
<td>59,600</td>
<td>1.4</td>
<td>59,600</td>
<td>1.4</td>
<td>269,000</td>
<td>254,200</td>
<td>256,700</td>
<td>9,970</td>
<td>9,420</td>
</tr>
<tr>
<td>B.1</td>
<td>300</td>
<td>39,000</td>
<td>0.9</td>
<td>39,000</td>
<td>0.9</td>
<td>395,000</td>
<td>274,100</td>
<td>280,200</td>
<td>14,630</td>
<td>10,160</td>
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<tr>
<td>B.2</td>
<td>300</td>
<td>51,500</td>
<td>1.2</td>
<td>51,500</td>
<td>1.2</td>
<td>440,400</td>
<td>339,500</td>
<td>325,500</td>
<td>16,310</td>
<td>11,840</td>
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<tr>
<td>B.3</td>
<td>300</td>
<td>51,500</td>
<td>1.2</td>
<td>51,500</td>
<td>1.2</td>
<td>440,400</td>
<td>339,500</td>
<td>325,500</td>
<td>16,310</td>
<td>11,840</td>
</tr>
<tr>
<td>B.4</td>
<td>300</td>
<td>51,500</td>
<td>1.2</td>
<td>51,500</td>
<td>1.2</td>
<td>440,400</td>
<td>339,500</td>
<td>325,500</td>
<td>16,310</td>
<td>11,840</td>
</tr>
<tr>
<td>B.5</td>
<td>300</td>
<td>51,500</td>
<td>1.2</td>
<td>51,500</td>
<td>1.2</td>
<td>440,400</td>
<td>339,500</td>
<td>325,500</td>
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<td>11,840</td>
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<tr>
<td>C.1</td>
<td>350</td>
<td>49,000</td>
<td>1.1</td>
<td>49,000</td>
<td>1.1</td>
<td>546,000</td>
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<tr>
<td>C.2</td>
<td>450</td>
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<td>1.9</td>
<td>82,700</td>
<td>1.9</td>
<td>856,900</td>
<td>667,500</td>
<td>676,800</td>
<td>31,740</td>
<td>24,730</td>
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<tr>
<td>TOTAL</td>
<td>3,200</td>
<td>495,900</td>
<td>11.4</td>
<td>309,100</td>
<td>7.1</td>
<td>4,097,500</td>
<td>3,130,300</td>
<td>3,181,800</td>
<td>151,780</td>
<td>115,990</td>
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**BREAKWATER TYPES AND QUANTITIES**

**PROPOSED SHORELINE RESTORATION QUANTITIES**

<table>
<thead>
<tr>
<th></th>
<th>AVERAGE CROSS SECTIONAL AREA (FT&lt;sup&gt;2&lt;/sup&gt;/FT)</th>
<th>PLAN AREA (FT&lt;sup&gt;2&lt;/sup&gt;)</th>
<th>LENGTH (FT)</th>
<th>VOLUME (FT&lt;sup&gt;3&lt;/sup&gt;)</th>
<th>VOLUME (yd&lt;sup&gt;3&lt;/sup&gt;)</th>
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<tbody>
<tr>
<td>TOTAL SHORELINE RESTORATION CONSIDERED</td>
<td>169</td>
<td>135,900</td>
<td>806</td>
<td>469,900</td>
<td>17,404</td>
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<tr>
<td>TOTAL SHORELINE RESTORATION BELOW MHW</td>
<td>72</td>
<td>58,400</td>
<td>806</td>
<td>314,200</td>
<td>11,637</td>
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<tr>
<td>TOTAL SHORELINE RESTORATION BELOW MHWS</td>
<td>77</td>
<td>61,900</td>
<td>806</td>
<td>333,200</td>
<td>12,341</td>
</tr>
</tbody>
</table>

**NOTES:**

1. PROPOSED SHORELINE RESTORATION QUANTITIES ARE BASED ON CONSTRUCTION SHORELINE RESTORATION PROFILE.
2. ALL VALUES INCLUDE AN ADDITIONAL 10% TO ACCOUNT FOR UNCERTAINTY.
PROPOSED PARTIAL SITE PLAN

LEGEND

- Mean High Water Spring
- Mean High Water
- NAVD88 EL. 0.0'
- Mean Low Water

SCALE 1"=200'-0"

PROPOSED BREAKWATER TYPE 'A1'
SEE SHEET 9

PROPOSED BREAKWATER TYPE 'A2'
SEE SHEET 9

DISTANCE TO FEDERAL CHANNEL
703 ±

DISTANCE TO SHORELINE
450 ±

450 ±

250 ±

964 ±

TO B1
677 ±

NOTES:

