

Village of Piermont Asset Inventory and Coastal Risk Assessment

For the Piermont Waterfront Resilience Task Force

January 2014

Overview

The New York State Department of State developed an asset inventory and risk assessment tool as part of its New York Rising Community Reconstruction Program. The tool is used to inventory and categorize all of the assets of a community's waterfront, and based on multiple factors to calculate a risk score for each. The resulting scores can be used to examine trends in coastal or riverine flooding risk, and to plan for risk reduction by geography or sector (e.g. critical facilities, vulnerable populations).

Risk scores are calculated according to the formula:

$$\text{Risk Score} = \text{Exposure} * \text{Vulnerability} * \text{Hazard}$$

Exposure = a sum of Risk Area and Landscape Attributes

Risk area = a score based on location of asset in relation to three modeled risk areas: Moderate (=0.5), High (=1), or Extreme (=2)

Landscape Attributes = an additive score based on six features of the landscape that lie between the assets and the source of flood waters (each feature contributes a score of 0.5 if its character contributes to flood risk, for a possible total range of 0-3).

Vulnerability = an assigned score representing the capacity of an asset to return to service after a storm, ranging from Insignificant (highest capacity, =1) to Major (lowest capacity, =5)

Hazard = a constant representing the likelihood and magnitude of future storm events (100 year storm = 3, 500 year storm = 4)

For a 100 year storm event (Hazard = 3), risk scores can be categorized as follows:

Risk category	Risk score	Consequences of flood
Residual	< 8	Minor or infrequent
Moderate	6 - 23	Moderate to serious
High	32 – 70	Significant
Extreme	> 70	Dangerous

Methods

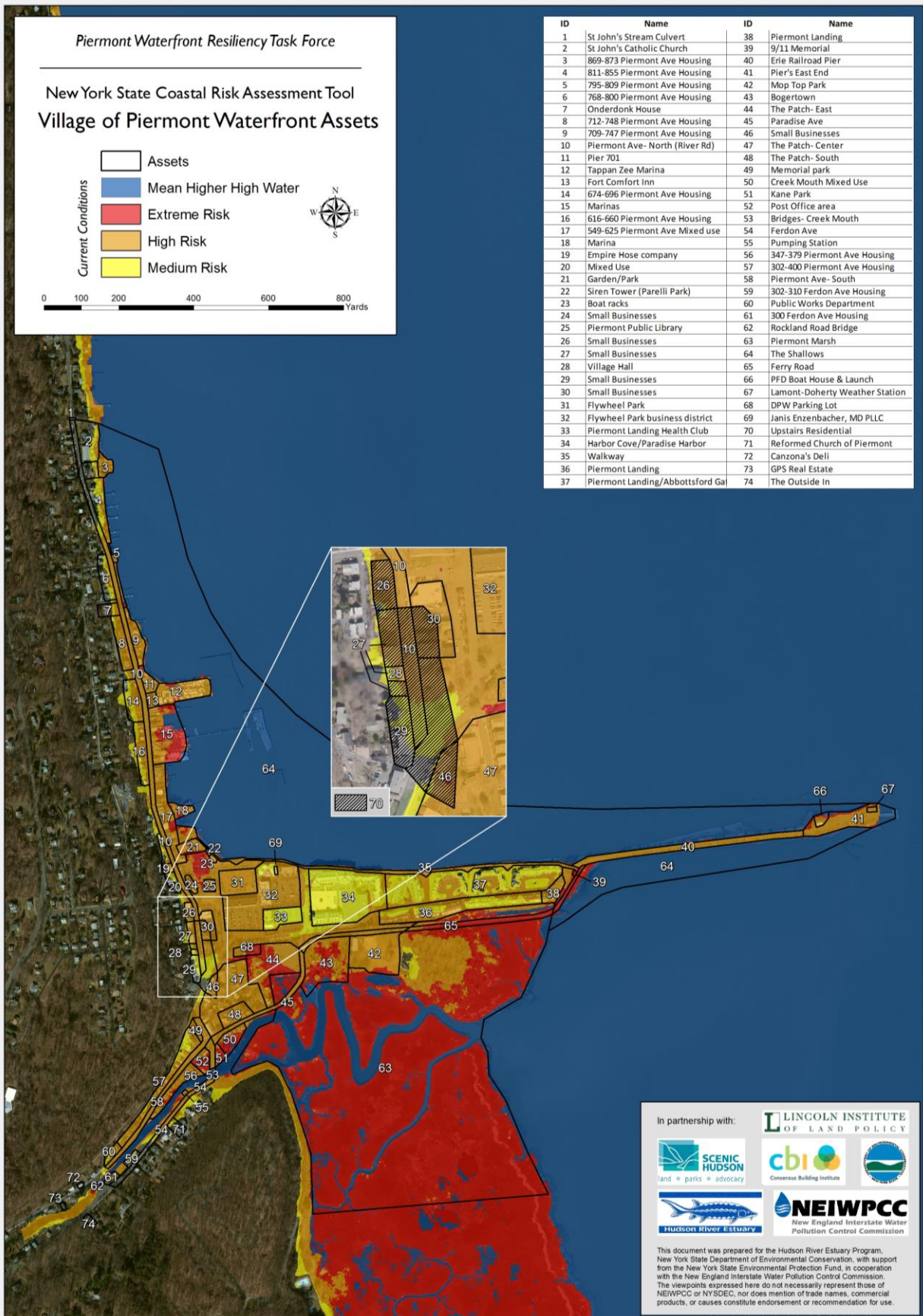
As part of the Piermont Waterfront Resilience Task Force initiative, project partner Scenic Hudson and task force members completed the Inventory and Coastal Risk Assessment created for the NY Rising Community Reconstruction Program. Assets were identified through remote analysis and a series of task force and public input exercises. They were categorized according to their class (e.g. Infrastructure Systems, Housing, Economic), class sub-category (e.g. Transportation, Single-Family Residence, Restaurant), importance to socially vulnerable populations, and critical facilities. Individual assets were grouped based on proximity and similar characteristics.

