G Coastal Flooding Hydraulic Analysis

To: Mike Junghans, VHB

Date: April 26, 2016

Project #: 28677.02

From: Todd Monson, VHB
Annique Fleurat, VHB

Re: Coastal Flooding Hydraulic Analysis

The following memorandum presents VHB's coastal flood hazard analysis in support of the Hampshire Country Club redevelopment located in Mamaroneck, New York.

INTRODUCTION

The Hampshire Country Club property is located at 1025 Cove Rd, Mamaroneck, NY 10543 (the Subject Property). The Subject Property is located 15 miles northeast of Manhattan along the Long Island Sound, within Delancey Cove. VHB is providing engineering services to support the redevelopment of the existing Hampshire Country Club golf course into a residential community (the Project). As part of the design, VHB completed the following coastal transect analysis to evaluate potential flood hazard impacts associated with the Project. The analysis assessed potential changes in existing flooding patterns and flows due to the proposed redevelopment. This report summarizes impacts to the 1% Annual Exceedance Probability (AEP) (100-year) and 0.2% AEP (500-year) floodplains and evaluates impacts to nearby properties. VHB completed the coastal transect analysis using model parameters based on the Effective (2007) and Preliminary (2014) Flood Insurance Studies (FIS) for Westchester County, New York developed as part of the National Flood Insurance Program (NFIP). VHB evaluated existing and proposed site topography for current and future FIS conditions for the 1% AEP and 0.2% AEP coastal storm events.

DATA COLLECTION

To evaluate the potential for flood hazard impacts at the site, VHB collected data from multiple sources. The following sections provide a description of sources for the collected data and descriptions of how the data was applied for the coastal analysis.

Data Sources

Effective Flood Insurance Study

The Federal Emergency Management Agency (FEMA) published an Effective Flood Insurance Study (FIS) and Flood Insurance Rate Maps (FIRMs) for all jurisdictions of Westchester County, New York on September 28, 2007. During this analysis, the Effective FIS will be evaluated as the "current" FEMA conditions. The study includes consideration for the potential impact of waves due to coastal processes along the Long Island Sound, specifically within Delancey Cove. The coastal study was prepared by FEMA contractors, originally by Staunton and Freeman Consulting Engineers in 1977 and then updated in March 1988 by Dewberry & Davis. The study determined the stillwater elevations and wave crest heights at the Subject Property for the 1% and 0.2% AEP coastal flood events.

The Effective FIS and FIRM (Panel 36119C0361F) indicates that the Subject Property is partially located in two flood hazard zones including AE Zones with a base flood elevation (BFE) of 12 feet NAVD 88 and X Zones (all elevations provided in this memorandum refer to the vertical datum of NAVD 88). Figure 1 shows the special flood hazard areas (SFHA) in the vicinity of the Subject Property as mapped on the Effective FIRM. The AE

Zone designation indicates that the area has been studied in detail and is an area of 1% AEP flood where wave heights are estimated to be less than 3 feet. The shaded X Zone designation indicates areas of 0.2% AEP flood, areas of 1% AEP flood with average depth less than one foot, or areas with drainage area less than 1 square mile.

The Effective FIRM depicts one transect that intersects the Subject Property. Coastal Transect 12 runs south to north through the property and is shown in Figure 1.

Preliminary Flood Insurance Study

FEMA issued a Preliminary FIS and Preliminary FIRMs on December 8, 2014. The preliminary editions have not yet been adopted for regulatory purposes, but will be evaluated as the "future" FEMA conditions during this analysis. FEMA informed VHB during correspondence that the Preliminary FIS is expected to become effective in December 2016. The Preliminary FIS includes a new, detailed coastal study for Westchester County. The detailed coastal study incorporated a preliminary analysis for the stillwater elevations (SWELs) for the 10%, 2%, 1%, and 0.2% AEP events (10-, 50, 100-, and 500-year floods, respectively), the significant wave height, and the peak wave period for the 1% AEP flood event.

The Preliminary FIS and FIRM (Panel 36119C0361G) indicate that the Subject Property is partially located in two flood hazard zones including AE Zones with BFEs of 12 to 14 feet NAVD 88 and X Zones. Figure 2 shows the SFHA in the vicinity of the Subject Property as mapped on the Preliminary FIRM.

The Preliminary FIRM depicts one numbered transect that intersects the Subject Property. Coastal Transect 35 runs north to south through the eastern edge of the Subject Property and is shown in Figure 2. Two additional transects not provided on the FIRM but included in the transect model analysis intersect the center and eastern edge of the Subject Property.

Preliminary Flood Insurance Study Coastal Transect Model

In March 2016, VHB coordinated with FEMA and obtained modeling data for the preliminary FIS for use during this analysis. VHB obtained the Coastal Hazards Analysis Modeling Program (CHAMP) v 2.0 model including the Wave Height Analysis for Flood Insurance Studies (WHAFIS) and Runup 2.0 model data for use in this analysis. The input data included model parameters for the 1% AEP event as well as transect topographic data.

FEMA also informed VHB that coastal data from the Effective FIS for the Village of Mamaroneck was prepared in a supplemental analysis in 1983 and was not available. As a result, only data published in the Effective FIS was available for use during this analysis.

Topographic / Bathymetric Data

VHB coordinated with FEMA and its contractors to obtain topographic and bathymetric data for the project site and surrounding areas. A digital elevation model (DEM) of the project area was developed as part of the updated coastal analysis completed for the Preliminary FIS. The surface was developed using a multistep process from a variety of sources including county topographic data, U.S. Geologic Survey, National Oceanic and Atmospheric Organization (NOAA), U.S. Army Corps of Engineers (USACE), and New York State GIS Clearinghouse. The seamless DEM under went three independent technical reviews before FEMA completed their analysis.

VHB modified the seamless DEM with existing site specific topographic data of the project site. Topographic data of the site, provided at 1-foot interval contour resolution, was developed by VHB from aerial survey flown on September 8th, 2014 and supplemented with ground survey in areas where additional detail was required.

Data Application

For this study, VHB performed an independent coastal hydraulic analysis at the Subject Property. VHB developed model parameters based on the Effective and Preliminary FIS to reflect current and future FEMA conditions. VHB used the CHAMP model supplemented with the *Technical Advisory Committee for Water Retaining Structures* (TAW) Method to evaluate existing and proposed topography for current and future FEMA conditions for the 1% AEP and 0.2% AEP storm events.

Topographic / Bathymetric Data

VHB developed station-elevation data for each transect using Autodesk AutoCAD Civil 3D 2015 tools. The seamless DEM provided by FEMA was used as the base for the topographic model. VHB overlaid the existing site specific topographic surface onto the FEMA DEM to provide additional resolution in the vicinity of the Subject Property. VHB then overlaid the proposed grading onto the created existing conditions surface to create a proposed conditions surface.

Flood Insurance Studies

VHB reviewed the Effective and Preliminary FIS to obtain input parameters for the CHAMP model. The following parameters were obtained from the FIS:

- SWELs for the 1% and 0.2% AEP flood events (Effective and Preliminary)
- Significant Wave Height (H_s) and Peak Wave Period (T_p) for the 100-year event (Preliminary only)

VHB reviewed the input parameters for FEMA transects in the vicinity of the project including Transect No. 32, 34 and 35.

Preliminary Flood Insurance Study Coastal Transect Model

Review of the Preliminary Transect Model indicated that the 1% AEP SWEL elevation varies along the transect. To develop a similar varying SWEL model, VHB used Autodesk AutoCAD Civil 3D 2015 to simulate an elevation surface across the subject property with varying elevations based upon the locations of the SWEL from the FEMA transects. This allowed the approximation of the 1% AEP SWEL across the non-FEMA preliminary transects. The Preliminary Transect Model did not provide inputs for the 0.2% AEP SWEL. The preliminary 0.2% AEP SWEL was obtained from the preliminary FIS and remains constant throughout the transect. The 1% and 0.2% AEP SWEL for the effective model was obtained from the effective FIS and remains constant throughout the transect.

An additional input obtained from the preliminary FEMA model is the WHAFIS line type card. The line type card describes the type of fetch (an unobstructed length) or type of obstruction. The preliminary FEMA model uses line type cards for Above Surge (AS), Inland Fetch (IF), Buildings, and Vegetation (VE). VHB developed WHAFIS cards for non-FEMA transects with inputs representing conditions of adjacent FEMA transects within the preliminary and effective models. Additional line type cards were added at proposed building locations, and other areas within the Subject Property development area were assigned IF cards, consistent with open surfaces or grass.

