Appendix M

Detailed Seaside and Landside Investigation
of the Low Battery Seawall
Photographs, Field Notes, and Sketches
In the zone below the horizontal crack and above the mud line, the concrete was generally of poor quality.

In this zone, the concrete was soft, deeply fissured, broken, and easily removed with pneumatic hand tools.
Detailed Seaside Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)
Note the approximately one inch gap between the top of the pile and the underside of the concrete seawall.

The top of the pile is approximately 82 inches (6'-10") below the seawall coping.
Detailed Seaside Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)
Four batter piles, one vertical pile, and the top portions of the timber sheet piles and concrete veil were exposed at the opening of the cavity.

A pair of exposed 5” wide x 12” deep timbers extended approximately perpendicular to the face of the seawall. The timbers were bolted to the vertical pile and its adjacent seaward batter pile.
Inconsistent with the archival sketch on page 1 of Appendix F, the seaward edge of the timber deck platform terminated approximately 2 ½ feet landward from the seaward face of the seawall.

The steel bolts, nuts, washers used in the connection of the 5” x 12” timber framing to the support piles were severely corroded. The ends of the bolted connections were heavily encrusted with a ferrous compound.
Considering the deep crevices in this localized area of the seaward face of the concrete seawall, there was remarkably little marine borer damage to these five exposed timber piles.

The ceiling of the cavity sloped irregularly downward from the seaward opening. Further towards the interior of the seawall and above the ceiling of the cavity, the concrete was substantially harder.
Detailed Seaside Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)

Inconsistent with the archival sketch on page 1 of Appendix F, the seaward edge of the timber deck platform terminated approximately 2 ½ feet landward from the seaward face of the seawall. The archival sketch clearly indicates that the timber deck was to extend to the seaward face of the seawall to provide support for the full width of the base of the cast-in-place concrete seawall.
Detailed Seaside Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)
Field Notes and Sketches

18.04

Seawall @ Murray Blvd.
Sheridan/Bennett/CRB

3 dwm view
11 am - 5 pm, Low @ 2:37 pm
50°, sunny, thin cloudy

- Exposed additional wood framing to
  view 5 pilars, vertical and battered
- Viewed 5x12 brackets, wood deck
  extremely soft below deck
- Wood sheet piles intact
  Took samples of wood sheet piles, pile
  hardware in brackets
  Wood sheet piles on uniform, seaward
  batter, to slope

- Measured/sketch layout etc.

- No pertinent info needed this site
- See back fill w/loox stone/rip rap.
Detailed Seaside Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)
Field Notes and Sketches
Detailed Seaside Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)
Field Notes and Sketches
Detailed Seaside Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)
Field Notes and Sketches
Detailed Landside Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)
The inspection revealed that the seawall construction was generally consistent with the archive drawings. The measured step down pattern on the landside closely correlated with the step down pattern indicated in the archive drawings.
Detailed Landside Investigation of the Low Battery Seawall Station 9+73 (84 Murray Boulevard)
The inspection revealed that the seawall construction was generally consistent with the archive drawings.

The deck timbers appeared well preserved. However, the wood fibers were very saturated with water and seemed “spongy”.
The deck timbers appeared well preserved. However, the wood fibers were very saturated with water and seemed “spongy”.

The bolts were very severely corroded from the ends with significant loss of metal cross section. A screwdriver shaft could be inserted into the ends of the bolts and pushed several inches into the interior length of the bolts.
A screwdriver shaft could be inserted into the ends of the bolts and pushed several inches into the interior length of the bolts.

The bolts were very severely corroded from the ends with significant loss of metal cross section. The remaining cross-section of a bolt was more comparable to a thin walled pipe than a solid round rod.
A pair of 5" wide x 12" deep timbers was bolted into the sides of the pile. The investigation revealed that approximately two inch wide by twelve inch deep notches had been cut into the sides of the piles to provide partial end support for the 5" wide x 12" deep timbers. At present, the ends of the 5" x 12" timbers are primarily supported by the notches cut into the sides of the support piles. At best, the remnants of the bolted joint provided some nominal amount of rotational resistance for the connection.
Detailed Landslide Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)
Field Notes and Sketches
5.4.04

SHERIDAN/ENGLISH:
84 Murray Blvd.

City furnished equipment and personnel
backhoe, dump truck, loc truck, showing (6x6, 6x6) bariaceres

Re-excavated hole, expanded westward, installed showing along asphalt and return ends

[Hand-drawn diagram showing soil layers and structures]
Detailed Landside Investigation of the Low Battery Seawall
Station 9+73 (84 Murray Boulevard)
Field Notes and Sketches
- material between 5x12's coarse sand w little clay, w course wet beach sand, generally tight to underside of decking
- 4" decking, generally well preserved, but spongy, compressible, no signs of worms, underside of decking eroded, very cheesy texture, flush at bearing surface (on 5x12) but very soft. Decking is cut 45
- 5x12's appear solid, but bolts severely corroded, washers appear concealed, difficult to confirm. Note 5" deep void at bolt holding 5x12 to pile!
- pile w 12" of timber, generally sound, although exterior spongy.

Closed opening ~4pm
Detailed Seaside Investigation of the Low Battery Seawall
Station 27+48 (32 Murray Boulevard)
Signs of deterioration include rust streaks from exposed and corroding steel reinforcing bars in the coping and horizontal cracks below the coping.
Detailed Seaside Investigation of the Low Battery Seawall
Station 27+48 (32 Murray Boulevard)
Signs of deterioration include rust streaks from exposed and corroding steel reinforcing bars in the coping and horizontal cracks below the coping.

