CITY OF NEWPORT BEACH
COMMUNITY DEVELOPMENT DEPARTMENT
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February 1, 2018

Via FedEx and email (Edward.Curtis@fema.dhs.gov)

Mr. Ed Curtis, Engineer
FEMA Region IX
1111 Broadway, Suite 1200
Oakland, CA 94607

Re: Response to Request for Additional Information for the City of Newport Beach

Case No.:	**12-09-1324S**	**Community:**	**City of Newport Beach, CA**
Docket No.:	**FEMA-B-1673**	**Community No.:**	**060227**

Dear Mr. Curtis,

The City of Newport Beach ("City") thanks the Federal Emergency Management Agency ("FEMA") for FEMA's initial review of the City's appeal submittals dated August 30, 2017, and September 6, 2017, (collectively "Appeal") regarding requested revisions to the Preliminary Flood Insurance Rate Map ("FIRM"), Flood Insurance Study ("FIS") report, and Base Flood Elevations ("BFE") issued by FEMA on August 15, 2016. The Appeal includes a written opinion (the "Written Opinion") of Dave Kiff, the City's Chief Executive Officer and City Manager, deciding that the evidence presented in support of the City's Appeal is sufficient to justify an appeal on behalf of 326 private owners and lessees of property in the City by the City in its own name.

The City is in receipt of FEMA's response letter to the City dated November 21, 2017, wherein FEMA requested additional information for consideration of the Appeal. On December 6, 2017, the City sent FEMA a request for an extension of time (from December 21, 2017, to January 20, 2018) to allow for the City to submit a more complete response to FEMA's request for additional information. On December 20, 2017, by email, you approved the extension, allowing the City to have until January 20, 2018, to respond to FEMA's letter dated November 21, 2017. On January 4, 2018, the City submitted a letter to FEMA providing some additional information for FEMA's consideration of the Appeal as well as a request for resolution of the Appeal by Scientific Resolution Panel. On January 11, 2018, the City requested an additional two-week extension in order to provide FEMA with even more additional information in response to its November 21, 2017, letter; on January 16, 2018, FEMA sent the City a letter granting an extension for the City to submit additional information to February 3, 2018. With that background in mind, the City offers the following in response to FEMA's request for additional information dated November 21, 2017, and intends for the information set forth herein (including attachments and enclosures) to supplement the information in the City's January 4, 2018, correspondence and for both to be considered as part of the Appeal.

Request No. 1

For purposes of the National Flood Insurance Program (NFIP), FEMA, in its flood hazard and risk mapping effort, will only recognize coastal flood protection structures that meet, and continue to meet, minimum design and maintenance standards that are consistent with the level of protection sought through the comprehensive floodplain management criteria established by 44 CFR Part 60.3. Please submit a detailed technical review of all coastal protection structures that are included in the flood hazard analysis and mapping, demonstrating that the coastal flood protection structure will survive during the base flood. Specific criteria for evaluating coastal structures are contained in FEMA Guidance for Flood Risk Analysis and Mapping: Coastal Structures (November 2015).

<u>Response to Request No.1</u>

For the reasons stated in the City's letter dated December 6, 2017, the City faces several obstacles inhibiting its ability to prepare a detailed technical review of the 22.5 miles of seawalls that are included in the flood hazard analysis and mapping. However, the City engaged Anchor QEA to perform a visual evaluation of all of the seawalls to better ascertain the validity of wall survivability during a storm event within the harbor. A copy of the report is included herewith along with GIS mapping, and a 10-hour video of segments of the seawalls relevant to the Appeal. Additionally, the City outlined in its letter dated January 4, 2018, the ongoing extension of the seawall around Balboa Island, the maintenance operations of City owned seawalls, and a copy of all permits for private residences that have already been built or reinforced seawall in the process of developing their parcels.

Hence, the City is providing information on the seawalls following the certification requirement described under Section 2.2 Coastal Armoring Structure Evaluation Based on Limited Data and Engineering Judgment of the FEMA Guidance for Flood Risk Analysis and Mapping: Coastal Structures (November 2015). Section 2.2 states that the Mapping Partner can apply engineering judgment to determine the likely stability of the seawall during the 1-percent annual chance flood, and the conclusion can be based on archive and local observations, including historical evidence of storm damage and maintenance. Please refer to City of Newport Beach letter to FEMA dated January 4, 2018.

Request No. 2

Submitted raster data for the seawalls around Newport Bay do not accurately represent conditions on the ground for the following reasons:

- *Survey data point density is very low with considerable interpolation between survey points. Higher density of survey points for individual seawalls is needed to interpolate between points, particularly in areas where individual seawalls for each property are present.*
- *The width of the seawall crests in the raster dataset is about 20 ft. Whereas the actual width of the seawall crests is generally less than 5 ft.*

Please modify the seawall raster dataset used in the HEC-RAS model to accurately represent ground conditions.

Response to Request No.2

The objective of the survey is to identify the location and height of the seawalls for the use of the HEC-RAS model to simulate flood extent in Newport Bay. As shown in Figure 1 (attached), most of the seawall segments along the shoreline of Balboa Island and Newport Bay are straight and of uniform heights and can be captured by two survey points at the two ends of a seawall segment. Hence, the density of the survey points is sufficient to meet the objective. The survey team kept very detailed field notes and photos to ensure all the necessary detail of the seawall was captured. Example survey field notes and photos are provided in Figures 2 and 3 (attached). Nevertheless, the City has retained Coast Surveying to conduct an additional survey, which added 1,427 survey points of the seawall elevations. The top of wall elevations were extracted from digital models developed from 1”=20’ scale photogrammetric mapping. The locations of these new surveys points are shown in Figure 4 (attached). In Figure 4, the previously submitted survey points conducted in 2017 are also shown. A reference of the data points is shown in the attached Seawall Survey 2018 Map. The following link shows the data points that were referenced in 2017 as submitted to FEMA as well as the new additional data collected in 2018; when zoomed you will be able to see the elevation labels turn on:

https://nbgis.newportbeachca.gov/NewportHTML5Viewer/?viewer=seawallelevations

The HEC-RAS model simulates flow overtop the seawall using a weir formula and the cell width of approximately 20 ft. shown in the raster dataset is irrelevant. The cells along the seawalls are only used to define the locations and heights of the seawalls. Since we are setting up the HEC-RAS model to simulate the entire Newport Harbor and Bay, we try to limit the cell size to be not smaller than approximately 20 ft. to reduce simulation time. Reducing the cell size along the seawall to approximately 5 ft. will not affect the model simulated flood extents.

The HEC-RAS Model was updated to include all the additional seawall elevations data. In addition, the model grid was revised to reduce the width of the cells representing the seawall to approximately 5 ft. as requested. In Figure 5, the updated HEC-RAS Model predicted flood zones are compared with the previously submitted proposed revised flood zones described in the Letter of Appeal dated August 30, 2017. As can be seen in the figure, there is only very slight changes in the predicted areas with the updated HEC-RAS Model.

Request No. 3

The wind wave estimation was done using the median wind speed. This approach is not consistent with the study objective of looking at the 1 percent-annual-chance coastal flood event. Please examine wave effects from wind speeds concurrent with the surge return event period of interest.

Response to Request No.3

The effect of waves on flood extent for the Newport Harbor area (AE Zone) was not considered in the hydrodynamic modeling using the HEC-RAS model. Not including the effect of waves in mapping the flood extent of the Newport Harbor is consistent with the approach used in the FEMA Open Pacific Coast (OPC) Study. The City substituted the “bathtub” approach used in the OPC study with the use of more accurate 2D hydrodynamic modeling to map the flood extent in Newport Harbor area. However, per request of

Mr. Ed Curtis on June 15, 2017, during a meeting at the City to go over the City's technical analyses, the typical wind wave conditions for Newport Harbor is provided in the City's Appeal documents.

In the OPC Study, three different approaches were developed for mapping the flood hazard in protected or sheltered waters. For Newport Bay, the "basic" treatment was implemented. Under the basic treatment, the 1-percent-chance still water elevation (SWEL) was extended from the open coast into the bay, which defined the extent of the AE Zone. According to the OPC documentation (IDS Submittal 1, Page 56), the basic approach is justifiable where "*there is very low exposure to wave energy and no VE zones are expected*". The OPC Study (IDS Submittal 1, page 42) further states that "*Newport Bay is one of nine embayments along the California coastline assessed by BakerAECOM to determine the necessity for detailed wave analysis, as requested by FEMA. It was determined that Newport Bay is almost completely sheltered from wave energy from the open coast, and has relatively short fetches within the Bay. Flooding is likely due to SWEL alone; therefore, a more detailed analysis is not required*."

In addition, even if wave effect is considered, it would not be appropriate to examine the wave effects from 1-percent wind speeds concurrent with the SWEL as suggested. This would pair a 1-percent-chance wind-wave event with a 1-percent-chance SWEL, resulting in a 0.01-percent event with return period on the order of 10,000 years.

Request No. 4

Long (swell) wave energy will penetrate the Newport Bay entrance channel. Depending on the frequency and direction of the swell waves and the nearshore bathymetry, this may have a significant effect on flooding in the bay. Please examine long wave penetration and evolution of long wave energy into Newport Bay as a contributing factor to flooding.

<u>Response to Request No.4</u>

Please see response above why swell is not considered. Nevertheless, the City is providing the following information regarding typical swell conditions in Newport Harbor for your reference.

Although both stations are currently inactive, historical data is available for the Coastal Data Information Program (CDIP) at Huntington Beach and Dana Point that spans 1992-2001 and 2000-2016, respectively. The mean wave height and peak period are similar at both stations; specifically, the mean wave height and peak period are approximately 2.6 ft. and 13.3 sec at Huntington Beach, and 3.0 ft. and 13.7 sec at Dana Point. As for wave direction, only the station at Dana Point had available data. The data show that the most significant wave directions were determined to come from the south, west, and south-south-west.

In lieu of conducting wave modeling, a simple wave diffraction analysis was conducted to provide a quick estimate of penetration of offshore swells through the harbor inlet channel into Newport Harbor. Figure 6 shows the approximated wave diffraction coefficients for a few locations along Balboa Island and Little Balboa Island for a wave direction of 191° from true north (average of the most common wave directions from south and south-south-west based on Dana Point data). As shown in the figure, the wave diffraction coefficient (K) along the southern face of Balboa and Little Balboa Island ranges from approximately 0.02

to 0.03. Even at the corner of Little Balboa Island which directly faces the inlet channel, the diffraction coefficient is only 0.14. Based on the mean wave height of 2.6 ft. to 3.0 ft. outside of the harbor entrance, the corresponding waves reaching the southern face of Balboa and Little Balboa Island would only be between roughly 0.05 and 0.09 ft. in height. Swell wave heights further inside of the harbor are expected to be even smaller. Only at the corner of Little Balboa Island, which directly faces the inlet channel, swell wave height may reach about 0.4 ft.

Request No. 5

The Newport Bay HEC-RAS model was validated qualitatively by looking at flood extents for the January 10, 2005, flood event. Please provide additional model validation to ensure accuracy of the HEC-RAS model using historic water level observations in Newport Bay. Below are a few examples of data sources that may be used to complete this validation.