ENGINEERING METHODS

VHB used CHAMP v. 2.0, including the WHAFIS and module to estimate the magnitude of locally-generated, wind-driven waves and their potential impact on the Subject Property. VHB used FEMA's TAW Wave Runup Methodology to evaluate estimated runup at breaking wave locations on the Subject Property. The CHAMP program with WHAFIS module and the TAW Wave Runup Methodology are approved for use by FEMA for the purpose of performing coastal FISs.

VHB evaluated potential coastal flood hazard impacts at the Subject Property for four scenarios for both the 1% AEP and 0.2% AEP coastal storm events:

- Scenario 1: The Effective FIS inputs analyzed over the existing conditions topography,
- Scenario 2: The Effective FIS inputs analyzed over the proposed conditions topography,
- Scenario 3: The Preliminary FIS inputs analyzed over the existing conditions topography, and
- Scenario 4: The Preliminary FIS inputs analyzed over the proposed conditions topography.

Based on the data and background described above, VHB performed this independent coastal analysis to estimate coastal hydraulic conditions in accordance with FEMA guidelines at the Subject Property. The preliminary FEMA model was used as the base model for the VHB analysis. VHB used CHAMP model input adjacent transects as a guide for determining non-FEMA transect inputs. CHAMP is a program which uses the station and elevation data of an individual transect and analyzes it under user defined inputs. Appendix A summarizes the effective (current) and preliminary (future) inputs at the applicable transects from the respective FEMA model.

VHB performed transect analyses at four locations, including two locations of FEMA defined transects within the Preliminary FIS to evaluated effects of proposed changes across the Subject Property. The transects were focused over areas where VHB has proposed grading changes, where flooding could be altered. The locations of the four analyzed transects are shown in Figure 3. As shown on Figure 3, Transect "A" and Transect "C" correspond to Non-Provided transects from the Preliminary FIRM. The FEMA transect corresponding to Transect "C" crosses a localized high point in the existing topography at approximate station 3600. VHB determined that evaluating the transect through the localized high point would provide results not indicative of the surrounding area, and as a result shifted Transect "C" 25 feet east of the FEMA transect. VHB determined it was not be necessary to include additional transects between Transects "C" and "D" because this area of the site is protected by an elevated topographic feature located seaward of the property, and analyzing transects in this location would not provide additional resolution of flood impacts to the site. The elevated area extends above the Preliminary 0.2% AEP floodplain and protects the site from wave action.

Transects were drawn nearly perpendicular to the shore at approximately a 20 degree skew. Transects were drawn consistent with approach angle as the FEMA transects used for the Preliminary FIS. FEMA technical guidance advises that transects be oriented in the direction that waves propagate, in most cases this is perpendicular to shore. In the case of the Subject Property where the shoreline curves, the waves may approach at angles that deviate significantly from the perpendicular, and transects that are not shore-perpendicular are required. The exact alignment was determined using engineering judgement. VHB followed the FEMA approach and used the same approach angle for consistency in our analysis.

WHAFIS

VHB used the WHAFIS model to predict wave heights associated with coastal storm surges. WHAFIS 4.0 was developed and is distributed by FEMA as part of the CHAMP 2.0 software package. The WHAFIS Model uses stillwater elevations , open fetch length, wave setup, wind speeds, and transect geometry to estimate wave

heights, wave periods, the locations where the waves break, and flood hazard designations continuously at points along the transect. As part of this work, VHB used WHAFIS to estimate wave heights and period along each transect using the described scenarios and conditions. WHAFIS is an appropriate tool for evaluating locally-generated wind-driven waves in the study area, which is a sheltered water body with depth-limited conditions.

As part of this work, VHB completed 32 WHAFIS model runs to estimate wave characteristics. For each of the four scenarios (Scenarios 1 through 4), VHB analyzed conditions at four transects ("A", "B", "C", and "D"), during two storm events (1% and 0.2% AEP flood events). Wind speeds of 60 miles per hour and 75 mph correspond to the 1% and 0.2% AEP flood events respectively. VHB evaluated stillwater elevations, wave setup, wave height, and wave runup for the 32 runs.

TAW Method

The TAW method is described in the Atlantic Ocean and Gulf of Mexico Coastal Update (FEMA, 2007) as the "recommended approach to calculating wave runup on structures". As part of the updated coastal analysis for Suffolk County, Massachusetts, FEMA developed a Mathcad worksheet to perform the TAW method calculations. VHB used the Mathcad worksheet to evaluate 2% wave runup (defined as the runup height exceeded by 2% of the waves) at locations of breaking waves on the Subject Property.

As part of this analysis, VHB completed six TAW method analyses, to evaluate runup conditions at the site. VHB performed runup calculations for the effective and preliminary conditions, at three transects, for the 100-year coastal storm events. VHB evaluated runup for Transects "B", "C" and "D" and determined that runup calculations were not applicable for Transect "A". VHB estimated runup at the seaward face of the Subject Property where proposed changes in grading are to occur. VHB estimated runup at two additional locations along Transect "D" corresponding to the property limits of the Subject Property. For Transects "B" and "C" estimated runup heights will be smaller under proposed conditions as compared to existing conditions, based on the revised wave parameters under proposed conditions at the property limits. Appendix B presents wave characteristics and estimated runup heights at the three applicable transects used for this analysis.

RESULTS

Wave Height Analysis (WHAFIS)

The existing and proposed conditions model results indicate that the proposed site development will result in both decreases and increases in wave heights within the Subject Property. Figures 4 through 7 show the wave decay profiles calculated by the WHAFIS model for each scenario during the 1% AEP flood event. Figures 8 through 11 show the wave decay profiles during the 0.2% AEP flood event. Detailed output are created by the WHAFIS model which include predictions of the controlling wave height (H_c) and the peak spectral wave period (T). The WHAFIS wave height predictions are used in subsequent 2% wave runup calculations.

Transect "A"

Figure 4 and Figure 8 show the wave decay profile for Transect "A" for the 1% and 0.2% AEP flood events, respectively. As shown on the figures, the proposed site conditions result in localized increases in wave heights of up to 0.5 feet and 0.6 feet during the 1% and 0.2% AEP events between Stations 2100 and 2600 within the property. Wave heights at Station 3070 outside the property decrease by up to 0.3 feet during the 1% and 0.2% flood events.

Transect "B"

Figure 5 and Figure 9 show the wave decay profile for Transect "B" for the 1% and 0.2% AEP flood events, respectively. As shown on the figures, the proposed site conditions result in decreases in wave heights between Station 2000 and 3880. Wave heights at Station 3755 outside the property decrease by up to 0.3 feet and 0.8 feet during the 1% and 0.2% AEP flood events.

Transect "C"

Figure 6 and Figure 10 show the wave decay profile for Transect "C" for the 1% and 0.2% AEP flood events, respectively. As shown on the figures, the proposed site conditions result in decreases in wave heights between Station 1900 and 3900. Wave heights within the property boundary at Station 3900 do not change under proposed conditions during the 1% flood event and decrease by up to 0.3 feet during the 0.2% AEP flood events within the property boundary. No changes occur outside the property boundary.

Transect "D"

Figure 7 and Figure 11 show the wave decay profile for Transect "D" for the 1% and 0.2% AEP flood events, respectively. As shown on the figures, the proposed site conditions result in minimal changes to wave heights, and predict small increases between Station 1600 and 3000. Wave heights within the property boundary at Station 3000 increase by up to up to 0.1 feet during the 1% and 0.2% AEP flood events. No changes to wave heights occur outside the property boundary during the 1% AEP flood event. Increases of up to 0.2 feet may occur in some areas along the eastern portion of the site at the property boundary during the 0.2% AEP flood event.

Wave Runup Analysis (TAW Method)

The TAW Method results indicate that the proposed site development will result in an increase of the 2% runup heights of 0.2 feet at Transect "D" during the 1% AEP flood event within the property boundary. The analysis also indicates that proposed grading decreases the estimated 2% runup heights at the seaward face of the Subject Property at Transects "C" and "C". Appendix B provides the wave parameter inputs and estimated 2% runup wave heights based on the TAW method calculated using the Mathcad worksheet.

CONCLUSIONS AND RECOMMENDATIONS

VHB evaluated two coastal model scenarios – existing conditions and the proposed site development design –based on the effective ("current") FIS and preliminary ("future") FIS data for the 1% and 0.2% AEP storm events. VHB analyzed coastal flood hazard impacts at four transects within the Subject property. The wave height results of transect A under preliminary FIS data and existing grading conditions were compared to the results from the FEMA WHAFIS model that had been provided to VHB. The comparison showed the results matched which validates the conclusions below. VHB offers the following conclusions and recommendations based on the results of the coastal models and calculations detailed in this report.