Current risk areas were modeled by Scenic Hudson (a project partner) using methods defined by the New York Rising Community Reconstruction Program, and the following data: a current working model of Hudson River elevation (a vertical datum modeled by New York Harbor Observing and Prediction System), LiDAR elevation data, and FEMA's Advisory Base Flood Elevations. Risk areas were also modeled for the 2020s, 2050s, and year 2100, using 10, 29, and 72 inches of sea level rise (SLR), respectively. The Piermont task force had chosen these values, which represent the upper end of ranges predicted in these time frames under future rapid ice melt conditions, to guide all of their planning work. The projected SLR values for the Hudson River under two SLR scenarios were published by the New York State Task Force on Sea Level Rise and the NYS2100 Commission, and they match almost exactly the high-estimate (90th percentile) projections made by the New York City Panel on Climate Change for the greater New York City Metro Region, which includes the Village of Piermont.

Landscape attribute values were scored based on the modeled risk areas, local knowledge, and remote analysis. Vulnerability scores, which represent the level of impairment or consequences that assets experience from a storm event, were developed in discussion with the Task force, village officials and other community members based on their knowledge of the assets and recent storm events (Superstorm Sandy, in particular). Vulnerabilities were estimated where a value was not otherwise available.

Risk scores were calculated for a 100 year storm event (Hazard = 3) for current, 2020s, 2050s, and 2100.

Additional detail on methodology can be found in the document "Guidance for New York Rising Community Reconstruction Plans: A planning Toolkit for CR Planning Committees" and the associated Assets Inventory and Coastal Risk Assessment Tool, available from the New York Rising Community Reconstruction Program website: <http://stormrecovery.ny.gov/community-reconstruction-program>



Mapped Village of Piermont waterfront assets, shown with modeled current risk areas.