- *NOAA hourly tide data from the Newport Bay Entrance Channel (Station ID 9410580) from 1979-1994.*
- *US Army Corps of Engineers (USACE), Los Angeles District, Upper Newport Bay Model Development- Baseline Conditions Analysis, 1998. This study validated an RMA hydrodynamic model of Newport Bay using observed water level data from 1992 at various locations around the bay.*

Response to Request No.5

The comparison of the HEC-RAS model with an actual flood event is to validate the capability of the model to simulate flooding in a coastal urban area due to overtopping of seawall. Generally, any two-dimensional hydrodynamic model such as the HEC-RAS model can accurately simulate water elevations in open water due to tidal action. The following illustrates the accuracy of the HEC-RAS model in simulating water elevations in the open water of Newport Harbor using the recommended data source (USACE 1998).

In the 1998 U.S. Army Corps of Engineers (USACE) Feasibility Report on Upper Newport Bay Numerical Model Development: Baseline Conditions Analysis, model results were compared with data from two tide gage stations. These stations are situated at Dover Shores and salt dike. Only data from Dover Shore was used in our modeling efforts to compare HEC-RAS model results with the field data. This is because since the USACE study was completed, the salt dike area has undergone extensive restoration and dredging as a part of the Upper Newport Bay Ecosystem Restoration Project—and now has completely different bathymetry. The Dover Shore data consisted of observed and simulated water surface elevations for June 11-12 and June 23-24, 1992. A comparison of the USACE data and our modeling results at Dover Shore show an almost exact match for water surface elevations, as presented in Figure 7. Specifically, the Figure includes a comparison plot for each of the two data timeframes, while each of these individual plots compares RMA modeling results from the USACE study, our HEC-RAS modeling results, and observed data from the USACE study. As such, the close match between the USACE data and our results provides additional model validation for ensuring accuracy of the HEC-RAS model used in our analyses.

If you need any additional information, please do not hesitate to contact me.

Sincerely,

Samir Y. Ghosn, MS, PE, CBO
Deputy Community Development Director | Chief Building Official
City of Newport Beach

SG:ds

c: Rick Sacbibit, Engineering Services Branch Chief, FEMA Federal Insurance & Mitigation Administration
Juliette Hayes, Risk Analysis Branch Chief, FEMA Region IX
Karin Ohman, CFM, Coastal Scientist, Michael Baker International
Seimone Jurjis, Community Development Director & Floodplain Administrator, City of Newport Beach
Dave Kiff, City Manager and Chief Executive Officer, City of Newport Beach

Attachments/Enclosures:
- Figures 1-7
- Flood Risk Assessment: Structural Integrity of Seawalls
  - Table of Contents *(i-ii)*
  - Report (Pages 1-22)
  - Appendix A – Resume Randy Mason, P.E. (A1-A2)
  - Appendix B – Enlarged Area Maps (B1-B13)
  - Appendix C – Seawall Survey Video (Flash drive)
- Seawall 2017-2018 Survey – Seawall Elevation Points (Pages 1-9)
- HEC_RAS MODEL (updated January 2018) – (CD)

REFERENCES

USACE 1998. Upper Newport Bay Model Development – Baseline Conditions Analysis.

Figure 1. Example Seawalls

Figure 2. Survey Locations on W Bay Avenue between 18th Street and 19th Street

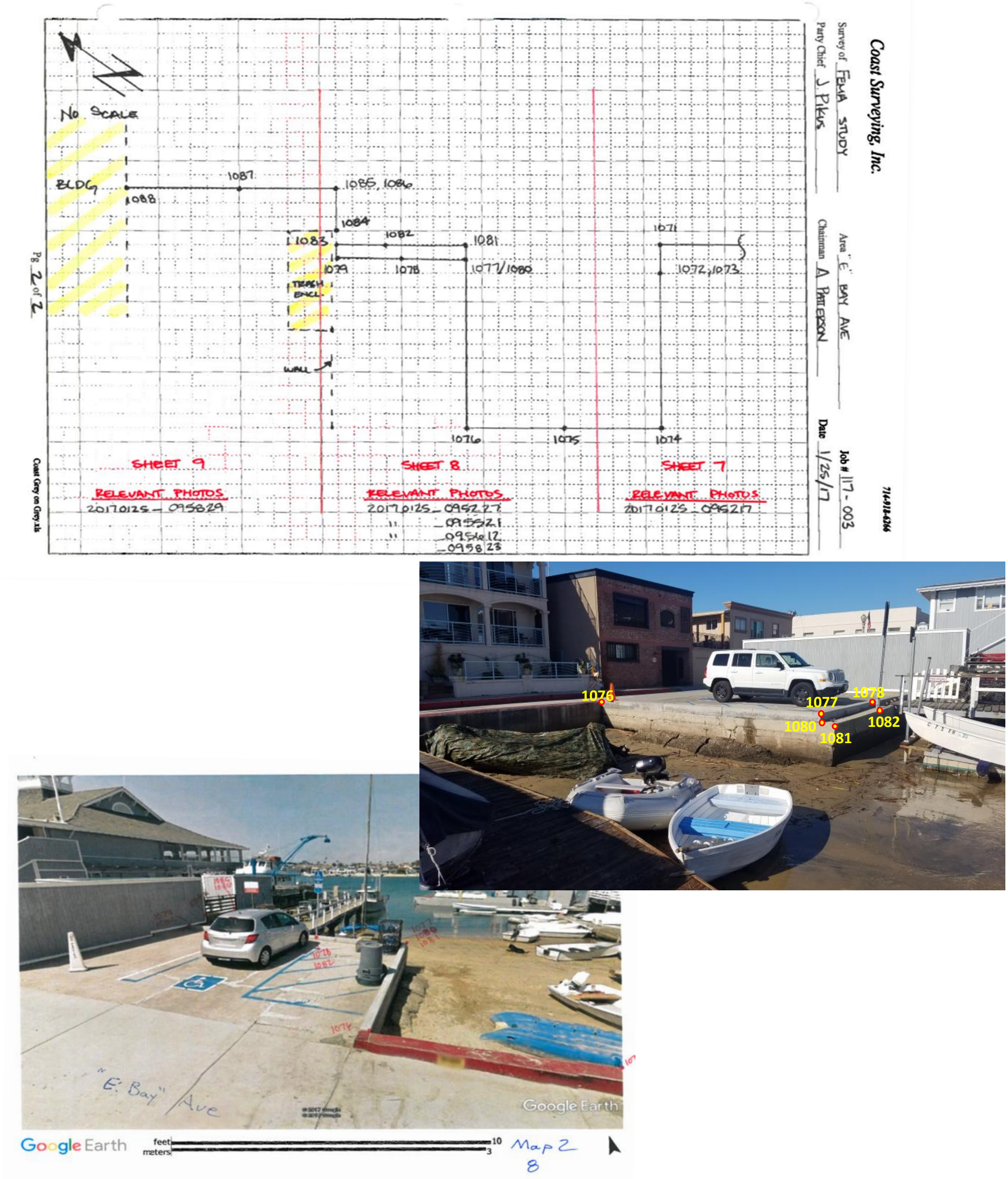
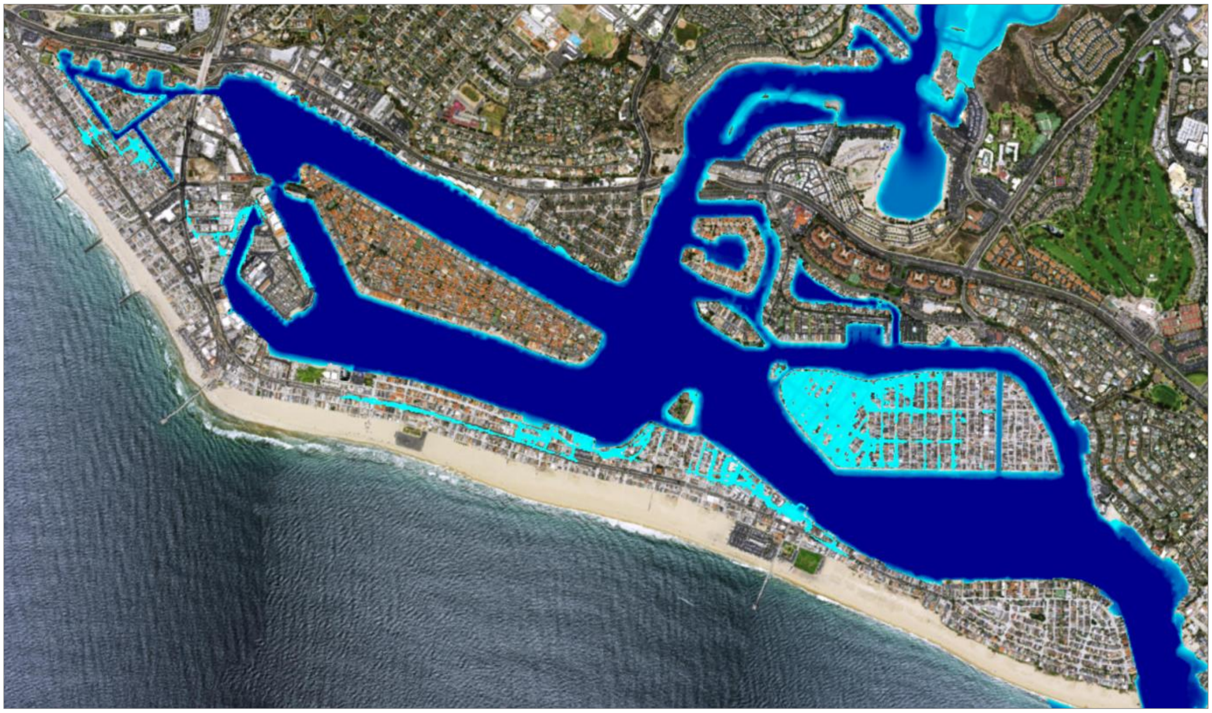


Figure 3. Example Survey Field Notes

Figure 4. Additional Survey Data Points (in Red) shown with the 2017 Survey Data Points (in Green)