1. Minimum distance from breakwater construction envelope to federal navigation channel is approximately 500 feet.

2. Shoreline distance is measure to MHW.

FOR PERMIT USE ONLY
NOT FOR CONSTRUCTION

DATUM: NAVD 88

APPLICATION BY: GOVERNOR'S OFFICE OF STORM RECOVERY

APPLICATION NO.:

AGENT: COMM

PROPOSED CONSTRUCTION OF LIVING BREAKWATERS

WARD POINT BEND, RARITAN BAY
TOTTENVILLE, STATEN ISLAND
COUNTY OF RICHMOND
STATE OF NEW YORK

DATE: 09/08/2017

SHEET 5 OF 25
PROPOSED PARTIAL SITE PLAN

LEGEND

- Mean High Water Spring
- Mean High Water
- NAVD88 El. 0.0'
- Mean Low Water

SCALE 1”=200’=0”

DATUM: N.A.V.D. 88
APPLICATION BY: GOVERNOR'S OFFICE OF STORM RECOVERY
APPLICATION NO.: Agent: COW

NOTES:

1. Minimum distance from breakwater construction envelope to federal navigation channel is approximately 500 feet.
2. Shoreline distance is measure to MHW.

PROPOSED CONSTRUCTION OF LIVING BREAKWATERS
WARD POINT BEND, RARITAN BAY
TOTTENVILLE, STATEN ISLAND
COUNTY OF RICHMOND
STATE OF NEW YORK

DATE: 09/08/2017 SHEET 6 OF 25
PROPOSED PARTIAL SITE PLAN

NOTES:
1. MINIMUM DISTANCE FROM BREAKWATER CONSTRUCTION ENVELOPE TO FEDERAL NAVIGATION CHANNEL IS APPROXIMATELY 500 FEET.
2. SHORELINE DISTANCE IS MEASURED TO MHW.

LEGEND

- MEAN HIGH WATERS
- MEAN HIGH WATER
- NAVD88 EL. 0.0'
- MEAN LOW WATER

SCALE 1"=200'-0"

PROPOSED CONSTRUCTION OF LIVING BREAKWATERS
WARD POINT BEND, RARITAN BAY
TOTTENVILLE, STATEN ISLAND
COUNTY OF RICHMOND
STATE OF NEW YORK

DATE: 09/08/2017 SHEET 7 OF 25

FOR PERMIT USE ONLY NOT FOR CONSTRUCTION

DATUM: N.A.V.D. 88
APPLICATION BY: GOVERNOR'S OFFICE OF STORM RECOVERY
APPLICATION NO.:
AGENT: COM
BREAKWATER TYPE 'A1-A2' PROPOSED SECTION A-A

NOTES:

1. WHERE POTENTIAL EConcrete® ARMOR UNITS ARE INDICATED, ARMOR STONE WILL BE REPLACED WITH EConcrete® ARMOR UNITS AT A RATE OF 30% IN ALL OTHER LOCATIONS, ARMOR AND TOE UNITS WILL BE STONE OF THE SIZE INDICATED.

2. REFER TO SHEET 8 FOR BREAKWATER VOLUME SUMMARY.

3. ALL VALUES INCLUDE AN ADDITIONAL 10% TO ACCOUNT FOR UNCERTAINTY.
BREAKWATER TYPE 'B2-B5' PROPOSED SECTION A-A

NOTES:

1. WHERE POTENTIAL EConcrete® ARMOR UNITS ARE INDICATED, ARMOR STONE WILL BE REPLACED WITH EConcrete® ARMOR UNITS AT A RATE OF 30%. IN ALL OTHER LOCATIONS, ARMOR AND TOE UNITS WILL BE STONE OF THE SIZE INDICATED.

2. REFER TO SHEET 8 FOR BREAKWATER VOLUME SUMMARY.

3. ALL VALUES INCLUDE AN ADDITIONAL 10% TO ACCOUNT FOR UNCERTAINTY.

LEGEND

- POTENTIAL LOCATION FOR EConcrete® ARMOR UNITS
- POTENTIAL LOCATION FOR EConcrete® TIDE POOL UNITS
BREAKWATER TYPE 'B2-B5' PROPOSED SECTION B-B

BREAKWATER TYPE 'B2-B5' PROPOSED SECTION C-C

NOTES:

1. WHERE POTENTIAL ECoConcrete® ARMOR UNITS ARE INDICATED, ARMOR STONE WILL BE REPLACED WITH ECoConcrete® ARMOR UNITS AT A RATE OF 30%; IN ALL OTHER LOCATIONS, ARMOR AND TOE UNITS WILL BE STONE OF THE SIZE INDICATE.