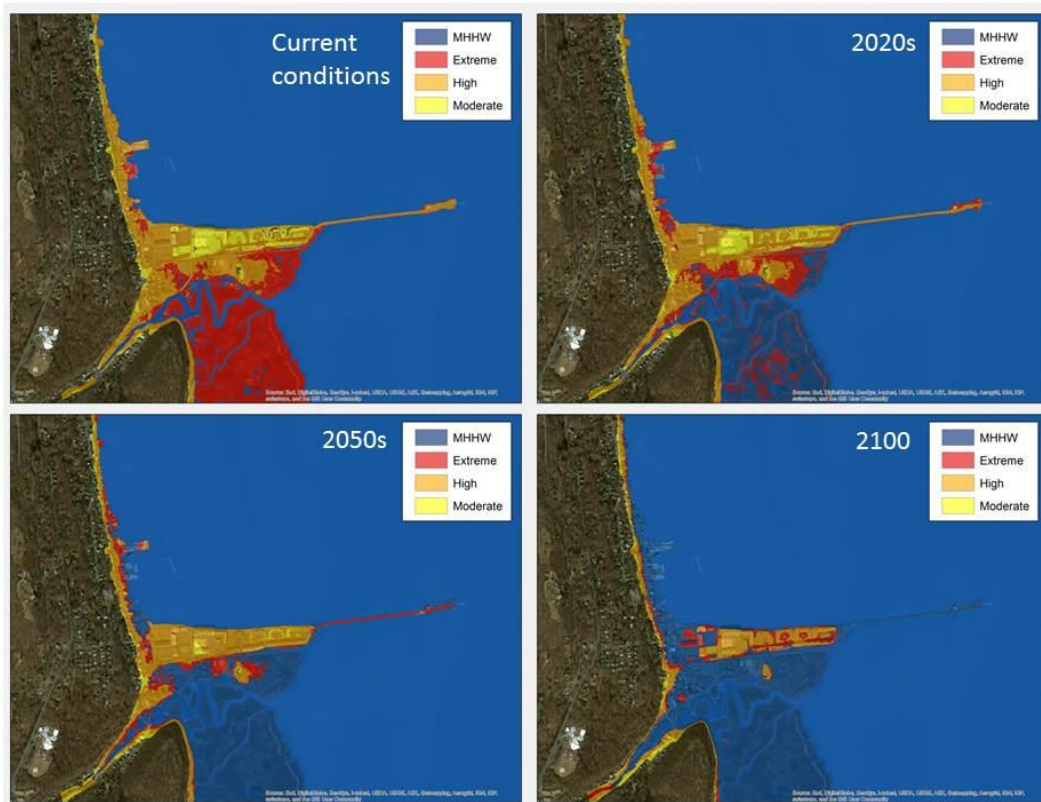
Results

The results below are described for current, 2020s, 2050s and 2100 time frames (corresponding to predicted sea level rise of none, 10", 29", and 72", respectively). It is important to note that while in reality the time frames of these sea level rise projections may be different, the trends are likely to hold under most conditions. It is also important to note that changes described for these individual time frames in fact describe the range of time leading up to each of them; that is, changes described in the 2100 time frame could in fact occur between the 2050s and 2100 (between 29" and 72" SLR).

Risk Areas

Piermont's small immediate Hudson River and Sparkill Creek waterfronts generally meet a steep, water-facing topography. Thus sea level rise and its associated risk areas are expected to make relatively little inland advancement beyond the current waterfront and risk areas over the next century. Rather, a gradual yet dramatic shifting into higher risk categories is expected for assets already within the low-lying waterfront over time.

In the 2020s the most dramatic predicted shift in risk areas will be to regular (higher) inundation in Piermont Marsh and the southeast flank of the pier¹ (e.g. Ferry Road). Inundation at high tides will also begin in a spotty pattern both north and south of the pier. A small, general shift from moderate to high risk areas is also expected throughout the village.



Modeled risk areas under current, 2020s, 2050s, and 2100 conditions for Village of Piermont waterfront assets.