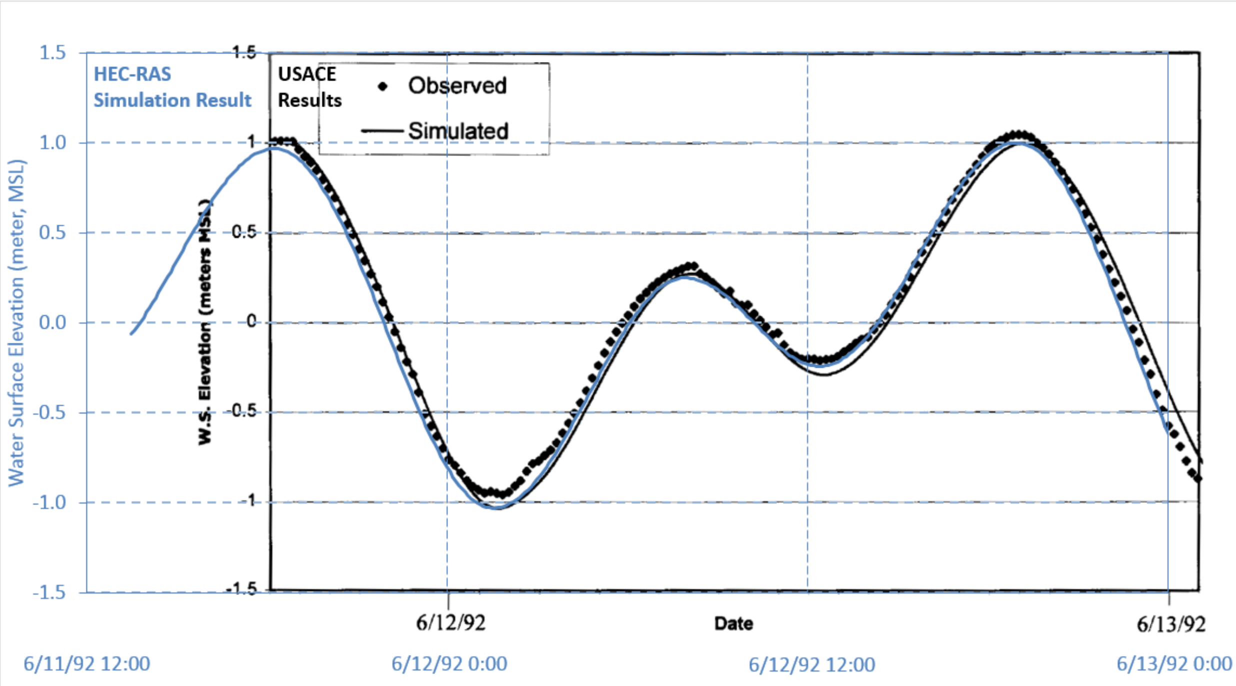


(a) Proposed revised flood zone submitted in the Letter of Appeal dated August 30. 2017

(b) Updated proposed revised flood zone

Figure 5. Comparison of Updated Proposed Revised Flood Zone with the Previous One Submitted in the Letter of Appeal

Figure 6. Wave Diffraction Coefficients for Newport Harbor



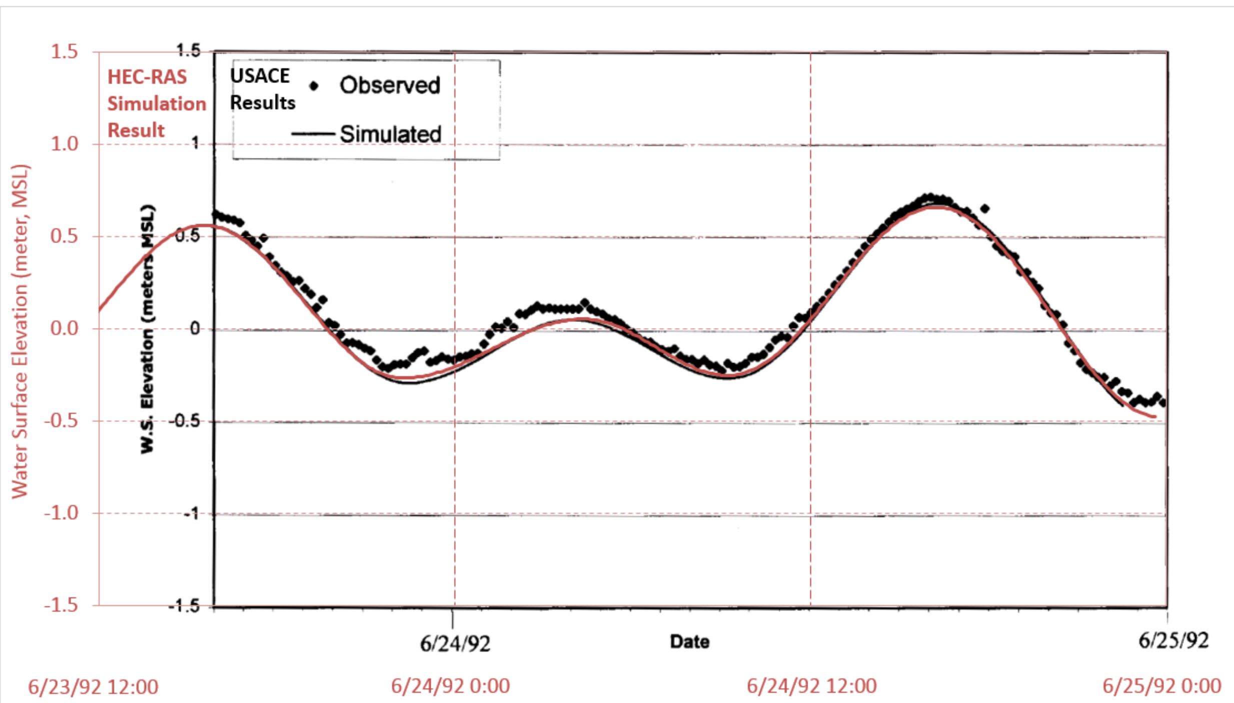


Figure 7. Comparison of Water Surface Elevation Results at Dover Shore for June 11-12, 1992 & June 23-24, 1992 ***(HEC-RAS results shown in blue & red-orange, original USACE results shown in black)***

January 2018
City of Newport Beach

Flood Risk Assessment: Structural Integrity of Seawalls

Prepared for City of Newport Beach

January 2018
City of Newport Beach

Flood Risk Assessment: Structural Integrity of Seawalls

Prepared for
City of Newport Beach
Community Development Department
100 Civil Center Drive
Newport Beach, California 92660

Prepared by
Anchor QEA, LLC
7755 Center Avenue, Suite 1060
Huntington Beach, California 92647

Project Number: 180243-01.01

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FIGURES

APPENDICES

1 Purpose and Scope

Anchor QEA, LLC, conducted a condition assessment of waterfront seawall and slope protection structures around Newport Harbor and evaluated the potential risks associated with these structures in the event of flood water intrusion from seasonal storm and king tide events. Excessive flood waters, coupled with a swift tidal reduction, would place an excessive hydrostatic pressure on these structures that could create risk conditions for potential structure damage or failure, resulting in collateral damage to the properties protected within or by these structures.

This Flood Risk Assessment is based on visual observations of the in-place waterfront structures protecting property around Newport Harbor. A team of California-registered civil engineers composed of Anchor QEA staff—Randy Mason, PE (No. C030661); Fred Massabki, PE, (No, C070423), and Soren Morch, PE (No. C080720)—observed waterfront seawall and slope protection structures surrounding Newport Harbor and prepared this report. This effort included locating, identifying, and documenting the potential structural risks from flood waters (structure overtopping) using the following basic classification system:

- Level 1: No perceived risk, which is defined as a wall that has survived past storm surge and king tide events, appears to be structurally sound, and appears to be in fair to excellent condition.
- Level 2: Possible risk, which is defined as a wall that has survived past storm surge and king tide events and appears to be in fair condition but given its age and construction may require modifications to withstand future flooding events. This type includes seawalls with cap extensions for which documentation may not exist and is intended to prevent seawall overtopping.
- Level 3: Higher risk, which is defined as a wall that has survived past storm surge and king tide events but is either in poor condition, or does not visually appear to be structurally sound. A Level 3 seawall classification does not necessarily mean that the building structures it protects are in danger; that assessment is dependent on many other factors that are not the focus of this report.

The three levels of risk used for this assessment are opinions based on experience in the design and repair of seawalls throughout Newport Harbor prepared or observed by the Anchor QEA team members since the early 1980s. That historical body of experience and the recent visual observations of in-place waterfront structures is the basis of this report. Mr. Mason has been involved with Newport Harbor seawalls and waterfront structures since the early 1980s. He was a key member of the consultant team member that prepared the 2011 Assessment of Seawall Structural Integrity and Potential for Seawall Over-Topping for Balboa Island and Little Balboa Island report for the City in association with other coastal engineers and the academic community. Mr. Mason's resume is provided in Appendix A.

The Newport Harbor waterfront consists of approximately 20 miles of seawalls and slope protection measures (i.e., revetments) that form the structures reviewed in this report. Figure 1 below depicts the extent of the seawall structures (green lines) in Newport Beach.

Figure 1
Extent of Survey

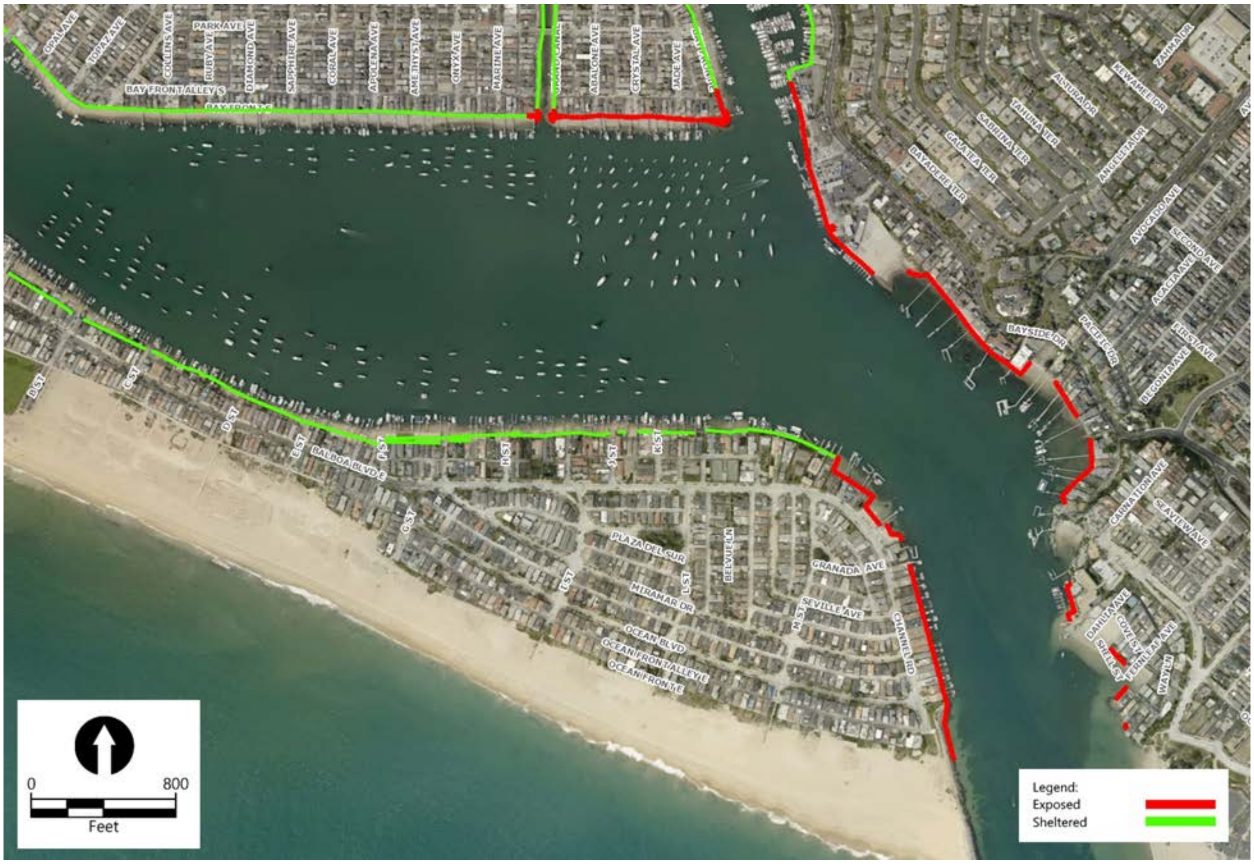
Newport Harbor is exposed to flood waters via the Balboa Peninsula which protects the peninsula and inner harbor from coastal storm conditions. Since the outer peninsula is composed of a beach rather than a waterfront structure, it was excluded from this assessment, along with other internal harbor beachfronts (pocket beaches) around the perimeter of the inner harbor.