Conclusions

The analysis indicated that proposed site development is expected to result in the following impacts to wave heights at the property limits:

- Transect "A": Increases in wave heights of 0.5 feet and 0.6 feet within the property boundary during the 1% and 0.2% AEP flood events and decreases in wave heights of up to 0.3 feet outside landward property boundary during the 1% and 0.2% AEP flood events.
- Transect "B": Decreases in wave heights outside the property boundary of 0.3 feet and 0.8 feet during the 1% and 0.2% AEP flood events. The proposed grading results in no increases to predicted wave heights within or outside the property.
- Transect "C": Decreases in wave heights within the property boundary during the 1% and 0.2% AEP flood events. The proposed grading results in no change in wave heights at the landward property boundary during the 1% AEP flood event and decreases in wave height by 0.3 feet within landward property boundary during 0.2% AEP flood events.
- Transect "D": Increases in wave heights of up to 0.1 feet within the landward property boundary during the 1% and 0.2% AEP flood events. The proposed grading results in no change in wave heights at the landward property boundary during the 1% AEP flood event and increases of up to 0.2 feet at the property boundary during the 0.2% AEP event.

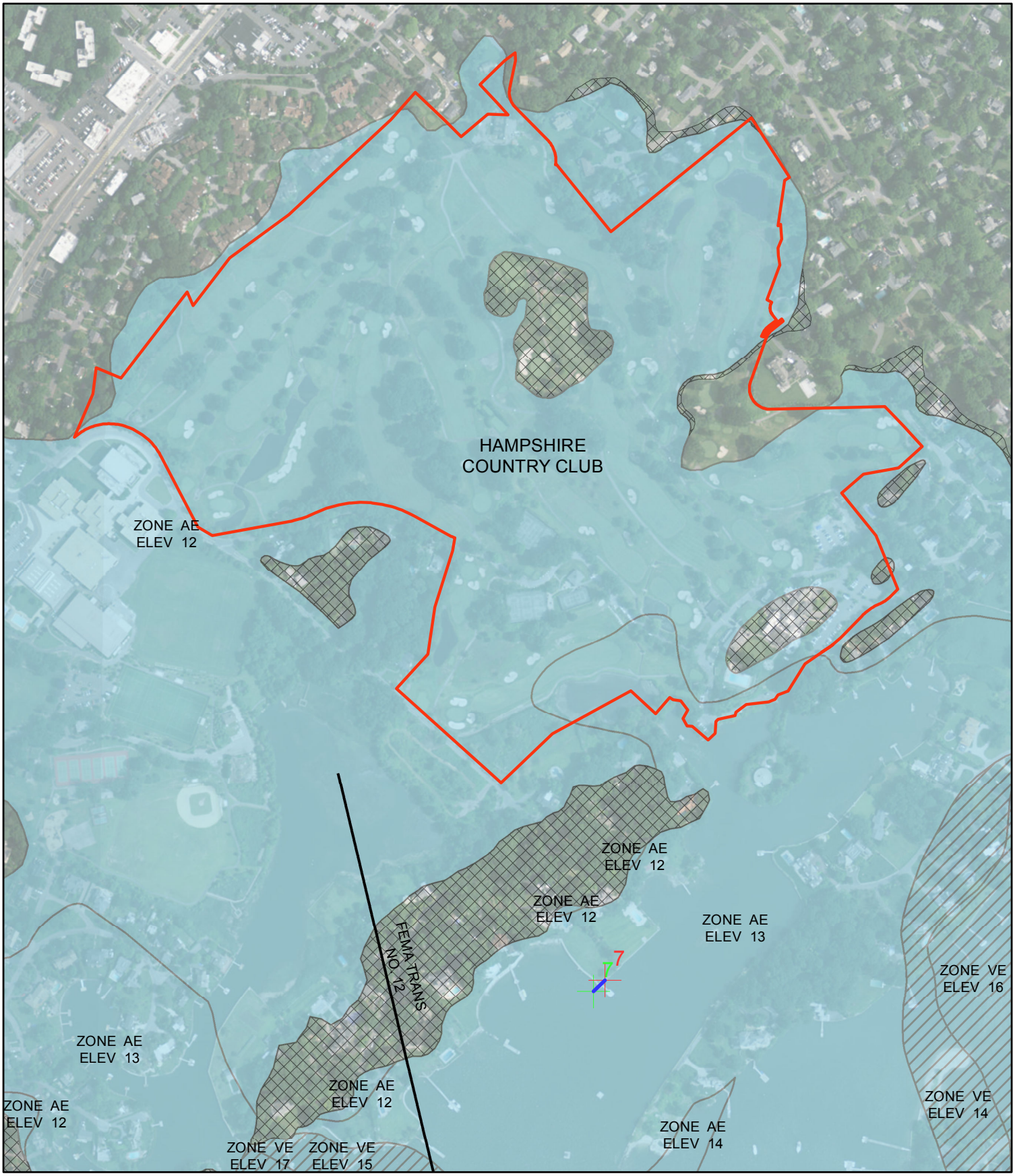
For the regulatory event (1% AEP flood event), the analysis predicts that proposed site development will not increase flood hazard impacts at adjacent properties. The proposed development is predicted to increase wave 2% runup wave heights by up to 0.2 feet during the 1% flood event within the property boundaries. The increases in 2% wave runup occurs only within the Subject Property boundaries and are not predicted to propagate onto adjacent properties.

The presence of the proposed development, including fill to elevation 15 feet, provides additional protection and reductions in wave heights, for a significant portion of inland offsite residences. As such, the proposed project does not adversely impact the expected flood elevations of adjacent properties under current and future FIS conditions.

The analysis indicates that all proposed buildings will be located outside the 1% and 0.2% AEP floodplains. The site development proposes that all new buildings be built with a minimum finished first floor elevation of 15 feet which is higher than the preliminary 0.2% AEP SWEL of 14.1 feet.

Recommendations

The analysis predicts increases and decreases in wave heights and flood elevations within the property limit which may require revision to the NFIP flood maps. We recommend a Conditional Letter of Map Revision (CLOMR) be completed and submitted to FEMA for review based on the final site grading for the Project. Preparation of a CLOMR, and approval by FEMA, will support the analysis to remove portions of the development from the regulatory floodplain, including locations where buildings are proposed. Upon FEMA approval of the CLOMR, VHB recommends submitting an as-built of the final proposed development with a Letter of Map Revision (LOMR) to change the NFIP flood maps to accurately reflect proposed conditions at the site.



Legend

- Property Line
- SFHA AE
- SFHA VE
- SFHA X

N

Hampshire Subdivision
Coastal Flooding Hydraulic Analysis
Village of Mamaroneck, NY

0 250 500 1,000 Feet

Figure 1
Effective FIRM
Special Flood Hazard Areas

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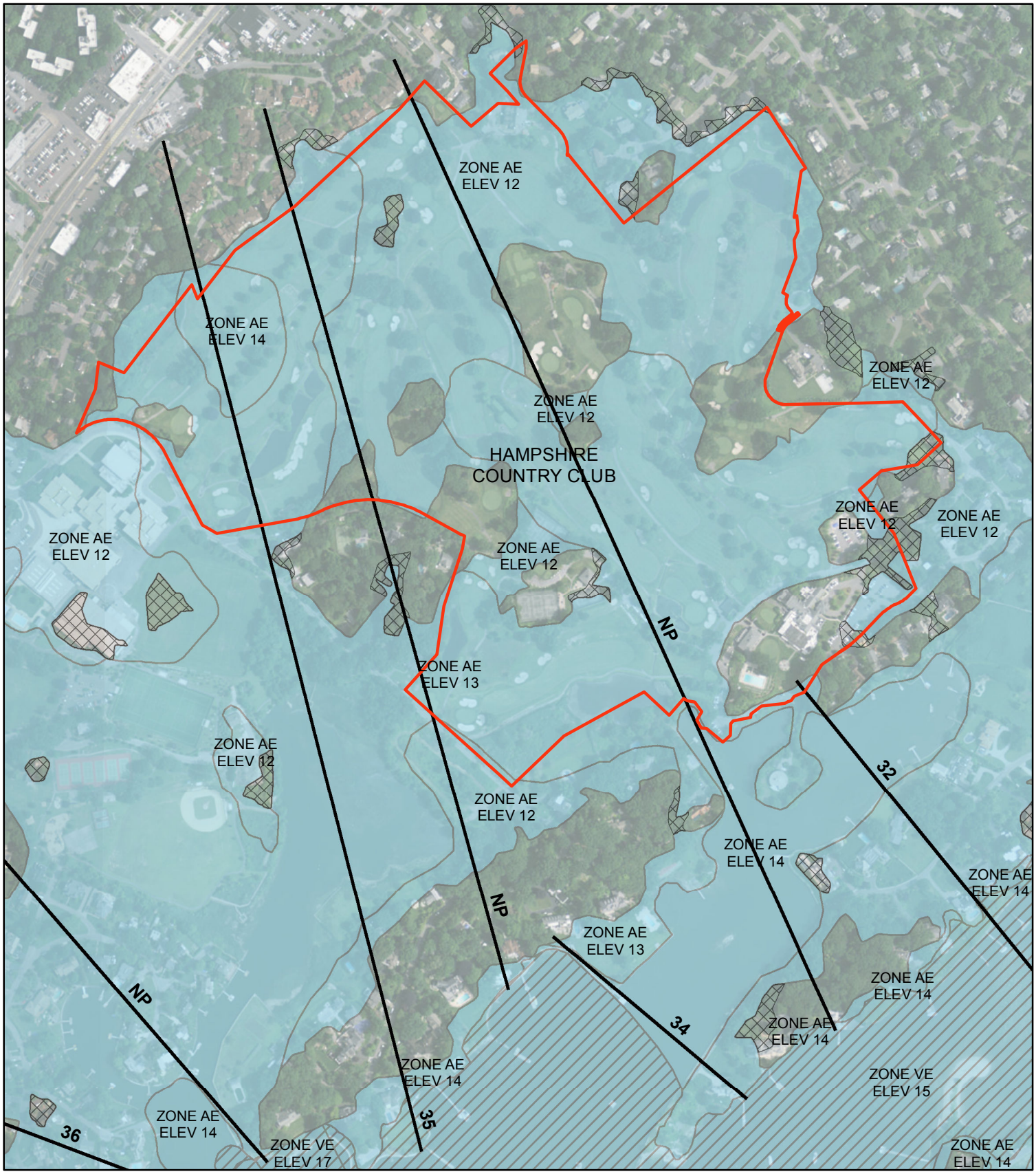