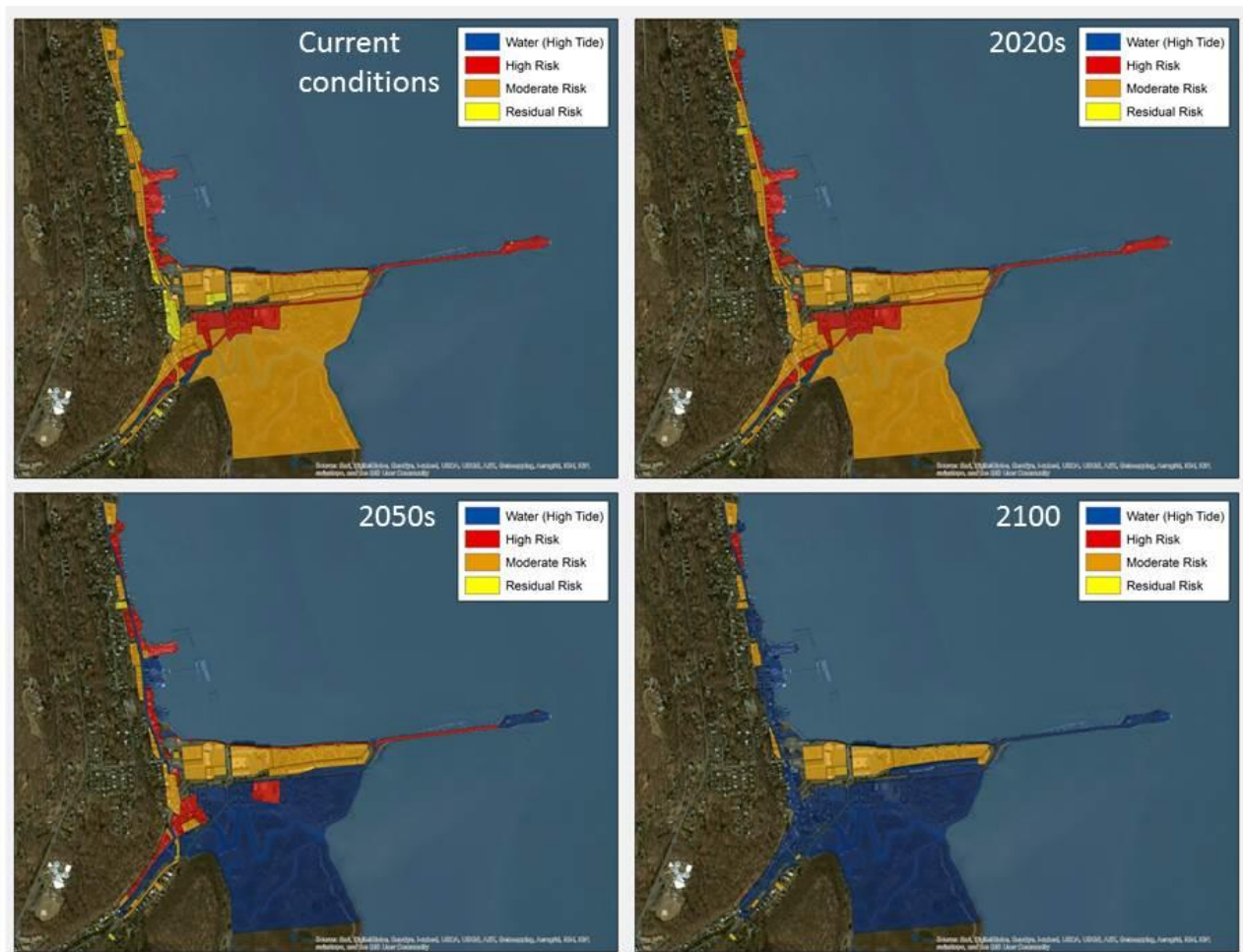
¹ In this document "The Pier" generally refers to the entire peninsula extending into the Hudson River. The long, narrow, easternmost extension is referred to in the risk assessment tool as the "Erie railroad Pier", and its assets as the "Pier's east end" assets.

A continued pattern of increasing risk and inundation is expected in all shore areas (Hudson River and lower Sparkill Creek) over the remainder of the century. By the 2050s a pattern of water pinching in from both north and south of the pier will develop, and is expected to lead to the pier's isolation from the mainland by 2100. Unless mitigated, this pattern will cause regular inundation for core business district assets (commercial and residential) at the base of the pier, with assets on the remaining pier experiencing extreme and high risk. In the north, Parelli Park, southern portions of a mixed use area (549-625 Piermont Ave) and the community garden will be in the path of this pinching pattern of inundation. From the south, flooding of the core business district will advance primarily through the eastern section of the Patch and the DPW Parking Lot. The village may wish to consider specific fortification adaptations to preserve the viability of the business core into the mid-term future. Examples of such adaptations may include repurposing Paradise Avenue to function as a levee, and elevating or adding protective shore defenses to key assets at the northern base of the pier.

Risk Scores

Risk scores in this analysis ranged from 0-60 (Residual to High). While not assets fell in the Extreme risk category, many were projected to become regularly inundated (that is they were in a permanent risk area which is not scored by this tool). One asset was projected to experience regular tidal inundation by 2020s, 20 assets by 2050s, and 50 of the 74 assets by 2100. Most assets were scored relatively low for vulnerability, with only 16 assets receiving a score of 4 or 5 (Significant or Major). Many of these 16 assets were among those predicted to be regularly inundated by the 2050s and 2100. Since Vulnerability is one of the main factors in the calculation of risk score, these relatively low numbers were a main contributor to the absence of Extreme risk scores.

The overall pattern of risk scores is similar to that of the modeled risk areas, but the risk scores take into account additional ground and situational conditions that are relevant to the overall risk of assets in the village. For instance, an asset in a High or Extreme risk area could have a relatively low risk score if the property has several protective landscape attributes and low vulnerability (due to a flood adapted building design, for example). Below are additional results as examined by components of risk score or various asset categories.