The existing seawalls and waterfront structures consist of a mix of both public and private property ownerships as depicted in Figure 2.

Figure 2
Seawall and Slope Protection Property Ownerships

Additionally, as depicted in Figure 3 on the following page, some seawalls and slope protection devices (i.e., revetments) within Newport Harbor are directly exposed to ocean waves and storm surge penetrating the harbor entrance. However, much of seawalls and slope protection devices are sheltered from the impact of open-ocean waves and surge. The red lines depict our opinion of those walls within the harbor that are subject to ocean conditions. All other areas in the harbor would be considered sheltered, in our opinion.

Figure 3
Ocean Swell Exposure



2 Harbor Development Background

Seawall construction in Newport Harbor began in the late 1920s and 1930s, with the newest seawalls being installed within the past 4 years. For this assessment, construction timeframes are based on knowledge of Newport Harbor, historical records, and as-built drawings. Figure 4 is a map indicating the major areas of Newport Harbor. Brief descriptions of these areas, including types of seawalls and slope protection devices found and approximate timeframe of construction, are provided below. Enlargements of selected designated areas shown in Figure 4 are provided in Appendix B.

Figure 4
Newport Harbor Area Designations

2.1 Balboa Peninsula

Development along the Balboa Peninsula began with the McFadden's Newport Landing (current site of the Balboa Pavilion) in 1875 and the McFadden's Wharf (current site of Newport Pier) in 1888. William Collins and Henry Huntington formed Newport Beach Company and purchased much of the peninsula for development in 1902. The Balboa Pavilion and Balboa Pier, both of which still stand today, were opened in 1906. Balboa Pavilion was built over the water on timber piles and did not have a protective structure. Timber seawalls were built later to protect the landside facilities and subsequently replaced with the current concrete seawalls. Because Balboa Peninsula is composed of multiple ownerships, seawalls along this portion of harbor vary in type and construction material, age, height, and condition. Generally, observed seawall types included concrete sheetpile walls with structural concrete caps, steel sheetpile walls with concrete caps, steel tube walls with timber waler, and slope protection devices, including, but not limited to, timber crib walls, composite crib walls, and revetments. The newest seawall along the Balboa Peninsula is located at Marina Park, which was constructed in 2014. The park's boat basin seawalls consist of concrete sheetpiles with a structural concrete cap.

2.2 Bay Island

Unlike other current islands in Newport Harbor (i.e., man-made and created from dredged material), Bay Island was an original island in Newport Bay. When originally purchased in 1904 by R. J. Waters and Rufus Sanborn for recreational purposes, the island consisted of a small hill of dry land surrounded by mudflats. Homes were being built on the island within a few years, and subsequently, the island was enlarged to accommodate more residences. The Bay Island seawalls were replaced in 2016 with cantilevered steel sheetpiles and a non-structural concrete cap. The steel sheetpiles were designed with a corrosion allowance (thicker panels) to extend their service life.

2.3 West Newport

The canals in West Newport were dredged in 1907 and the dredged material was used to create Newport Island (located in the center of the canals), the oldest habited island in Newport Harbor. Original building sites consisted of beachfront properties protected by timber crib walls. However, as properties were developed and homes became larger, timber walls were constructed and subsequently replaced with concrete seawalls. Balboa Coves was formed after the Santa Ana River waters were diverted and portions of its old channel filled in. Homes in Balboa Coves, with the notable exception of Newport Marina Villas, front sand beaches and are protected by concrete and masonry gravity retaining walls. Newport Marina Villas is in a cove surrounded by a concrete sheetpile wall with structural concrete cap. A large section of this wall was reconstructed 25 years ago.

2.4 Balboa Island

In 1905, Newport Beach Company began dredging Newport Harbor around Balboa Island with the intent to use the dredged material to build up the mudflats to form Big Balboa, Little Balboa, and Collins Islands. The western end of Big Balboa and Collins Islands were developed first and protected with timber crib walls to keep the low-lying land dry at high tides. Timber and rudimentary concrete seawalls were installed around the remaining areas of Big Balboa and Little Balboa islands as properties were sold. In 1929, the original timber crib walls around Collins Island and the western end of Big Balboa were replaced with a concrete sheetpile and concrete cap seawall. In the mid-

1930s, the remaining seawalls around Big Balboa and Little Balboa islands were replaced with a concrete soldier pile and concrete lagging seawall system. The seawall system was structurally extended over the years and is currently scheduled for extension to a height of 9 feet mean lower low water (MLLW) (i.e., a 9-inch extension). Sand beaches protect much of the seawall system; however, rock revetments and toe protection have been added to selected zones of the seawall that are either exposed to incoming wave action through the harbor entrance, exposed to long fetches of wind-driven wave action, or in island corners that are susceptible to scour during tidal exchanges. Rock revetments and toe protection were installed at the ends of the Grand Canal and on the western face of Collins Island.

2.5 Santa Ana River Re-Orientation

Tidal and Santa Ana River flooding in 1914 and 1916 prompted construction of Newport Harbor's jetties and damming of the Santa Ana River at Bitter Point by the City and County of Orange to protect Newport Beach against future flooding. These mitigation measures were repeated multiple times over the next 2 decades until New Deal era projects in the 1930s channelized the Santa Ana River and built the Newport Harbor jetties as they exist today. The biggest change was the diversion of the Santa Ana River from the previous outlet into Newport Bay to a direct outlet into the Pacific Ocean at its present location. River Avenue, in present-day West Newport, is the approximate location of the original Santa Ana River Channel and Semeniuk Slough remains from the old river channel. Construction of the Prado Dam on the Santa Ana River in Riverside County finally tamed the river and its flood waters.

2.6 Lido Isle

As a partner in Newport Beach Company, railroad magnate Henry Huntington received the title to the sandbar and mudflats then known as Electric Island. Oil magnate W.K. Parkinson purchased Electric Island (also known as Pacific Electric Island and Huntington Island) and the associated mudflats in 1925 with the intent to transform them into the present-day Lido Isle. Construction to fill in the Electric Island mudflats and raise its elevation to 10 feet MLLW began in 1928. Griffith Company, which is still in business, built the streets, utilities, the Via Lido Bridge, and many of the seawalls on the island. The seawalls were low height gravity-type walls. Many of these seawalls remain and are identified by the construction of basement levels in landside structures, typically used for storage, located under Lido Isle houses. Although properties on deep water have installed modern concrete sheetpile seawalls, significant portions of Lido Isle are fronted by sand beaches.

2.7 Corona del Mar

Properties near the Newport Harbor entrance, in China Cove and Pirates Cove, were first developed using the existing natural rock formations as seawalls. Subdivision and development of the upper blufftop plateau that forms Corona del Mar begun in earnest in the late 1920s. Waterfront properties along Bayside Drive across from Balboa Island were developed into marinas and boatyards in the 1950s and 1960s. Concrete sheetpiles with structural concrete caps seawalls were installed. These seawalls incorporate tiebacks connecting the caps to deadmen; however, the presence of a shale rock formations prevented sufficient sheetpile embedment. Therefore, in the 1980s, it was necessary to reinforce these seawalls with a concrete beam and rock revetment along the toe. Residential and commercial development of the remaining portion of the Corona del Mar waterfront along Newport Harbor occurred in the late 1960s through 1970s. Because of the shale formations, steel sheetpiles were driven into the rock and topped with a structural concrete cap tied back to deadmen. Over subsequent decades, stretches of these seawalls have been augmented with new tiebacks.

2.8 Rhine Channel and Lido Peninsula

Rhine Channel was, and still is, home to many shipyard and water-dependent uses, which were built starting in the 1930s and greatly expanded during the shipbuilding effort for World War II. Concrete seawalls were originally built for the yards. Concrete seawalls were installed on the portion of the Lido Peninsula that faces Lido Isle in the 1960s. A small section of seawall on the Lido Peninsula was replaced with steel sheetpiles in the 1980s to accommodate deeper draft vessels.

2.9 Harbor Island, Beacon Bay, Balboa Yacht Basin, and Promontory Bay

Harbor Island was created from dredged material in the 1920s, and homes were first constructed in the 1930s. The island was formerly annexed by the City in 1942. Concrete seawalls were installed prior to 1950; however, repairs and improvements including, but not limited to, augmentation with new tiebacks, have been made to the seawalls after the initial construction. Joseph Beek, whose family still operates the Balboa Island Ferry, first developed Beacon Bay across the channel from Balboa Island in 1940. This area uses various types of gravity and retaining walls for protection, but also has a mix of sandy beach and tidal mudflats. Balboa Yacht Basin, originally created in the 1930s, was redeveloped in the 1980s and new concrete sheetpiles with a structural concrete cap were installed. Promontory Bay was excavated in the early 1970s with corresponding seawall and residential home construction. The waterfront residential properties are protected by a concrete sheetpile wall. Although the concrete cap is a non-structural component, a concrete waler beam runs approximately 6 feet below the top of wall to provide structural support.

2.10 Bayshores, Swales, and Balboa Bay Club

Development of the Balboa Bay Club, Bayshores neighborhood, and Swales Apartments began in the early 1950s, and a concrete sheetpile seawall with structural concrete cap fronting these properties was installed. The seawall is separated by pocket beaches; however, the top elevation of these beaches is at or above the elevations of the adjacent seawall sections. Portions of the seawalls have been repaired over the years, including, but not limited to, augmentation by the installation of additional tieback anchors and repairs that include concrete patching and crack and joint sealing.

2.11 Mariners' Mile and Lido Village

Mariners' Mile and Lido Village have been undergoing development and reconstruction since the 1920s. Much of the current seawall system was constructed in the 1960s and 1970s, using concrete sheetpiles with a structural concrete cap. There are current plans under consideration to replace large sections of the seawalls along Mariners' Mile with new concrete seawalls, as part of new waterfront redevelopment plans.

2.12 Linda Isle and Balboa Marina

Linda Isle was formed from harbor material dredged as part of the New Deal era projects in the 1930s. It remained undeveloped until the late 1960s. The seawall around Linda Isle was completed in 1970 and consists of concrete sheetpiles with a structural concrete cap and tieback anchors connecting the structural cap to deadmen. The seawalls have been augmented at selected locations via the installation of additional tiebacks and a continuous deadman. Balboa Marina was developed in the 1960s with a seawall consisting of concrete sheetpiles and structural concrete cap, tied-back to deadmen running under the adjacent parking lot. In 2009, the entire length of seawall was augmented with earth anchors engaging the seawall with segmental steel waler weldments.

2.13 Dover Shores

Development of Dover Shores began in 1961. Concrete sheetpile walls with structural concrete caps were installed. These seawalls remain in place today; however, some wall sections have been augmented with the installation of additional tiebacks.