2. REFER TO SHEET 8 FOR BREAKWATER VOLUME SUMMARY.

3. ALL VALUES INCLUDE AN ADDITIONAL 10% TO ACCOUNT FOR UNCERTAINTY.
BREAKEWATER TYPE 'C1' PROPOSED SECTION A-A

NOTES:

1. WHERE POTENTIAL EConcrete® ARMOR UNITS ARE INDICATED, ARMOR STONE WILL BE REPLACED WITH EConcrete® ARMOR UNITS AT A RATE OF 30%. IN ALL OTHER LOCATIONS, ARMOR AND TOE UNITS WILL BE STONE OF THE SIZE INDICATED.

2. REFER TO SHEET 8 FOR BREAKWATER VOLUME SUMMARY.

3. ALL VALUES INCLUDE AN ADDITIONAL 10% TO ACCOUNT FOR UNCERTAINTY.

LEGEND

- POTENTIAL LOCATION FOR EConcrete® ARMOR UNITS
- POTENTIAL LOCATION FOR EConcrete® TIDE POOL UNITS
**NOT FOR CONSTRUCTION ONLY**

**FOR PERMIT USE ONLY**

**APPLICANT BY GOVERNOR'S OFFICE OF STORM RECOVERY**

**APPLICATION NO:**

**DATE:** 09/08/2017

**PROPOSED CONSTRUCTION OF LIVING BREAKWATERS**

**WATER POINT BEND, RARITAN BAY**

**TOMS RIVER, COUNTY OF RICHMOND**

**STATE OF NEW YORK**

**N.A.V.D. 88**

**DATUM:**

**PROJECT:** Living Breakwaters

---

**BREAKWATER TYPE 'C2' PROPOSED SECTION A-A**

**NOTES:**

1. **WHERE POTENTIAL ECOConcrete® ARMOR UNITS ARE INDICATED, ARMOR STONE WILL BE REPLACED WITH ECOConcrete® ARMOR UNITS AT A RATE OF 30%, IN ALL OTHER LOCATIONS, ARMOR AND TOE UNITS WILL BE STONE OF THE SIZE INDICATED.**

2. **REFER TO SHEET 8 FOR BREAKWATER VOLUME SUMMARY.**

3. **ALL VALUES INCLUDE AN ADDITIONAL 10% TO ACCOUNT FOR UNCERTAINTY.**

---

**LEGEND**

- Potential Location for ECOConcrete® Armor Units
- Potential Location for ECOConcrete® Tide Pool Units

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**SCALE:** 1"=30'-0"
PROPOSED SHORELINE RESTORATION PLAN

LEGEND

- MEAN HIGH WATER SPRING
- MEAN HIGH WATER
- FEMA V-ZONE
- MEAN LOW WATER
- LMWA
- 1978 NYSDEC SHORELINE

CONSTRUCTION ENVELOPE
PROPOSED SHORELINE RESTORATION (AS CONSTRUCTED)
CONSTRUCTION TEMPLATE
EQUILIBRIUM SHORELINE RESTORATION OUTLINE
PROPOSED CONSTRUCTION TEMPLATE MHW CONTOUR

NOTES

1. CONSTRUCTION TEMPLATE OUTLINE REPRESENTS THE FOOTPRINT OF PLACED SAND.
2. EQUILIBRIUM SHORELINE RESTORATION OUTLINE REPRESENTS THE PROJECTED SPREAD OF THE CONSTRUCTION TEMPLATE.

FOR PERMIT USE ONLY
NOT FOR CONSTRUCTION

DATUM: N.A.V.D. 88
APPLICATION BY: GOVERNOR'S OFFICE OF STORM RECOVERY
APPLICATION NO:
AGENT: COW

PROPOSED CONSTRUCTION OF LIVING BREAKWATERS
WARD POINT BEND, RARITAN BAY
TOTTENVILLE, STATEN ISLAND
COUNTY OF RICHMOND
STATE OF NEW YORK

DATE: 09/08/2017
SHEET 22 OF 25
PROPOSED SHORELINE RESTORATION SECTION (TYPICAL)

NOTES:
1. SHORELINE RESTORATION FILL MATERIAL IS SAND WITH D50=0.3MM
2. CONSTRUCTION TEMPLATE OUTLINE REPRESENTS THE FOOTPRINT OF PLACED SAND.
3. EQUILIBRIUM SHORELINE RESTORATION OUTLINE REPRESENTS THE PROJECTED SPREAD OF THE CONSTRUCTION TEMPLATE.

SCALE: 1"=50' HORIZONTAL
1"=10' VERTICAL

LEGEND
- - - - - CONSTRUCTION TEMPLATE
- - - - - EQUILIBRIUM SHORELINE RESTORATION
- - - - - - SHORELINE RESTORATION FILL MATERIAL
ELEVATION (FIVE SIDE, SIX SIDE FACING SEABED IS FLAT)

ECOncrete® ARMOR UNIT

TOP VIEW

ECOncrete® BIO-ACTIVE TIDE POOL

SIDE VIEW

SCALE 1"=2'-0"