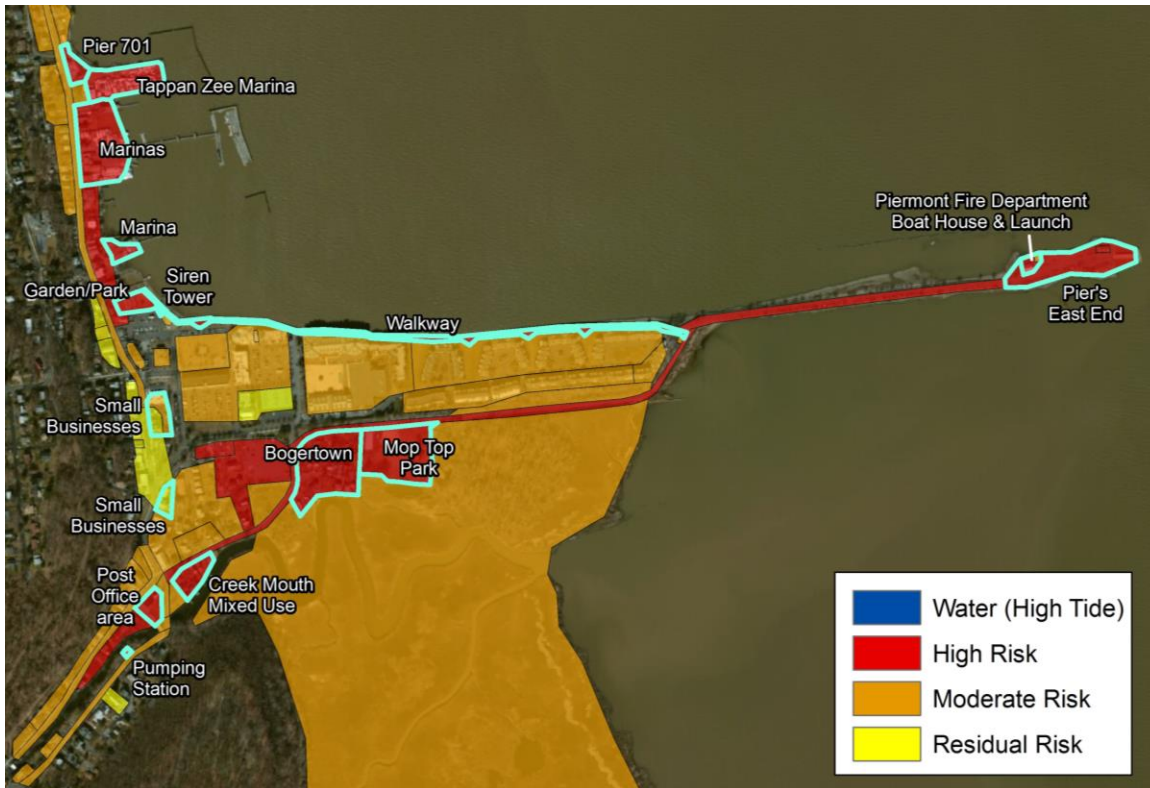


Risk scores under current, 2020s, 2050s, and 2100 conditions for Village of Piermont waterfront assets.

High Vulnerability

Sixteen assets were rated with the highest vulnerability scores (Significant and Major). Among those, the Siren Tower (at Parelli Park), the Pumping Station, and the Piermont Fire Department Boat House are critical facilities². Mop Top Park and the Walkway both represent highly vulnerable parks/recreational resources, and the remaining most vulnerable assets are small businesses. Examining the specific conditions that cause high vulnerability in assets (e.g. mechanicals in the basement) may present opportunities for effective adaptation actions. This may be a particularly productive line of investigation for highly vulnerable assets that have relatively low exposure, such as two of the small business asset groups along the commercial core of the village (#30 and #46), and to a lesser degree the Pumping Station, Mop Top Park, and the Walkway.

² According to FEMA, critical facilities are those essential to the health and welfare of the whole population, and are especially important following hazard events.