2.14 Back Bay Landing and Newport Dunes Marina

The area that is now called Back Bay Landing and Newport Dunes Marina were developed in the 1960s. The seawalls consist of concrete sheetpiles with a structural concrete cap. Tiebacks connect the concrete cap with deadmen running under in the adjacent parking lots. These seawalls have been augmented over the years with the installation of additional tiebacks. Planning is currently underway to redevelop Back Bay Landing with flood protection measures that will consist of installing new seawalls along the unarmored shoreline.

2.15 Castaways

Castaways is the former site of a restaurant, marina, boat launch, and mobile home park. The property was first developed in 1935 as a salt works facility. It is currently a parking lot and recreational park site. The existing seawall is not fully extended across the entire waterfront and predates 1955. Although this seawall is in disrepair and there are undeveloped gaps in the waterside frontage, the backland property elevation is sufficiently high and there are no structures that could potentially be impacted by flood waters.

3 Study Assumptions

To provide an initial assessment of the existing seawall and slope protection structures within Newport Harbor in an expeditious manner, the following assumptions were made when preparing this report.

3.1 Visual Inspection

The assessment is based on observed conditions during performance of waterside (only visual) inspection.

3.2 Technical Studies

No geotechnical studies or structural stability calculations were prepared as part of this assessment.

3.3 Typical Seawall Elevations

Unless otherwise noted, for the purposes of this initial assessment, it was assumed that observed seawalls were originally built at approximately a top of cap elevations of 8 feet MLLW. This typical elevation was selected by engineers and contractors for seawalls in Newport Harbor as far back as the early 1930s. Property owners have extended this top of cap elevation over the years.

3.4 Seawall Cap Extensions

Property owners have extended the top of seawalls via masonry or concrete extensions as noted in Section 3.3. These extensions were constructed to resist seawall overtopping during upset conditions, generally king tides coupled with storm events or boat wake that resulted in damage from water intrusion into landside structures behind the seawalls. These cap extensions are partially exposed to some hydrostatic loading conditions during upset condition events. The remaining height of these seawall cap extensions relates to the need to install guard railing to protect from inadvertent falls from the patio decks into harbor waters. These upper extents of the cap extensions are not subject to hydrostatic pressure associated with flood waters and overtopping.

3.5 Seawall Embedment into Subgrade

The extent of seawall embedment into the subgrade is unknown, because such embedment is only documented in selected areas. Based on observations of the Newport Harbor seawalls, for the purposes of this initial assessment, adequate embedment of seawalls is assumed to exist.

3.6 Seawall Tiebacks

Seawall tiebacks could not be observed or assessed as they are located underground and beneath landside structures. Unless seawall distress indicates a potential deterioration of the seawall tiebacks, for the purposes of this initial assessment, tiebacks are assumed to be functional and providing the necessary structural load resistance.

3.7 Seawall Reinforcing

Seawall reinforcing is unknown for most seawalls observed. If evidence of wall distress and cracking was not observed, for this initial assessment, wall reinforcing is assumed to be adequate.

4 Classification of Waterfront Structure Condition

The City's GIS was used to collect structural information associated with the seawalls and slope protection structures around Newport Harbor that were included in this initial assessment. Attributes and input information associated with these structures included the following components:

- Ownership (public or private)
- Wall exposure (open or sheltered)
- Estimated age
- Wall types
- Wall components and condition
- Mudline support
- Landside loading conditions

Not all information was available or observable for portions of the existing seawalls around the harbor. In particular, mudline support conditions were difficult to assess due the water clarity, and seawall tiebacks that are buried beneath landside structures and parking lots cannot be assessed without major intrusion (i.e., unearthing) or destructive testing.

5 Field Observations

Observed seawalls surrounding Newport Harbor were generally in good or satisfactory condition. Structural integrity at some locations was noted and is of some concern. In some cases, existing structures may be exposed to risk in the occurrence of flood/overtopping conditions. These locations are noted in Figures 5 through 13.

Most seawalls in the harbor are concrete construction with some areas composed of steel sheetpiles. Most seawall caps are composed of reinforced concrete. Most of these caps are anticipated to have embedded tiebacks that extend 25 to 45 feet into the adjacent properties to support the upper portion of seawall. Normally, these tiebacks are on 8- to 12-foot spacing. Some of the seawall sheetpile walls observed may be a cantilever design that does not require tiebacks; however, this condition could not be definitively determined. Some limited use of alternative sheetpile products occur at the land/water interface.

The Newport Harbor waterfront is composed of numerous and separate ownerships, and the age and seawall/slope protection construction type often changes from property to property. Additionally, the types of cap extensions range from masonry to concrete as well as other construction types. It could not be easily determined if these cap extensions were reinforced or unreinforced.

Some locations have seawall or slope protection structures that are constructed of timber, which are showing evidence of deterioration from dry rot or invasive biological organisms (i.e., marine borers) that can deteriorate timber components within the tidal zone. These locations have been identified in this report as Level 3 conditions.

A video of our survey from the waterside of the walls via boat is included as Appendix C. The video surveys approximately 20 miles of wall frontage.

In summary, most of the Newport Harbor waterfront is composed of seawalls and slope protection that appear structurally sound. The seawalls appear to be straight, which is an indicator that tiebacks are serving their intended purpose.

For illustrative purposes, the following examples depict the most prevalent conditions observed during our field survey. These examples are based on the basic classification system (Levels 1, 2, and 3) described in Section 1.