Legend

- Property Line
- FEMA Preliminary Transects
- SHFA AE
- SFHA VE
- SFHA X

N

0 250 500 1,000 Feet

Hampshire Subdivision
Coastal Flooding Hydraulic Analysis
Village of Mamaroneck, NY

Figure 2
Preliminary FIRM
Special Flood Hazard Areas

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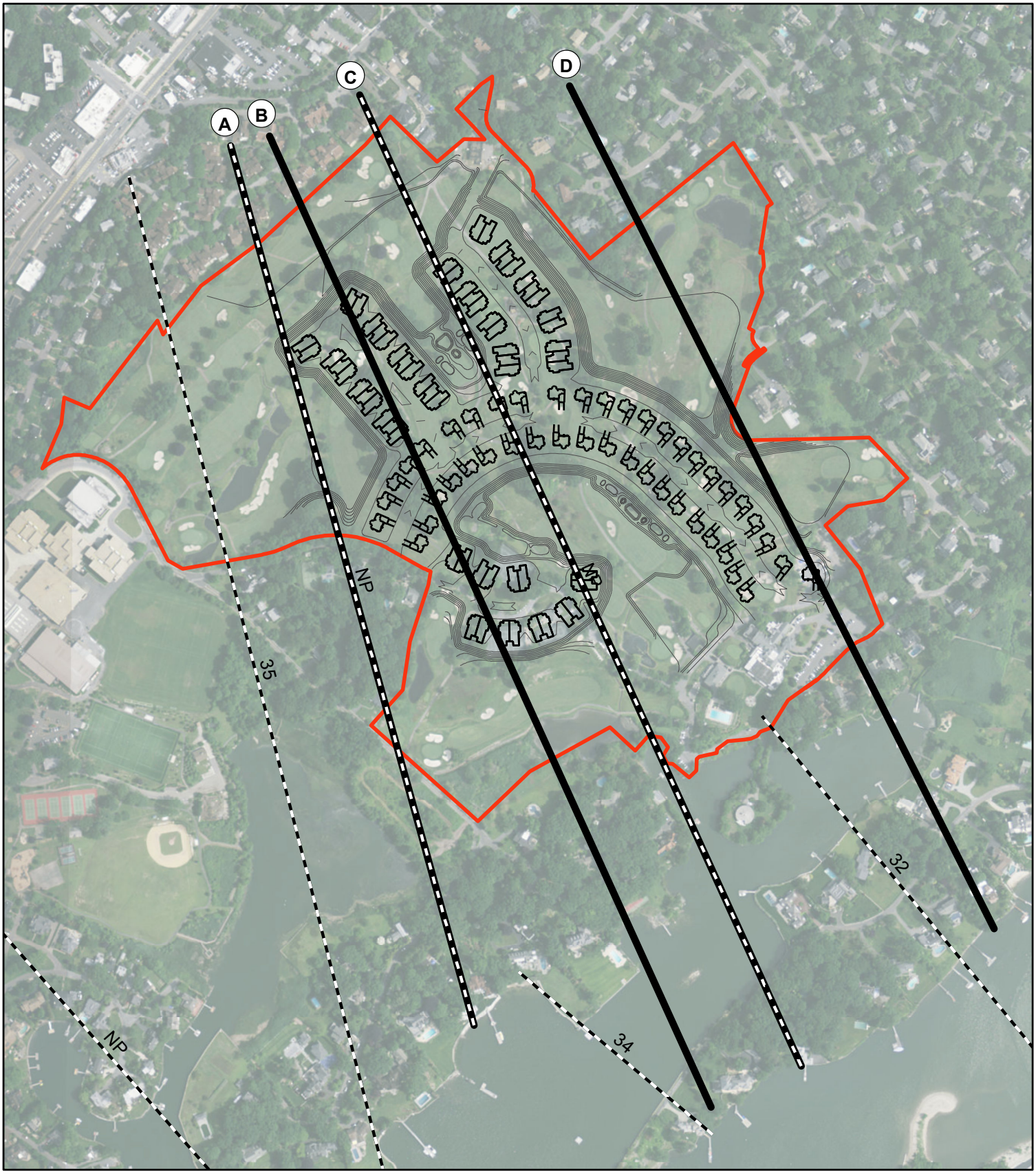

Legend

- VHB-TRANSECTS
- FEMA Preliminary Transects
- Proposed Grading
- Proposed Buildings
- Property Boundary

Hampshire Subdivision
Coastal Flooding Hydraulic Analysis
Village of Mamaroneck, NY

N

0 250 500 1,000 Feet

Figure 3
Transect Locations

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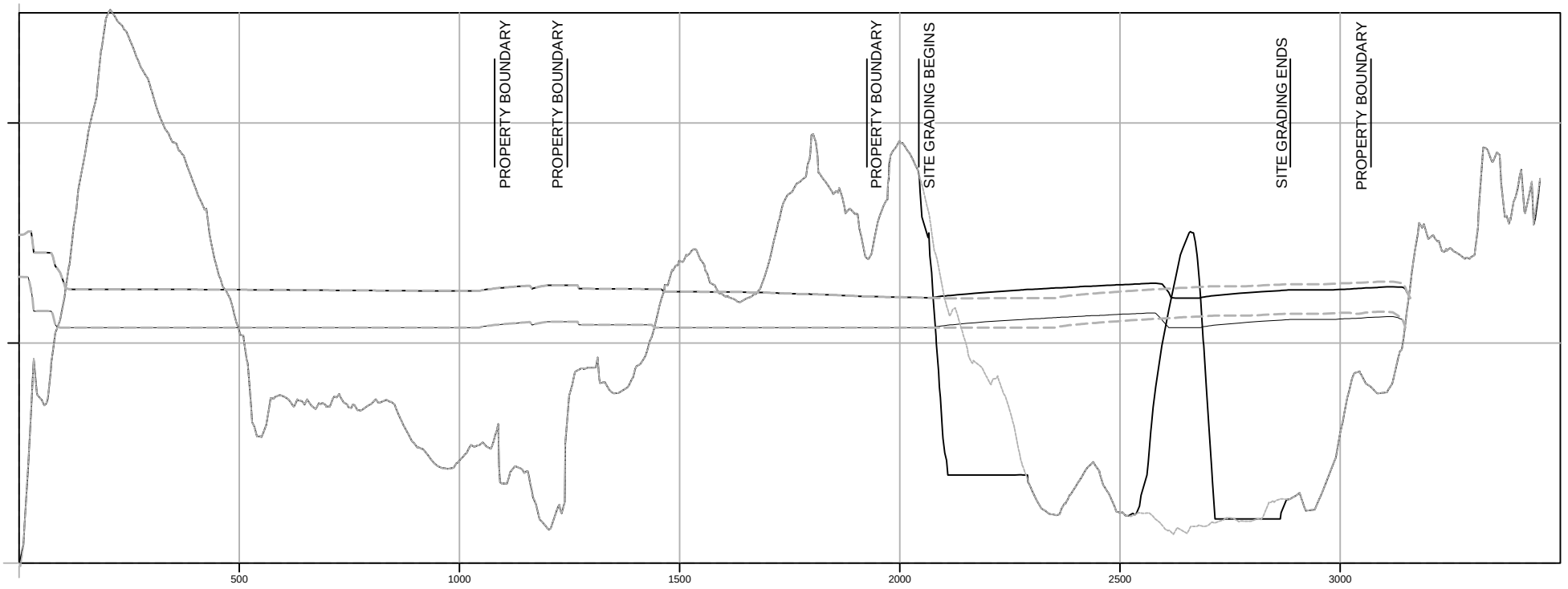
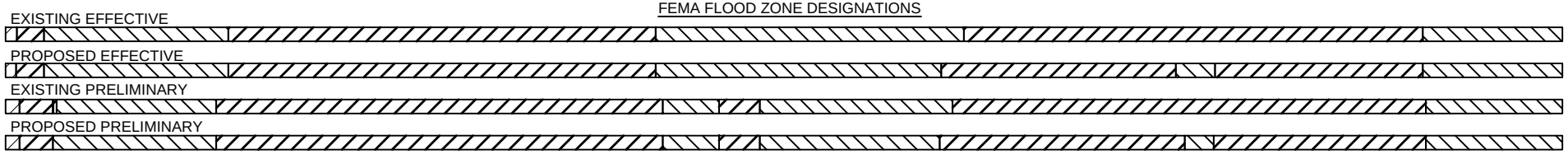