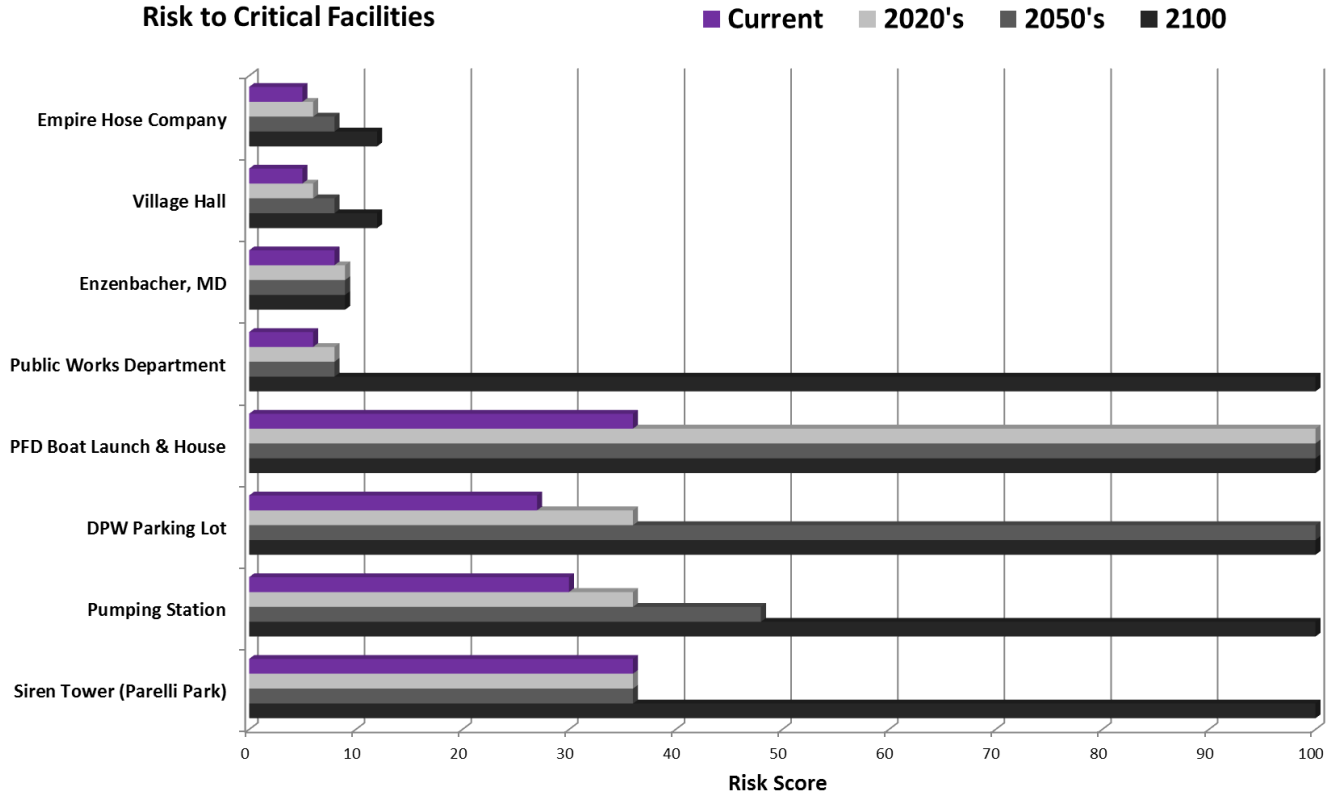


Assets with the highest vulnerability scores in the Village of Piermont waterfront (shown with current risk scores).

Critical facilities and transportation/access assets

The analysis identified eight assets that are considered critical facilities according to FEMA’s definition. Those at highest risk under current conditions are the Siren Tower (in Parelli Park), the Pumping Station (Ferdon Ave), the PFD Boat Launch & Boat House, and the DPW Parking Lot. Of these, the PFD Boat Launch (though not the House) and DPW Parking Lot are the first expected to be regularly inundated (in the 2020’s and 2050s, respectively). At lower current risk (moderate or residual risk categories) are the Public Works Department, a Medical facility (J. Enzenbacher, MD), Village Hall, and the Empire Hose Company. By the end of the century the Public Works Department and all currently high risk critical facilities will experience regular inundation.