Figure 5
Seawall Section – Example of Level 1 Conditions

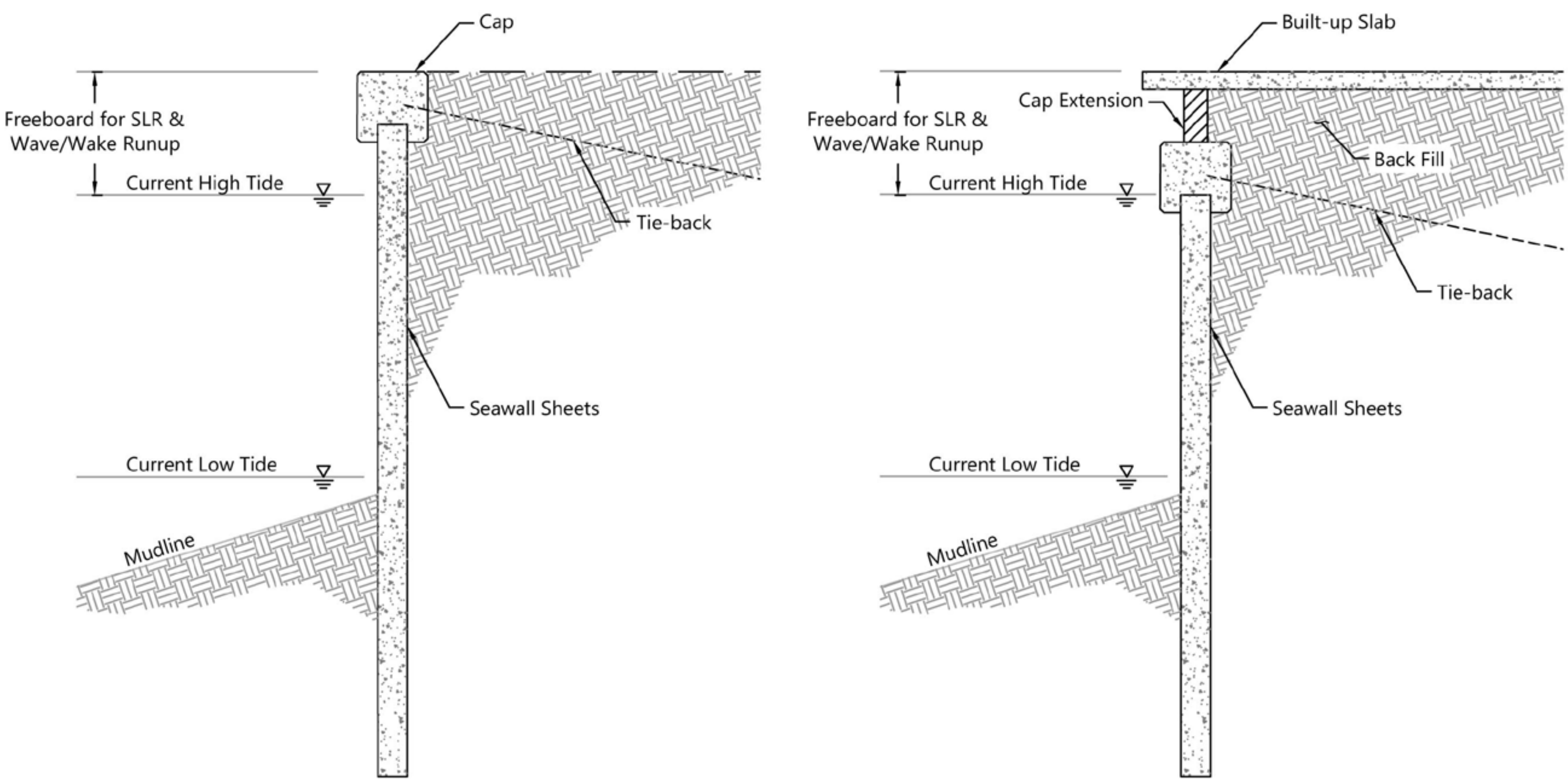


Figure 6
Well-Maintained City Seawall – Example of Level 1 Condition

Figure 7
New City Seawall – Example of Level 1 Condition

Figure 8
Seawall Section – Typical Level 2 Condition

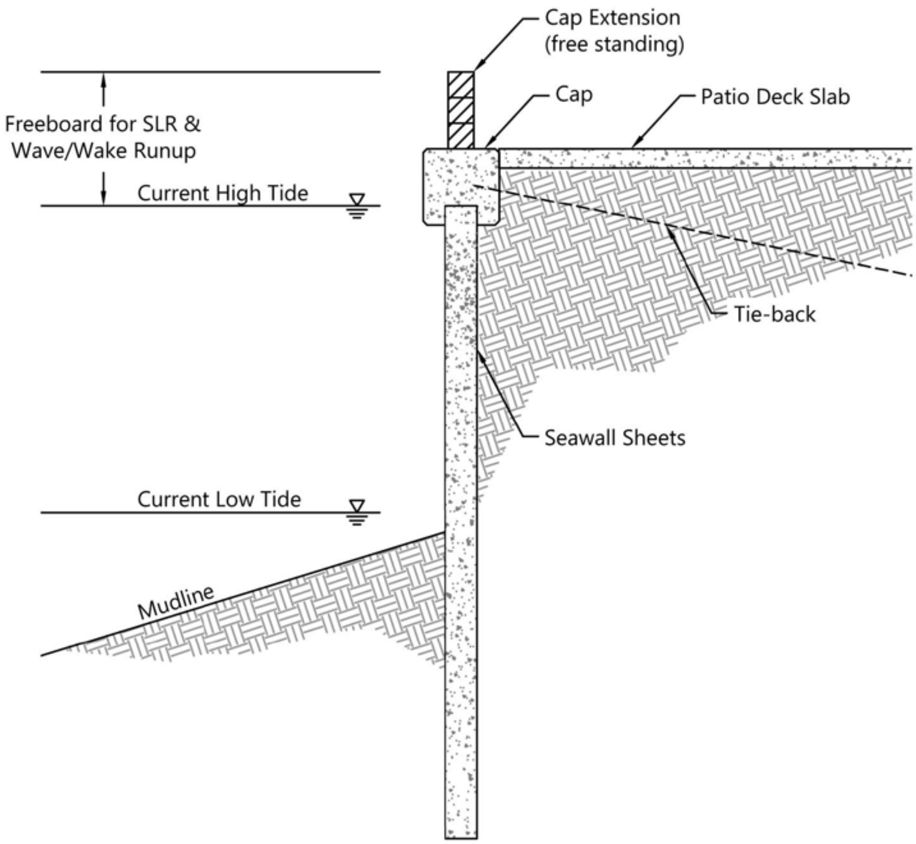


Figure 9
Residential Seawall Cap and Extension – Level 2 Condition

Figure 10
Residential Seawall Cap Extension – Level 2 Condition

Figure 11
Residential Seawall – Level 3 Condition

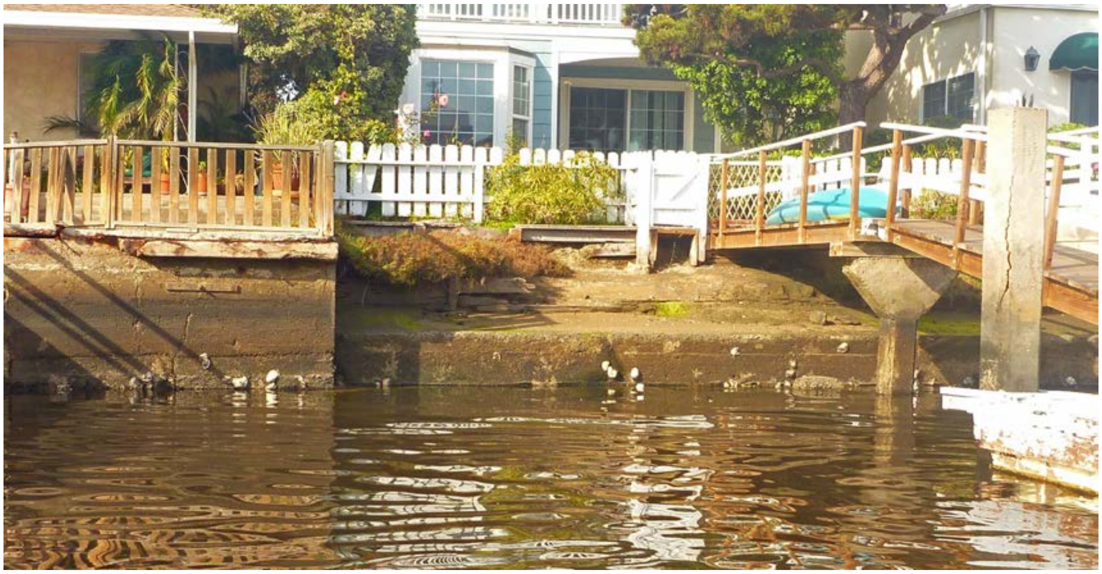


Figure 12
Residential Seawall – Level 3 Condition

Figure 13
Residential Seawall – Level 3 Condition

6 Conclusions

The existing seawall and slope protection conditions, which were input into and generated within the City's GIS system, and visual observations conducted during the field work are included in Figure 14 with enlargements of selected designated areas provided in Appendix B.

Based on these observations, most seawalls and slope protection structures in Newport Harbor are currently exhibiting no or little perceived risk of distress in the event of flood conditions. This represents approximately 82,248 feet of seawall, or 77% of the overall inventory of waterfront structures within Newport Beach. Those locations have been identified as Level 1 condition frontage.

Approximately 23,780 feet of seawalls have extended caps. This represents approximately 23% of the overall inventory of waterfront structures within Newport Beach. The cap extensions are concerning, because the nature of their support cannot be determined without formal documentation and permits or additional testing (i.e., destructive or non-destructive methods). The concern relates to the possibility of excessive shear force causing potential movement and distress. If the cap extensions were not adequately connected to the original reinforced concrete seawall caps, then excessive shear force could occur. Additionally, it could not be determined that the cap extensions have internal reinforcing. Therefore, these locations have been identified as Level 2 condition frontage. With confirmation that properties within Level 2 have documented permits or have adequate reinforcing, these areas could be reclassified as Level 1.

The remaining 194 feet of seawall represent Level 3 locations and relate to a higher risk of concern based on observed condition, deterioration, or suspect wall construction. These areas are along Newport Island, Rhine Channel, and Mariners' Mile, and include five properties. One of the Level 3 locations along Mariners' Mile has been redesigned and has been submitted for local and state permits. Once completed construction is completed, this location would be removed from the list.

Figure 14
Observed Condition Summary – Levels 1, 2, and 3

7 Certification

This report is based on initial visual observations of the existing seawalls and slope protection structures and the opinions of the Anchor QEA team who performed the work. Additional studies, calculations, and geotechnical input were outside the scope of this report.

Randy H. Mason, P.E. (No. C030661)
Principal Engineer

Appendix A

Resume

Randy Mason, PE

Principal Engineer

Randy Mason began working with the City of Newport Beach in 1983. His initial work involved condition surveys, repair design, and construction support for the Bayside Marina bulkhead restoration project, followed by other studies involving Balboa Island and Lido Isle seawalls. Over the ensuing years, he has provided project management and engineering for a variety of waterfront study, design, and construction projects for the City as well as for various other local Cities and Counties, developers, commercial and residential property owners, and other consultant firms. His project experience includes new seawalls and assessment, repair, and stabilization of concrete and steel seawalls Mr. Mason has also assisted the City with revisions and subsequent updates to their Waterfront Project Guidelines and Standards, Harbor Design Criteria for Commercial & Residential Facilities.

EDUCATION

BS, Civil Engineering, California State University, Fullerton, 1972

LICENSES/CERTIFICATIONS

Professional Engineer, State of California, No. C30661

Project Experience

Balboa Island Seawalls Rehabilitation Project

City of Newport Beach
Public Works Department
Newport Beach, California

Mr. Mason was the project manager and lead engineer for development of options to retrofit or replace the aging seawalls around Balboa Island. Various options for wall reinforcement or replacement as well as future cap height increases were developed and evaluated. The preferred option for future seawall replacement consisted of interlocking steel sheet piles to be constructed on the waterside of the existing seawall. The project scope included community outreach and a public comment period. Under a separate project, Mr. Mason also provided expert consulting for the Grand Canal portion of the seawall to assist with addressing the need to maintain canal navigation.

Balboa Island/Little Balboa Island Seawall Integrity/Sea Level Rise Study

City of Newport Beach
Public Works Department
Newport Beach, California

Mr. Mason was the project manager and principal engineer for subconsultant engineering to prepare a 2011 study to assess flooding and harbor water over-topping of existing concrete seawalls from potential seasonal storm events, King tides, and extreme tides associated with global warming. In conjunction with this pre-design study, Mr. Mason was responsible for structural integrity review (threat for structural compromise) for the seawalls and comparison with findings contained in a previous 2005 seawall condition survey he led which was performed during combined heavy seasonal rainfall and extreme high tides conditions. The 2011 study results provided a basis for determining a minimum seawall elevation for future wall construction and the appropriate manner to increase the height of the existing seawall. Preliminary seawall replacement and future wall height (cap) extensions options and costs were developed based on predicted sea level rise.

Project Experience

Balboa Marina Rebuild and Balboa West Marina Expansion *Irvine Company* *Newport Beach, California*	Mr. Mason was the project manager for the complete rebuild of the Balboa Marina. In conjunction with this work, the existing concrete seawall was evaluated and options were developed to stabilize and increase the wall safety factor to meet City of Newport Beach standards. Repairs included the installation and testing of nearly 170 pressure-grouted earth anchors. New guard rails and a trench drain to capture runoff water were also installed along the seawall. Mr. Mason is currently working with the Irvine Company and City of Newport Beach on expansion of the Balboa Marina that includes repair and stabilization of an existing seawall and rock revetment slope, boat slips, and a short-term use public dock.
City-wide Seawall/Bulkhead Inspection and Restoration Program *City of Long Beach* *Public Works Department* *Long Beach, California*	Mr. Mason was the project manager/lead engineer for evaluation of all City of Long Beach-maintained seawalls, approximately 11 miles. The program scope included review of record documents, field survey and documentation of existing conditions, material testing and biological survey programs, preparation of a report with findings and recommendations, and development of a Basis of Design and cost estimates. Follow-on projects included design and construction services to repair seawalls along Bayshore Avenue, partial replacement and repair/stabilization of the Mother's Beach seawall, and stabilization to portions of the Naples Island seawall system. Most recently, Mr. Mason provided expert consulting for Phase I of the multi-phase Naples Island Permanent Seawall Repair project.
Marina del Rey Seawall Pilot Repair Program *County of Los Angeles, Department of Internal Services and Beaches and Harbors* *Los Angeles, California*	Mr. Mason led a seawall condition study of the7.5-mile long Marina del Rey concrete seawall system. Work focused on conducting a pilot repair program to develop and evaluate a repair approach that could be applied to the entire seawall system. The goal of the pilot program was to verify the feasibility of the preferred repair scheme, develop alternatives for construction phasing, and evaluate cathodic protection systems for reinforcing steel. Plans were also prepared for temporary access and utility relocations. The preferred repair option was subsequently used to retrofit the entire seawall system.
Huntington Harbour Seawall Inspections, Assessments, and Repairs *Various Clients* *Huntington Beach, California*	Mr. Mason has been the project manager and principal engineer for numerous projects Huntington Harbour seawall project for more than 20 years. His experience includes inspections and condition assessments, developing technical reports and repair documents, permitting, and construction and expert witness services. He has worked with homeowner associations, individual homeowners, attorneys, and marine contractors.