FEMA FLOOD ZONE DESIGNATIONS



HORIZONTAL AXIS 1"=350'
VERTICAL AXIS 1"=7'

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- EXISTING EFFECTIVE WAVE HEIGHT
- PROPOSED EFFECTIVE WAVE HEIGHT
- EXISTING PRELIMINARY WAVE HEIGHT
- PROPOSED PRELIMINARY WAVE HEIGHT

- FEMA VE ZONE
- FEMA AE ZONE
- FEMA X ZONE

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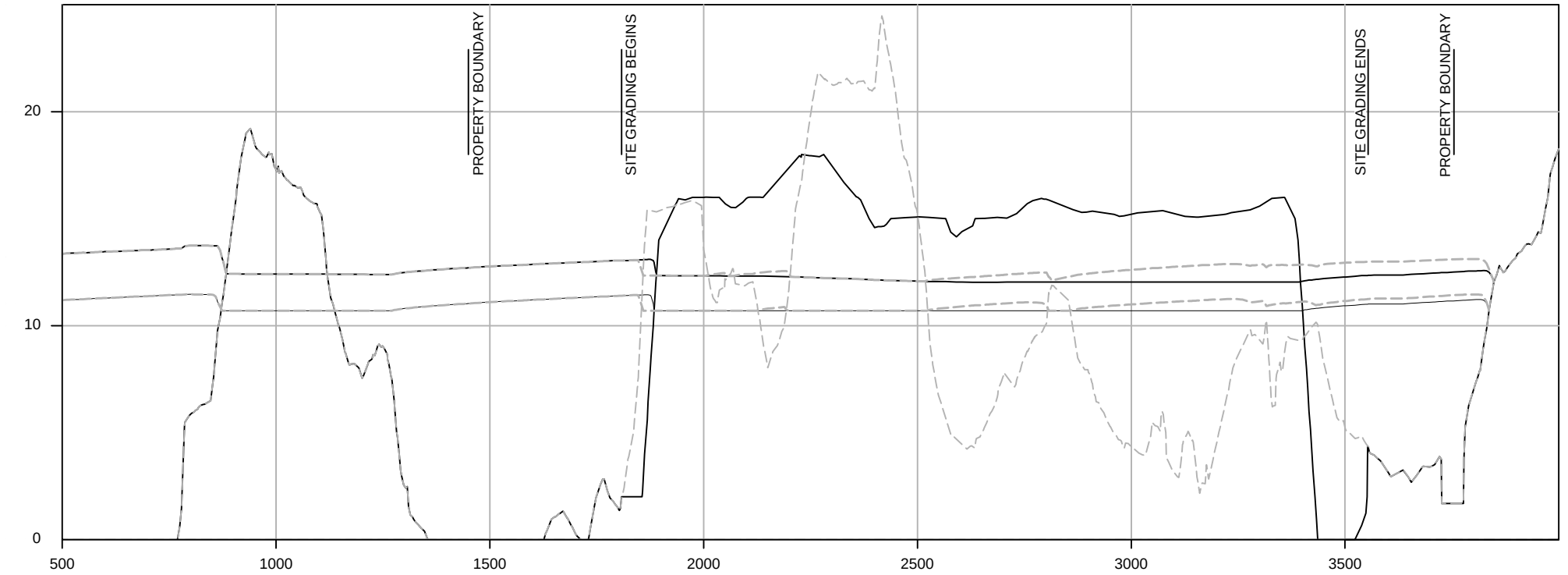
WAVE HEIGHT RESULTS
HAMPSHIRE SUBDIVISION
NEW WORLD REALTY
APRIL 2016

FIGURE 4 - 100YR
TRANSECT A



FEMA FLOOD ZONE DESIGNATIONS

EXISTING EFFECTIVE

PROPOSED EFFECTIVE

EXISTING PRELIMINARY

PROPOSED PRELIMINARY

HORIZONTAL AXIS 1"=350'
VERTICAL AXIS 1"=7'

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- EXISTING EFFECTIVE WAVE HEIGHT
- PROPOSED EFFECTIVE WAVE HEIGHT
- EXISTING PRELIMINARY WAVE HEIGHT
- PROPOSED PRELIMINARY WAVE HEIGHT

- FEMA VE ZONE
- FEMA AE ZONE
- FEMA X ZONE

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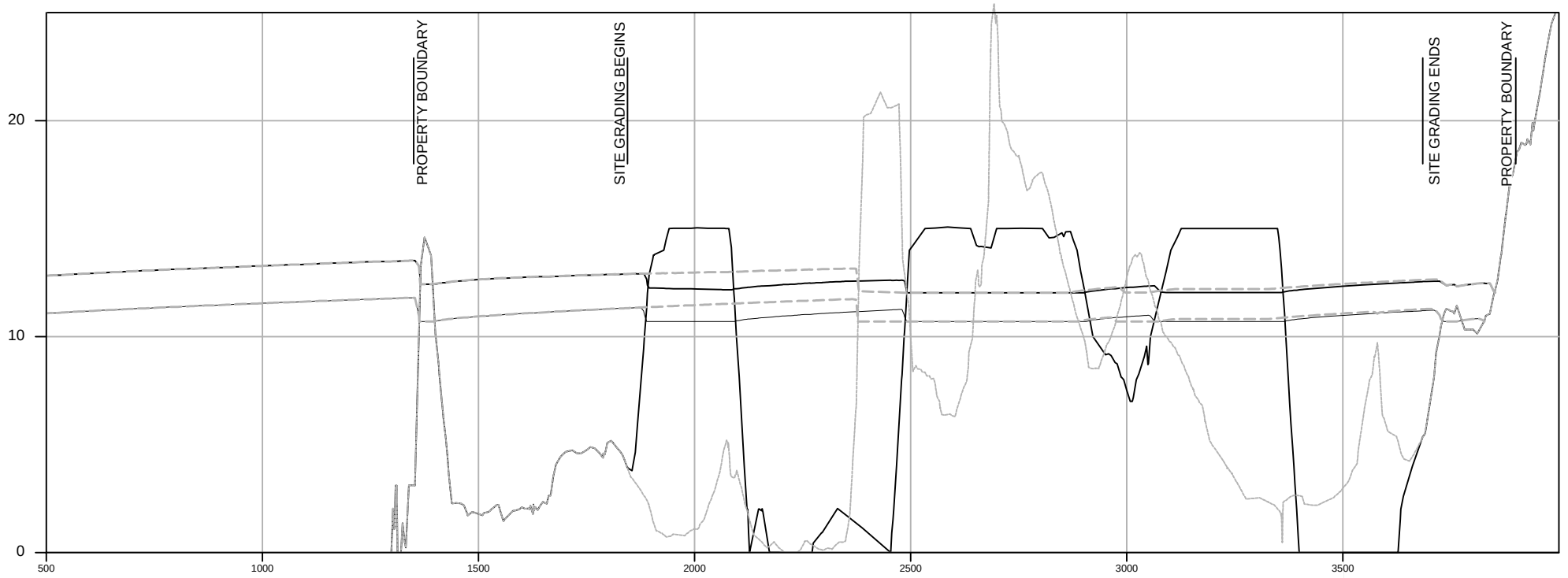
WAVE HEIGHT RESULTS
HAMPSHIRE SUBDIVISION
NEW WORLD REALTY
APRIL 2016