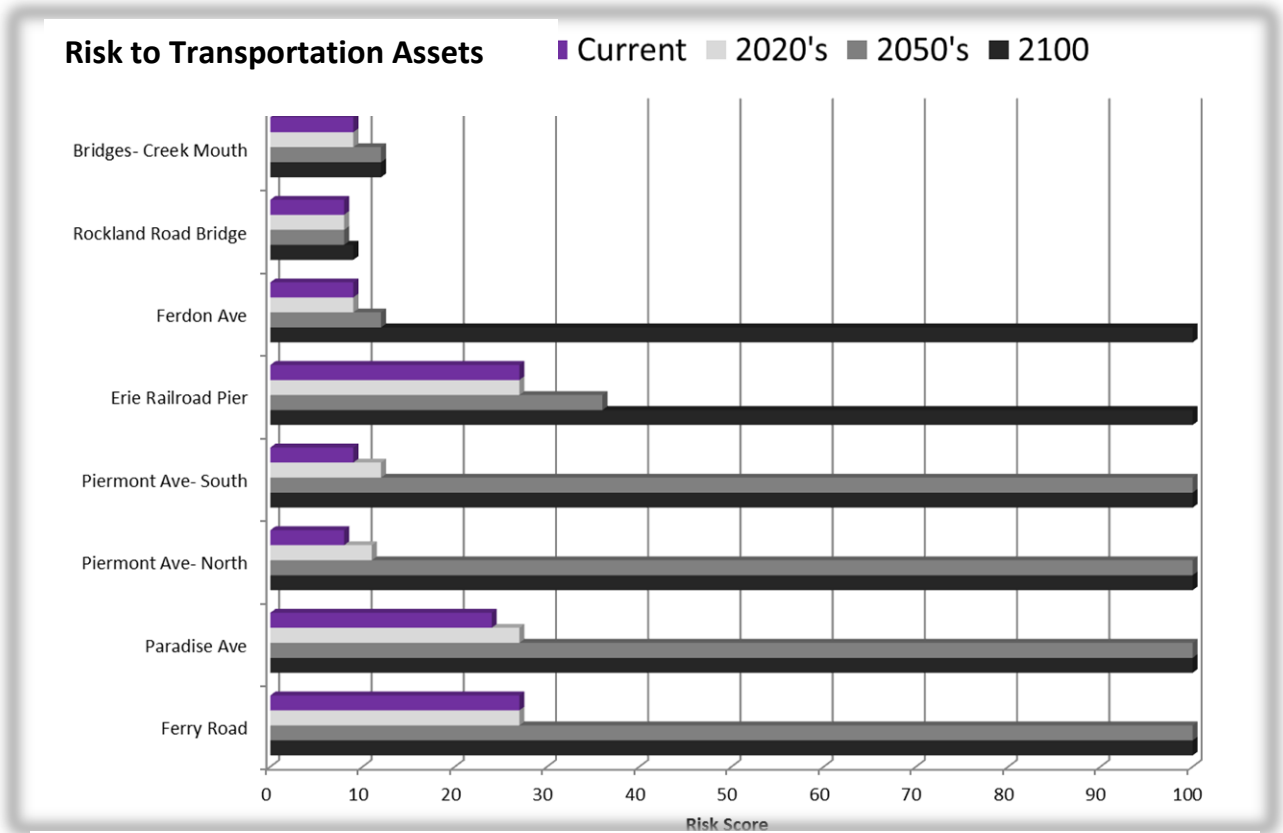
Risk to Critical Facilities



Risk scores of critical facilities in Piermont’s waterfront. A score of 100 is used to represent assets that are predicted to be inundated.

Of the eight transportation/access assets included in the analysis³, Ferry Road, Paradise Avenue, and the Erie Railroad Pier (the narrow, easternmost extension of Ferry Road) are at the highest current risk. The north and south sections of Piermont Avenue, along with Ferdon Avenue and the three bridges over Sparkill Creek, are all currently in a moderate risk category. No changes in risk category are expected for transportation/access assets before the 2020s, but by the 2050s portions of Ferry Road, Paradise Avenue, and north and south Piermont Avenue are expected to be inundated regularly. The Pier road will be at high risk in the 2050s, and along with Ferdon Avenue is expected to be regularly inundated by 2100. If the village determines that extending the longevity of current access routes throughout the municipality is a priority, it may wish to examine specific actions such as seeking alternate driving access to the Pier (e.g. via Piermont Landing/Abbotsford Gate) and elevating the lowest portions of North and South Piermont Avenue (i.e. just north of Pier 701, near the Post Office, across from the Pumping Station, and just north of DPW).

³ This includes roads and bridges, but excludes the DPW Parking Lot, which is a transportation asset but not directly related to access.



Risk scores of transportation assets in Piermont’s waterfront. A score of 100 is used to represent assets that are predicted to be inundated.

Natural

The most significant natural resources of the Piermont waterfront are Piermont Marsh and the shallow areas surrounding the pier and along the shore to the north. These natural assets are by definition already inundated regularly, and their landscape attributes (which contribute to the exposure score) were somewhat difficult to quantify using this tool. However, it is likely that by the 2020s the characteristics of these assets that provide shoreline protection will be impacted, and by the 2050s they could be considerably diminished. The longevity of Piermont Marsh’s protective services may be extended by marsh adaptation and/or migration, through natural or human assisted processes (e.g. assisted accretion).

Preliminary Observations

The risk assessment indicates that most waterfront assets in the Village of Piermont will experience a relatively slow increase in overall risk in the near-term. This trend affords an opportunity to plan for targeted adaptation to more dramatic increases in risk that are anticipated in the mid-term (2020s to 2050s). Strategic investments may effectively prolong several key uses, assets, and the safety of areas central to the character of the village. Simultaneously, the Task Force may want to consider more transformational thinking (e.g., a re-visioning of the village) to facilitate longer term adaptation in the face of ever increasing risk to its waterfront assets.