Appendix B
Enlarged Area Maps

Figure B-1
Balboa Island and Little Balboa Island

Figure B-2
Balboa Coves

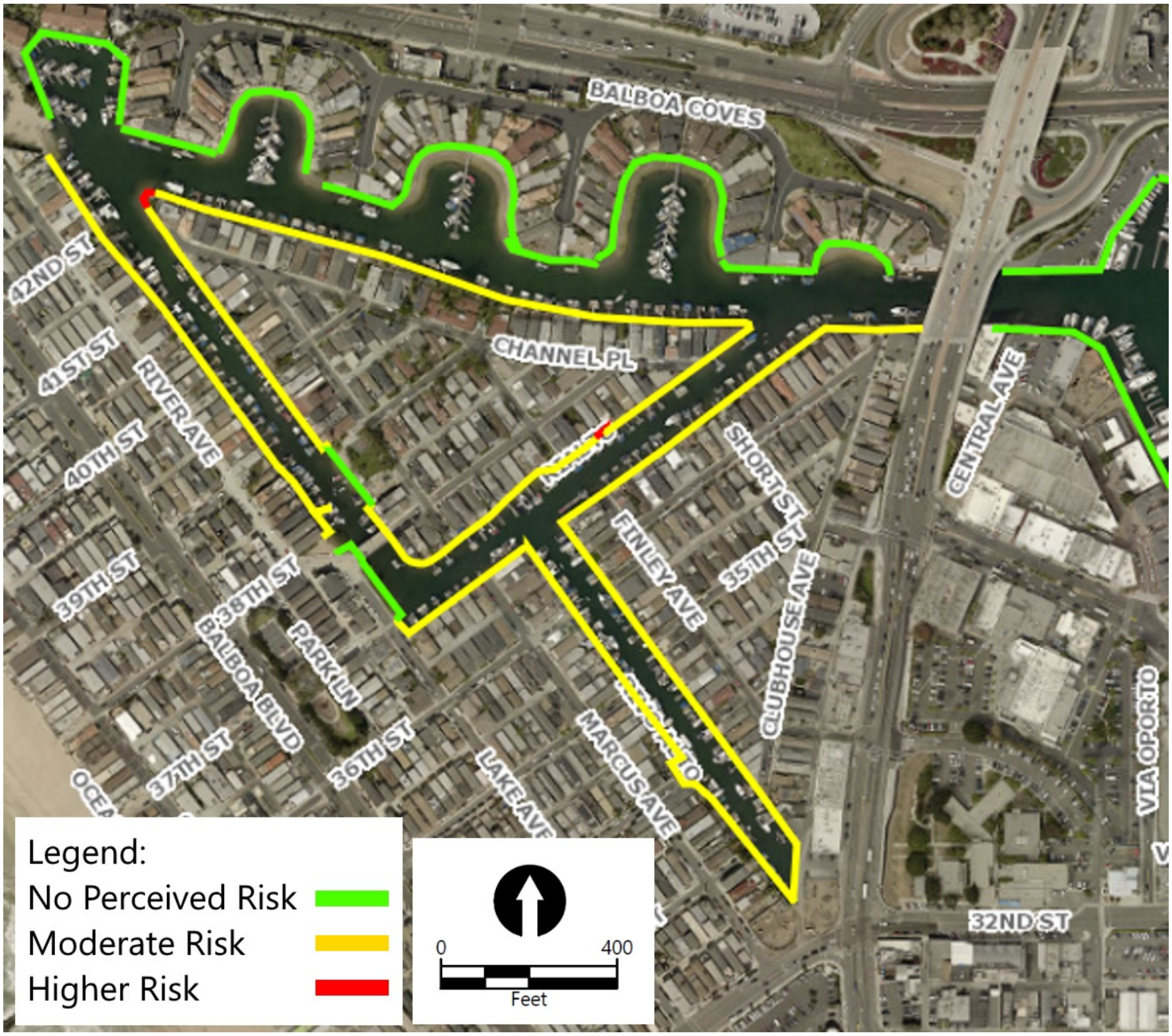


Figure B-3
Harbor Island

Figure B-4
Linda Isle

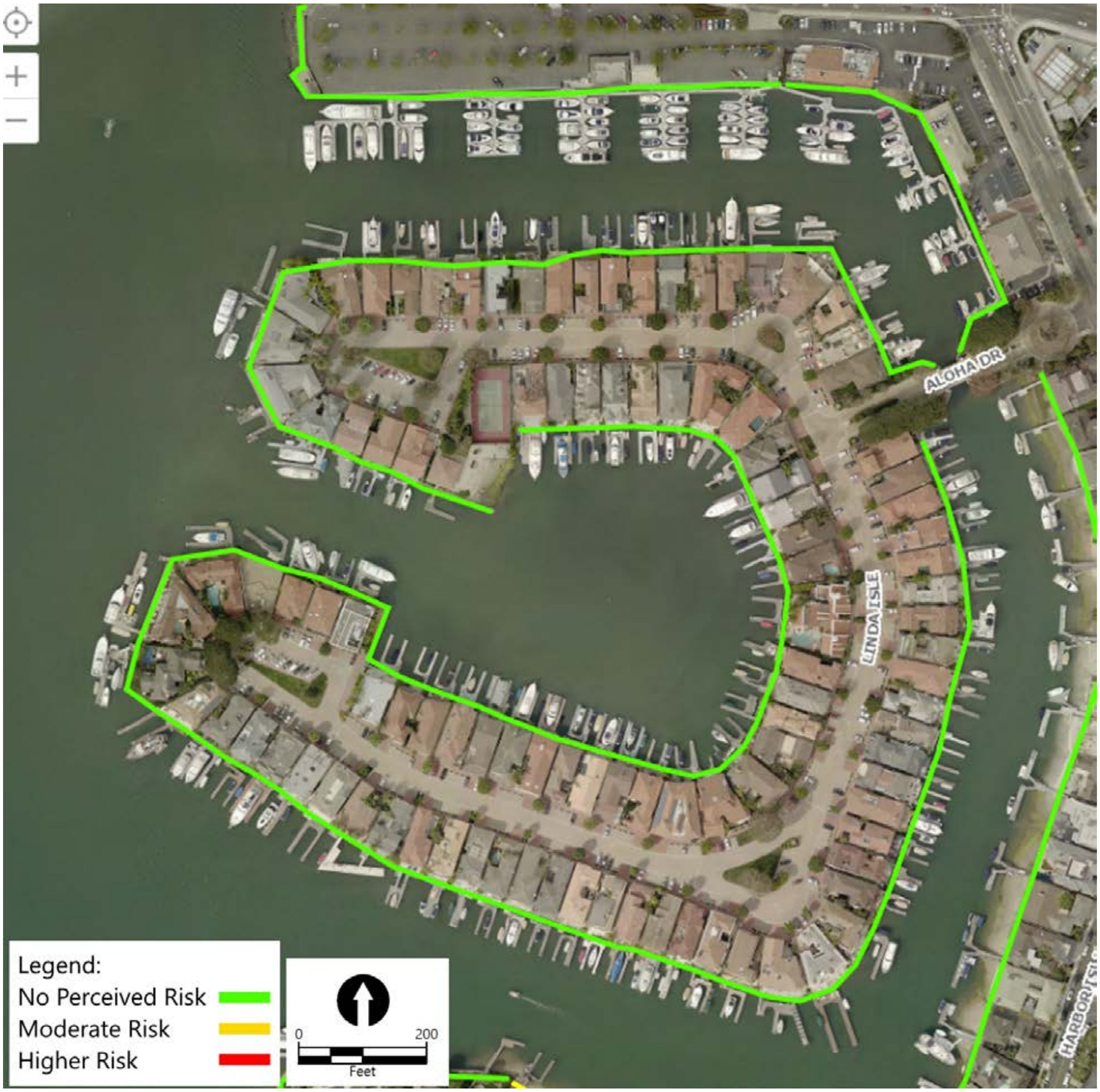


Figure B-5
Dover Shores

Figure B-6
Bay Island

Figure B-7
Lido Isle

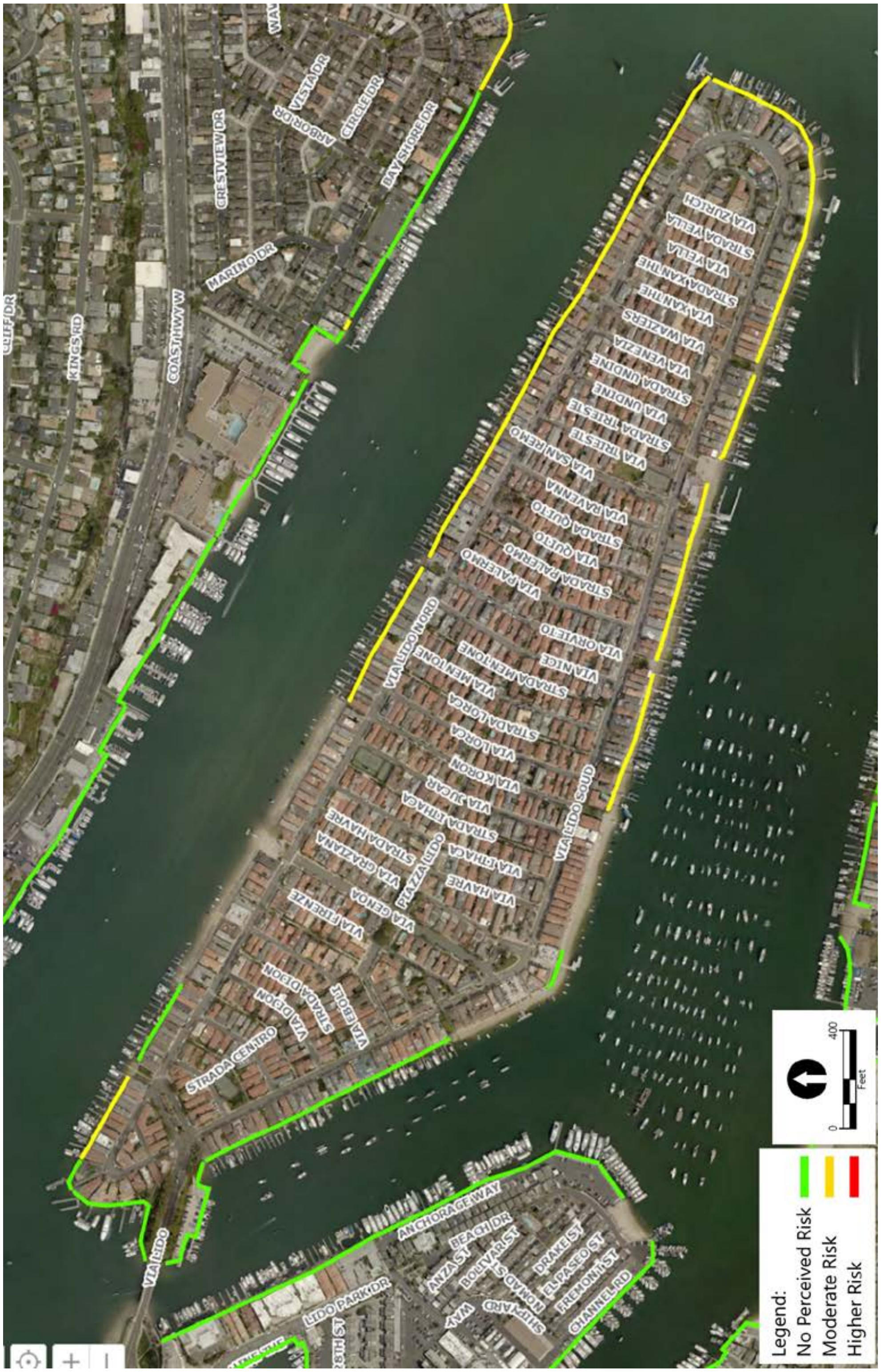


Figure B-8
Bayside Village Marina

Figure B-9
Eastern Peninsula and Harbor Entrance

Figure B-10
Promontory Bay and Balboa Island North Channel

Figure B-11
Mariners' Mile and Bayshore

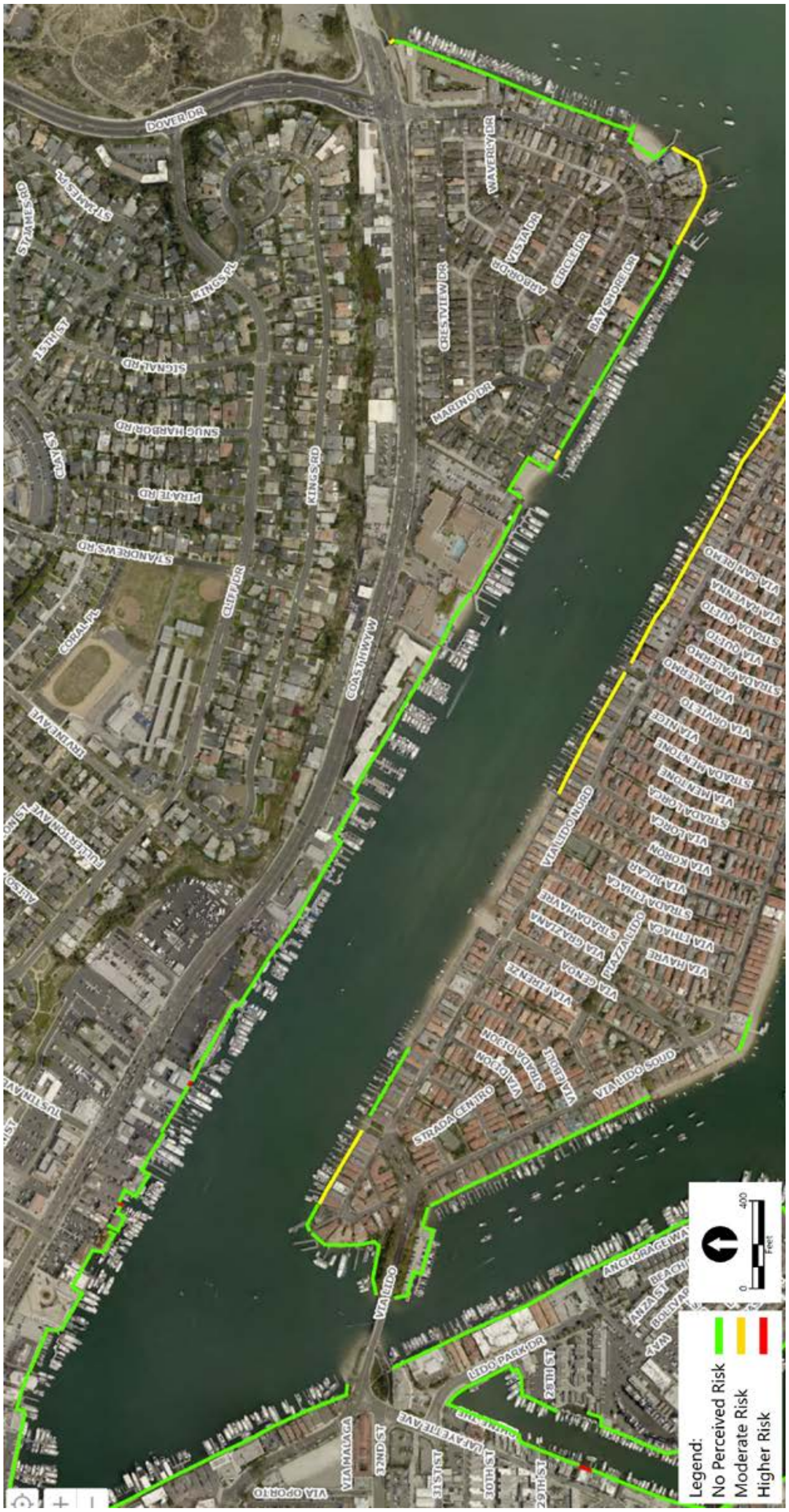