FIGURE 5 - 100YR
TRANSECT B



FEMA FLOOD ZONE DESIGNATIONS

EXISTING EFFECTIVE

PROPOSED EFFECTIVE

EXISTING PRELIMINARY

PROPOSED PRELIMINARY

HORIZONTAL AXIS 1"=350'
VERTICAL AXIS 1"=7'

LEGEND

- EXISTING GROUND
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- PROPOSED EFFECTIVE WAVE HEIGHT
- EXISTING PRELIMINARY WAVE HEIGHT
- PROPOSED PRELIMINARY WAVE HEIGHT

- FEMA VE ZONE
- FEMA AE ZONE
- FEMA X ZONE

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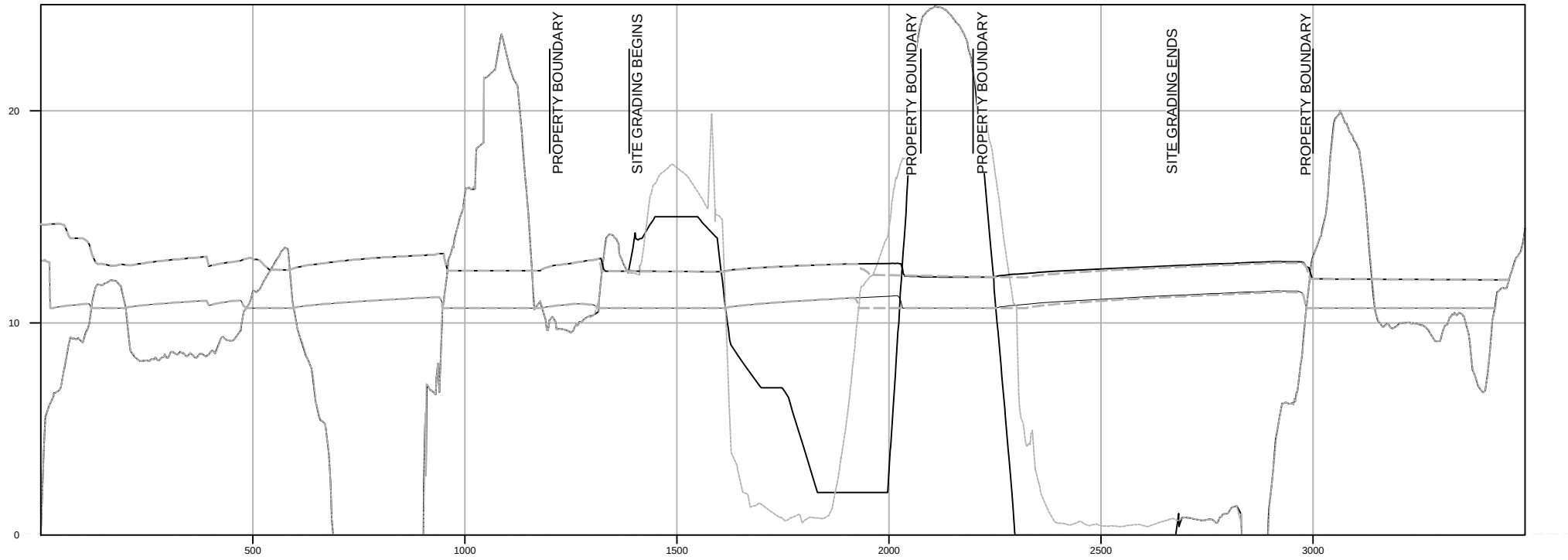
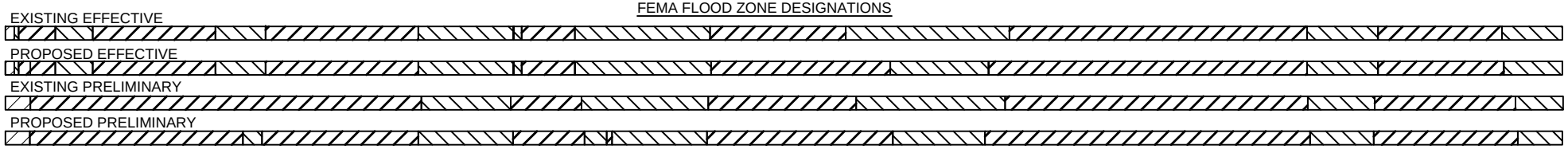
WAVE HEIGHT RESULTS
HAMPSHIRE SUBDIVISION
NEW WORLD REALTY
APRIL 2016

FIGURE 6 - 100YR
TRANSECT C



FEMA FLOOD ZONE DESIGNATIONS



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LEGEND

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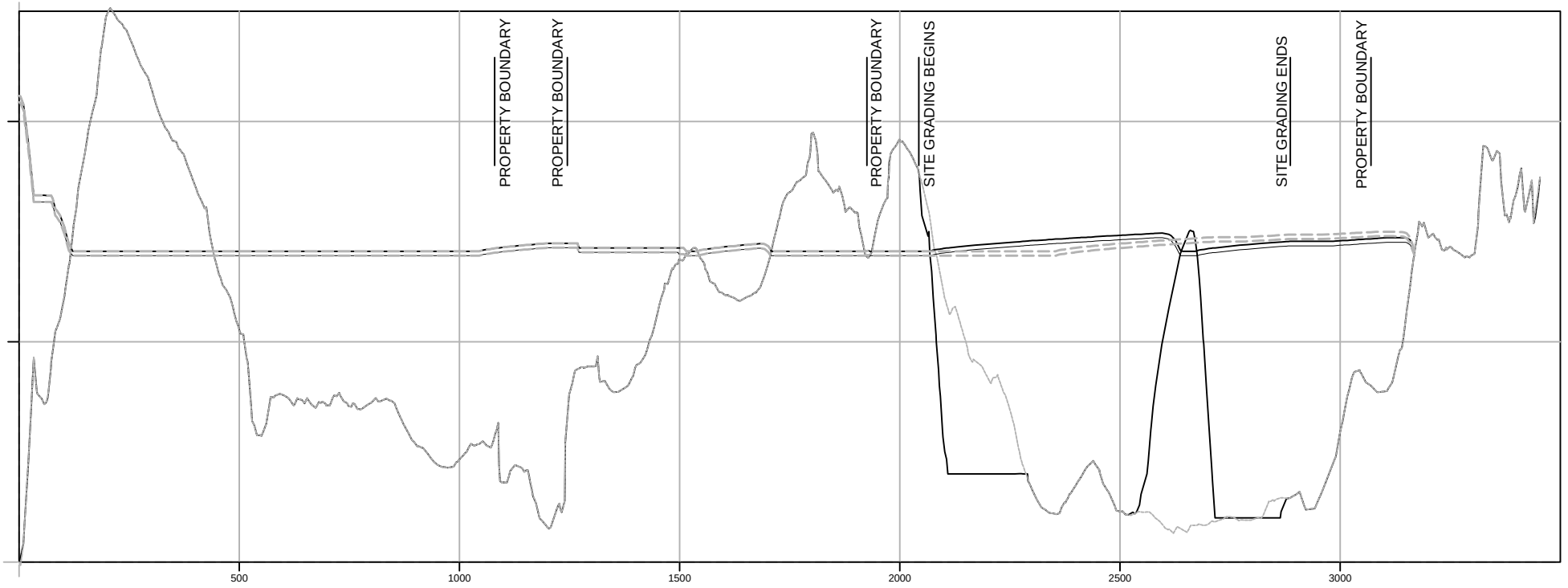
- EXISTING PRELIMINARY WAVE HEIGHT
- PROPOSED PRELIMINARY WAVE HEIGHT

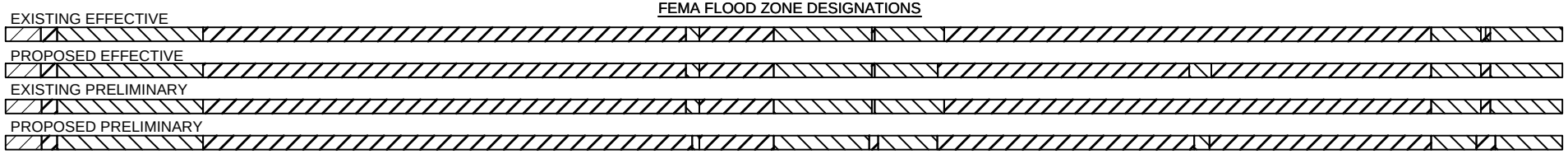
- FEMA VE ZONE
- FEMA AE ZONE
- FEMA X ZONE