The vertical yellow line highlights the joint between adjacent concrete veil panels. The horizontal yellow line highlights the joint between the bottom of the seawall and the protective concrete veil. The concrete quality was very good and the joint between the bottom of the seawall and the protective concrete veil appeared sound.
The yellow circle highlights the original cementitious patch covering the head of one of the steel bolts connecting the concrete veil to the underlying timber sheet pile and the timber waler. The original cementitious patch was removed. The exposed head of the steel bolt was found in very good condition and had very little corrosion.

A core sample of the protective concrete veil was taken. The concrete was in very good condition.
Detailed Seaside Investigation of the Low Battery Seawall
Station 27+48 (32 Murray Boulevard)
A core sample of the underlying timber sheet pile structure was taken.
The wood was in very good condition.
Detailed Seaside Investigation of the Low Battery Seawall
Station 27+48 (32 Murray Boulevard)
Field Notes and Sketches
The landside investigation uncovered two support piles located approximately six feet apart. The associated 5” x 12” timber beams were connected to the sides of the piles near their tops. The construction was consistent with the archive drawings.

The platform deck timbers, the 5” x 12” timber beams, and the top portions of the piles appeared well preserved. Again, the wood fibers were very saturated with water and seemed “spongy”
The bolts, washers, and nuts used in the connection of the 5” x 12” timbers to the piles again were severely corroded. A screwdriver shaft was pushed six inches into the interior length of another bolt before any resistance could be felt.
At the landside of the seawall, approximately midway between supporting piles, there was an approximately one inch gap between the underside of the concrete seawall and the timber support platform.
3/5/04  SHERIDAN/BEWELL/ENGLISH @ 32 MURRAY Blvd.
~ NOON, PTRY. CLOUDY, 70° WINDY, ABOUT LOW TIDE
(EXCAVATION STARTED 9:40 AM)

- City equipment + personnel
  (backhoe, dump truck, vac truck, ud. shoveling)
- City has installed 2 wood shoring and excavated
defined site, removed sidewalk 4" slab and stone curb
cement seawall virtually same as joint excavation,
virtually same as arch Lori section drawing.
- Top sand, then clayey sand
- Note water level stabilization ~ 2' below underside of wood shoring, very rapidly after vac truck lown

Level.

Water level in house quickly stabilizes.
Detailed Landside Investigation of the Low Battery Seawall
Station 27+48 (32 Murray Boulevard)
Field Notes and Sketches
3.5.04

- Sand surrounds 5x12's, potentially providing lateral support.
- No large spikes in decking to 5x12's, smaller heads visible.
- Generally wood is very soft, 2" deep from exterior, note difference in spring/summer wood.
- Soil generally cohesive, more visually layered.
- Desire IC staff to view next part (CWU).
- Photos by Bennett & Sheridan.
- Apparent accretion at heads of bollito 5x12's at piles - unable to determine composition - dark, rough edge, one mass over both bollitso.
Detailed Seaside Investigation of the Low Battery Seawall
Station 43+50 (near White Point Garden)
The investigation was performed at the existing crack opening at the face of the seawall. The crack opening was approximately 6 inches wide and corroded reinforcing bars were exposed to view.

In the past, attempts have been made to seal the wider portions of the cracks with patches of bricks and mortar.
In this location, the timber sheet pile system extended approximately one foot above the timber platform and the protective concrete veil. The portions of the timber sheet pile system extending above the mud line were actively invested with marine boring organisms.
A section of the timber sheet pile system extending above the mud line was removed. The timber was actively invested with marine boring organisms.
Where exposed to view, the perimeters of the top portion of the batter piles were soft and the exterior one inch of wood fiber was easily scrapped away. There was no apparent marine borer damage to the two batter piles. The timber platform deck, located just below the surface of the mud, had no apparent marine borer damage.
Detailed Seaside Investigation of the Low Battery Seawall
Station 43+50 (near White Point Garden)
Field Notes and Sketches
Detailed Landside Investigation of the Low Battery Seawall
Station 43+50 (near White Point Garden)
“The Boulevard Extension” also appears to have been constructed to the
dimensions and configuration presented in the archival design
sketch on page 1 of Appendix F.
Detailed Landside Investigation of the Low Battery Seawall
Station 43+50 (near White Point Garden)
The landside excavation exposed the timber support platform and the top portion of a vertical support pile connected to a pair of 5” wide x 12” deep timber beams.

Detailed Landside Investigation of the Low Battery Seawall
Station 43+50 (near White Point Garden)
The underside of the timber platform had considerable marine borer damage believed to have occurred during the original construction phase when the platform extended over then-open water.
Detailed Landside Investigation of the Low Battery Seawall 
Station 43+50 (near White Point Garden) 
It was noted that the topside of the timber platform did not have any marine 
borer damage.

Detailed Landside Investigation of the Low Battery Seawall 
Station 43+50 (near White Point Garden) 
Again, the 5” x 12” timber beams and the top portion of the pile were saturated 
with water and seemed “spongy”. The spongy fibers extended approximately 
an inch inward from the faces of the timbers before solid resistance could be felt.
Similar to the other landside investigations, the steel bolts, nuts, and washers used in the connection of the 5” x 12” timber framing to the support piles were severely corroded. The ends of the bolted connections were heavily encrusted by a ferrous compound.

The interior of the lengths of the bolts had corroded deeply inward from the ends. Here also, a shaft of a screw driver could be inserted into the ends of the bolts and pushed several inches into the interior length of the bolt.
Detailed Landside Investigation of the Low Battery Seawall
Station 43+50 (near White Point Garden)
Field Notes and Sketches
Detailed Landside Investigation of the Low Battery Seawall
Station 43+50 (near White Point Garden)
Field Notes and Sketches