Figure B-12
Mariners' Mile Enlarged

Figure B-13
Rhine Channel

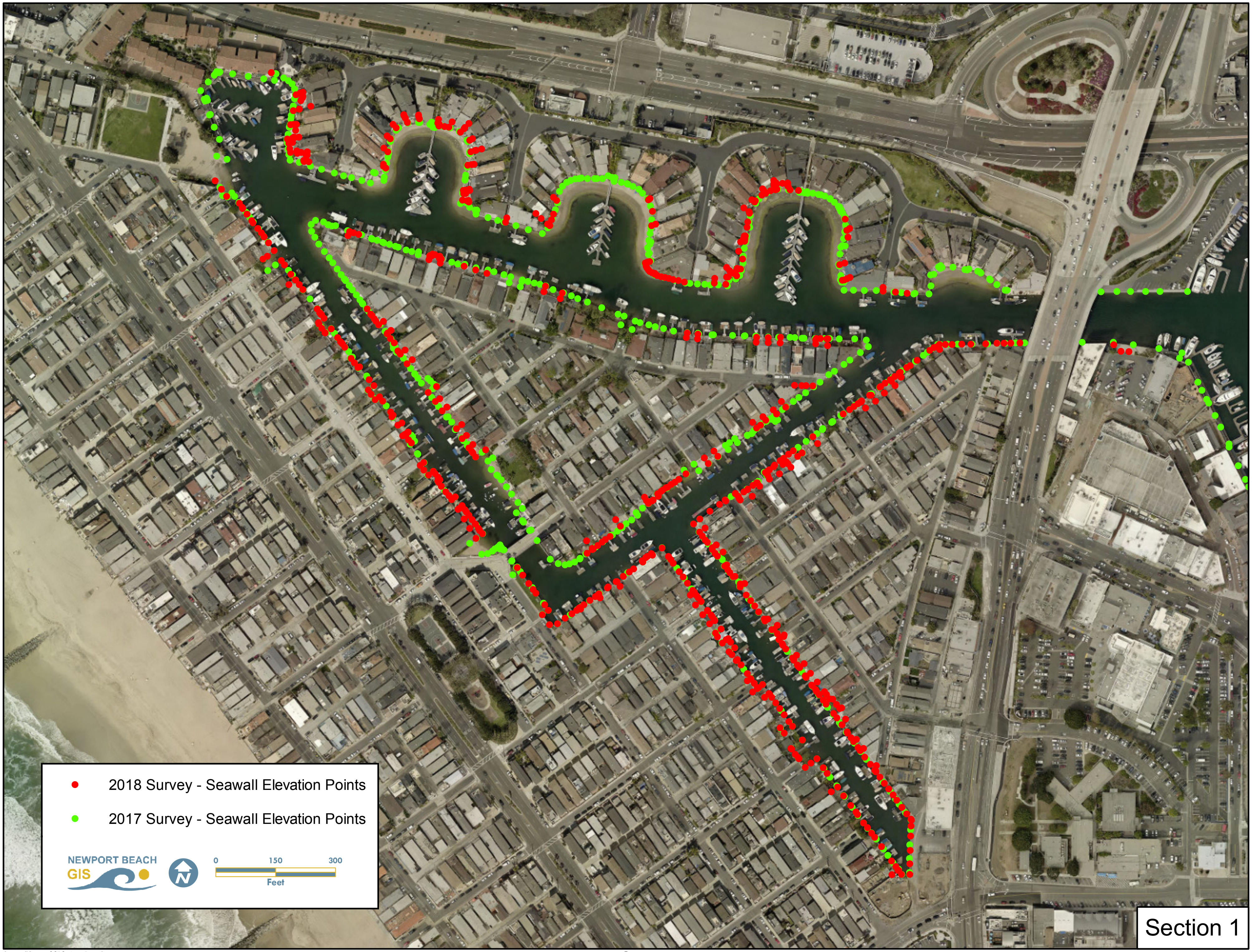
Appendix C
Seawall Survey Video

Provided on Flash Drive with Supporting Video File List

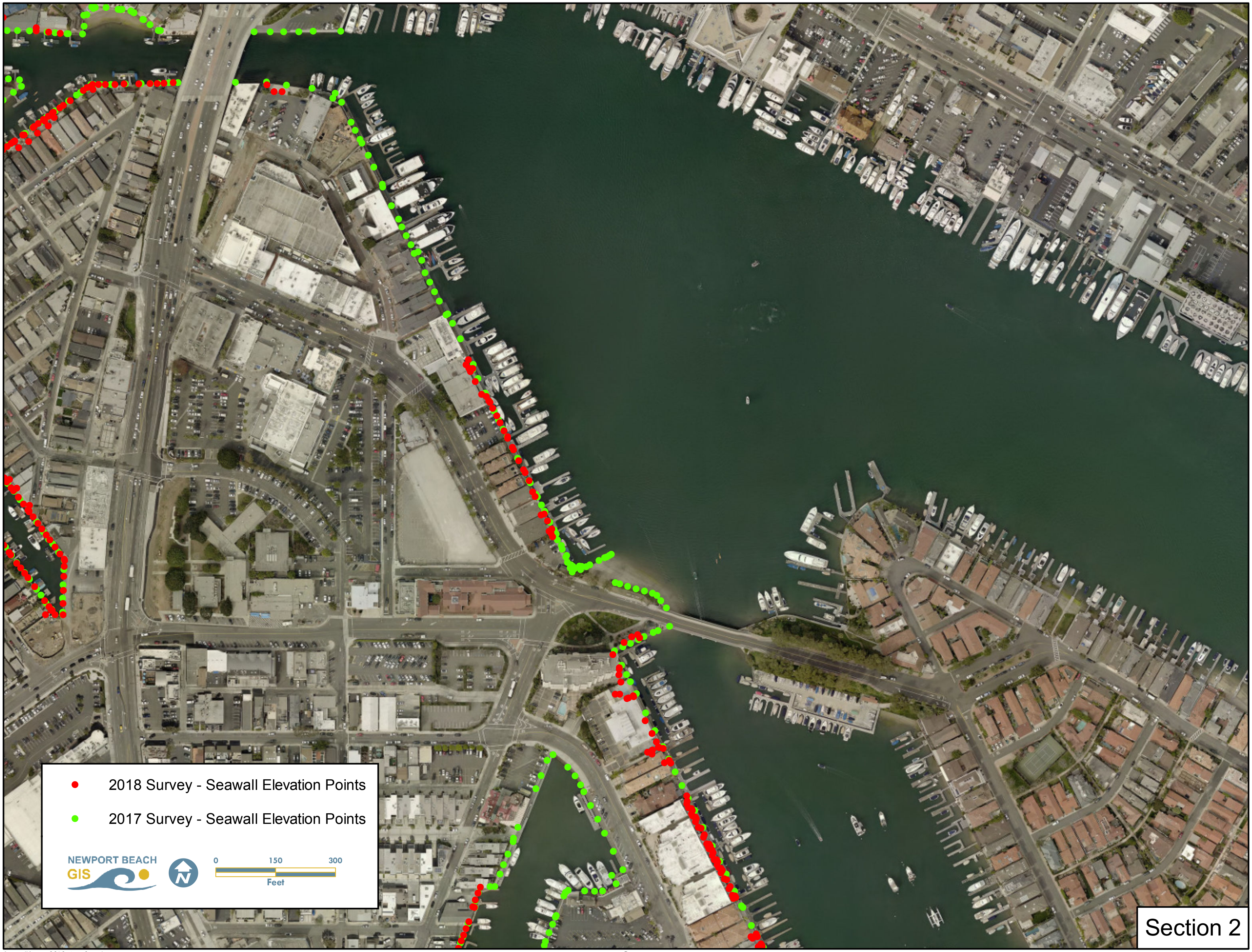
Seawall 2017-2018 Survey

Seawall Elevation Points

SeawallSurvey2018.mxd



SeawallSurvey2018_Area1.mxd



SeawallSurvey2018_Area2.mxd

SeawallSurvey2018_Area3.mxd

SeawallSurvey2018_Area4.mxd

SeawallSurvey2018_Area5.mxd

SeawallSurvey2018_Area6.mxd

SeawallSurvey2018_Area7.mxd

SeawallSurvey2018_Area8.mxd