WAVE HEIGHT RESULTS
HAMPSHIRE SUBDIVISION
NEW WORLD REALTY
APRIL 2016

FIGURE 7 - 100YR
TRANSECT D



FEMA FLOOD ZONE DESIGNATIONS



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- PROPOSED EFFECTIVE WAVE HEIGHT
- EXISTING PRELIMINARY WAVE HEIGHT
- PROPOSED PRELIMINARY WAVE HEIGHT

- FEMA VE ZONE
- FEMA AE ZONE
- FEMA X ZONE

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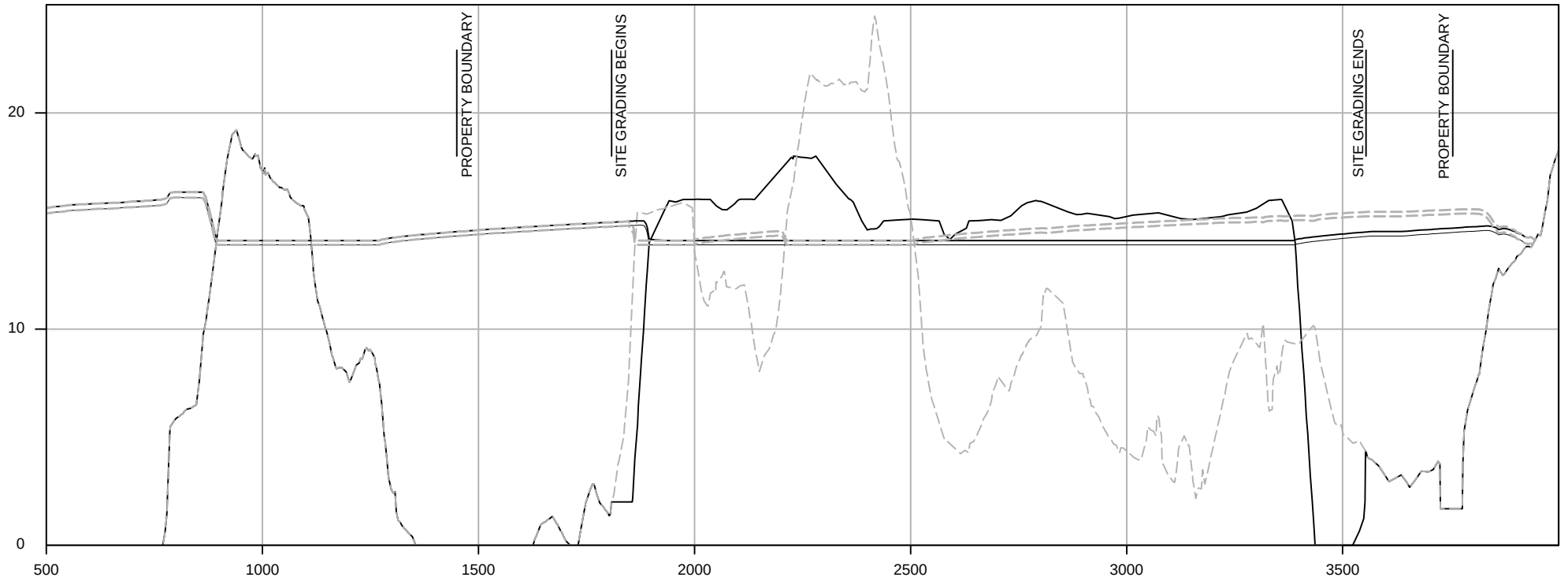
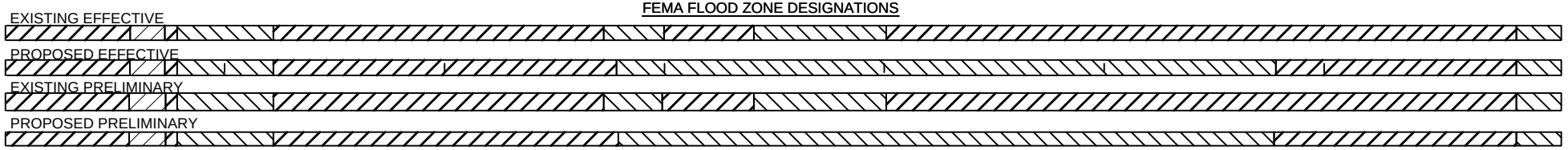
WAVE HEIGHT RESULTS
HAMPSHIRE SUBDIVISION
NEW WORLD REALTY
APRIL 2016

FIGURE 8 - 500YR
TRANSECT A



FEMA FLOOD ZONE DESIGNATIONS



HORIZONTAL AXIS 1"=350'
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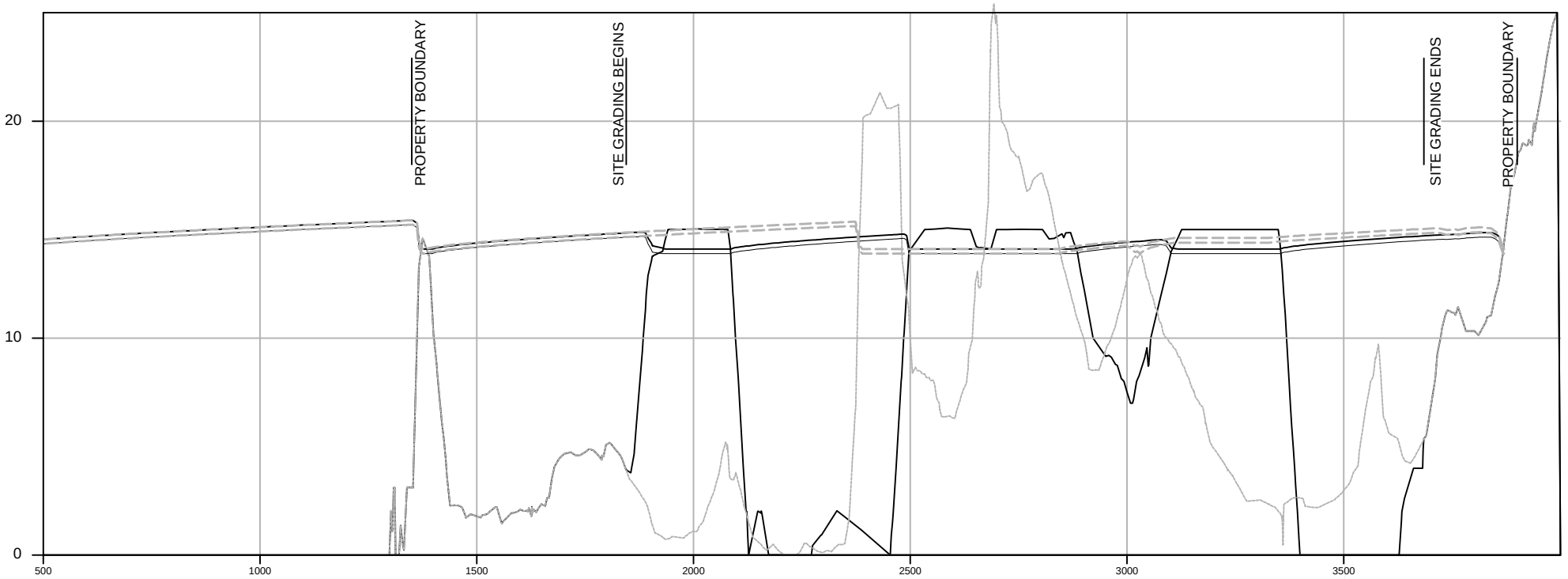
- PROPOSED EFFECTIVE WAVE HEIGHT
- EXISTING PRELIMINARY WAVE HEIGHT
- PROPOSED PRELIMINARY WAVE HEIGHT

- FEMA VE ZONE
- FEMA AE ZONE
- FEMA X ZONE

vhb

WAVE HEIGHT RESULTS
HAMPSHIRE SUBDIVISION
NEW WORLD REALTY
APRIL 2016

FIGURE 9 - 500YR
TRANSECT B



FEMA FLOOD ZONE DESIGNATIONS

EXISTING EFFECTIVE

PROPOSED EFFECTIVE

EXISTING PRELIMINARY

PROPOSED PRELIMINARY

HORIZONTAL AXIS 1"=350'
VERTICAL AXIS 1"=7'

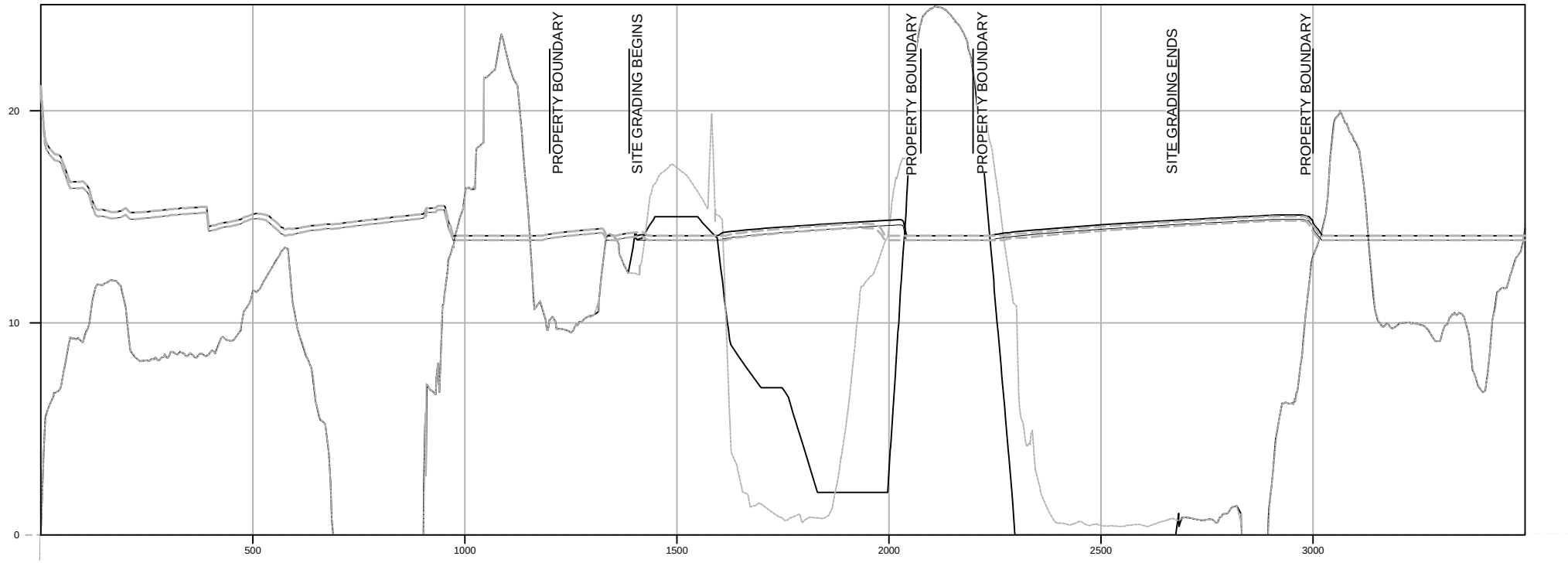
LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- EXISTING EFFECTIVE WAVE HEIGHT
- PROPOSED EFFECTIVE WAVE HEIGHT
- EXISTING PRELIMINARY WAVE HEIGHT
- PROPOSED PRELIMINARY WAVE HEIGHT

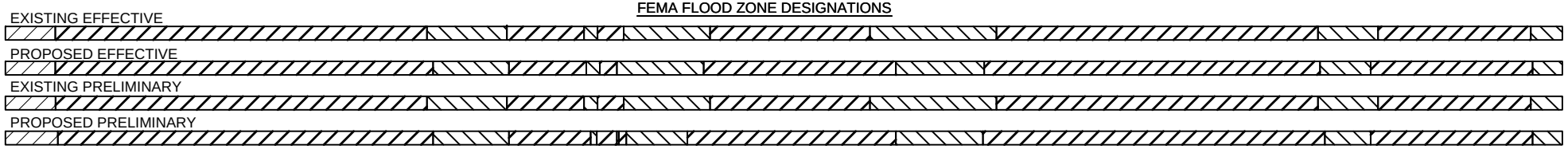
- FEMA VE ZONE
- FEMA AE ZONE
- FEMA X ZONE

WAVE HEIGHT RESULTS
HAMPSHIRE SUBDIVISION
NEW WORLD REALTY
APRIL 2016

FIGURE 10 - 500YR
TRANSECT C



FEMA FLOOD ZONE DESIGNATIONS



HORIZONTAL AXIS 1"=350'
VERTICAL AXIS 1"=7'

LEGEND

- EXISTING GROUND
- PROPOSED GROUND
- EXISTING EFFECTIVE WAVE HEIGHT
- PROPOSED EFFECTIVE WAVE HEIGHT
- EXISTING PRELIMINARY WAVE HEIGHT
- PROPOSED PRELIMINARY WAVE HEIGHT

- FEMA VE ZONE
- FEMA AE ZONE
- FEMA X ZONE

WAVE HEIGHT RESULTS
HAMPSHIRE SUBDIVISION
NEW WORLD REALTY
APRIL 2016

FIGURE 11 - 500YR
TRANSECT D

Appendix A:
Whafis Inputs

Project:	**New World Realty - Hamshire Subdivision Flood Study**
Project #:	**28677.02**
Date	**4/20/2016**

Appendix A - Whafis Input

Transect ID	**A**		**B**		**C**		-		**D**	
Prelimnary ID	[11830-NP]		-		[11780-NP]		[11700-32]		-	
	Effective	**Prelim.**	**Effective**	**Prelim.**	**Effective**	**Prelim.**	**Effective**	**Prelim.**	**Effective**	**Prelim.**
10% SWEL (ft)		9.344		9.34*		9.366		9.29		9.34*
2% SWEL (ft)		11.5		11.5*		11.5		11.5		11.5*
1% SWEL (ft)	10.7	12.463	10.7*	12.42*	10.7	12.451	10.7	12.34	10.7*	12.42*
0.2% SWEL (ft)	13.9	14.1	13.9*	14.1*	13.9	14.1	13.9	14.1	13.9*	14.1*
Fetch Length (ft)	24*	24	24*	24*	24*	24		24	24*	24*
1% Significant Wave Height (ft)		2.163	2.163*	2.163*	2.003*	2.003		4.601	2.003*	2.003*
1% Deepwater Wave Period		4.383	4.383*	4.383*	3.105*	3.105		4.869	3.105*	3.105*

Effective: Source of data is Effective FEMA FIS

Prelim.: Source of data is Preliminary FIS

*Assumption used based upon representative FIS

[Prelimnary transect data used for variable determination]

Appendix B:
TAW Inputs

Project: New World Realty - Hamshire Subdivision Flood Study
Project #: 28677.02
Date 4/20/2016

Appendix B - TAW Input

EFFECTIVE FIS

Transect ID	A		B		C		D		D		D	
	Not Applicable						Location 1		Location 2		Location 3	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
Controlling Wave Height (ft)	-	-	1.04	1.07	1.48	0.80	0.23	0.23	0.68	0.82	1.06	1.14
Significant Wave Height (ft)	-	-	0.20	0.20	0.28	0.15	0.04	0.04	0.13	0.16	0.20	0.22
Wave Period (sec)	-	-	1.20	1.21	1.42	1.05	0.70	0.70	0.96	1.06	1.21	1.25
Represenative Slope (ft/ft)	-	-	0.31	0.28	0.66	0.33	0.17	0.17	0.06	0.31	0.19	0.19
Station (ft) at Structure Toe	-	-	1850	1860	2365	2450	1316	1316	1900	1997	2970	2970
Station (ft) at Structure Top	-	-	1868	1895	2390	2495	1334	1334	1940	2060	2990	2990
Stillwater Elevation (ft NAVD 88)	-	-	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7	10.7
2% Runup (ft)	**-**	**-**	**0.6**	**0.5**	**1.3**	**0.4**	**0**	**0**	**0.2**	**0.4**	**0.3**	**0.4**

PRELIMINARY FIS

Transect ID	A		B		C		D		D		D	
	Not Applicable						Location 1		Location 2		Location 3	
	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed	Existing	Proposed
Controlling Wave Height (ft)	-	-	1.05	1.08	1.49	0.81	0.86	0.86	0.69	0.84	0.2	0.22
Significant Wave Height (ft)	-	-	0.20	0.21	0.28	0.15	0.16	0.16	0.13	0.16	0.04	0.04
Wave Period (sec)	-	-	1.2	1.21	1.43	1.06	3.19	3.19	0.98	1.07	1.21	1.26
Represenative Slope (ft/ft)	-	-	0.31	0.28	0.66	0.33	0.17	0.17	0.06	0.31	0.19	0.19
Station (ft) at Structure Toe	-	-	1803	1856	2365	2450	1316	1260	1840	1997	2954	2954
Station (ft) at Structure Top	-	-	1868	1895	2390	2495	1334	1330	2032	2047	3053	3053
Stillwater Elevation (ft NAVD 88)	-	-	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4
2% Runup (ft)	**-**	**-**	**0.6**	**0.5**	**1.3**	**0.4**	**0**	**0**	**0.2**	**0.4**	**0.3**	**0.3**