Risk assessment tool assumptions/limitations

There are two versions of the risk assessment tool: coastal and riverine. The village of Piermont includes both Hudson River shore and frontage on the lower Sparkill Creek, and as such is influenced differently depending on the type of storm event (e.g. Hurricane Floyd, with stormwater and creek flooding vs. Superstorm Sandy, with coastal storm surge). Using the coastal version of the tool may not adequately capture the influence of surface stormwater and creek flooding, and some landscape attributes of this version are not applicable to estuarine coastal environments (e.g. presence of dunes). However, using the riverine version would similarly fall short in capturing risk from tidal storm influences, and would fail to accurately quantify risk to large portions of the village's Hudson River waterfront. The project team ultimately selected the coastal version of the tool as the most suitable for use in Piermont.

The vulnerability score of the tool is a major driver of the final risk score. The project team used community member input on vulnerability scores whenever possible, but in some cases had to estimate vulnerability. In addition, future sea level rise conditions will change vulnerability scores, but the same vulnerability scores were used in all future models due to the difficulty in predicting how future vulnerability will change. Thus the change in *future* risk scores is driven disproportionately by exposure (a function of modeled risk area and landscape attributes).

Landscape attributes were difficult to score for natural assets such as Piermont Marsh and the shallows. Care should be taken in comparing their risk scores with built assets.

Shore defenses, where present, were assumed to be inadequate for anticipated storm or sea level rise conditions in model runs for future time frames. While some assets were considered to have adequate shore defenses under current conditions, it is possible that none in fact do.

An examination of risk changes in smaller time/SLR steps would likely help clarify trends and prioritize adaptation planning for specific assets, but is outside of the current scope of the project.

Support and technical assistance for this project comes from NYS Department of Environmental Conservation Hudson River Estuary Program, the New England Interstate Water Pollution Control Commission, Scenic Hudson, the Consensus Building Institute, and the Lincoln Institute of Land Policy.



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ID	Asset	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Current Risk Area	10" SLR Risk Area	29" SLR Risk Area	72" SLR Risk Area
1	St John's Stream Culvert	Infrastructure Systems	Stormwater	No	No	N/A	N/A	N/A	N/A
2	St John's Catholic Church	Natural & Cultural Resources	Cultural/Religious Establishments	No	Locally Significant	High	High	High	High
3	869-873 Piermont Ave Housing	Housing	Single-Family Residence	No	No	High	High	Extreme	Inundated
4	811-855 Piermont Ave Housing	Housing	Single-Family Residence	No	No	High	High	High	Extreme
5	795-809 Piermont Ave Housing	Housing	Single-Family Residence	No	No	High	High	High	Inundated
6	768-800 Piermont Ave Housing	Housing	Single-Family Residence	No	No	Moderate	Moderate	High	High
7	Onderdonk House	Natural & Cultural Resources	Historic Landmarks and Facilities	No	Locally Significant	N/A	N/A	N/A	Moderate
8	712-748 Piermont Ave Housing	Housing	Single-Family Residence	No	No	High	High	Extreme	Inundated
9	709-747 Piermont Ave Housing	Housing	Single-Family Residence	No	No	High	High	Extreme	Inundated
10	Piermont Ave- North (River Rd)	Infrastructure Systems	Transportation	No	Locally Significant	High	Extreme	Inundated	Inundated
11	Pier 701	Economic	Restaurants	No	No	High	High	High	Inundated
12	Tappan Zee Marina	Economic	Marina/Water Based Business	No	No	High	High	High	Inundated
13	Fort Comfort Inn	Natural & Cultural Resources	Historic Landmarks and Facilities	No	Locally Significant	High	High	Extreme	Inundated
14	674-696 Piermont Ave Housing	Housing	Single-Family Residence	No	No	High	High	High	Extreme
15	Marinas	Economic	Marina/Water Based Business	No	No	Extreme	Extreme	Inundated	Inundated
16	616-660 Piermont Ave Housing	Housing	Single-Family Residence	No	No	High	High	High	Inundated
17	549-625 Piermont Ave Mixed use			No	No	High	High	Extreme	Inundated
18	Marina	Economic	Marina/Water Based Business	No	No	Extreme	Extreme	Inundated	Inundated
19	Empire Hose company	Health & Social Services	Emergency Operations/Response	No	Yes, FEMA	High	High	High	Extreme
20	Mixed Use			No	No	High	High	High	Extreme
21	Garden/Park	Natural & Cultural Resources		No	No	Extreme	Extreme	Inundated	Inundated
22	Siren Tower (Parelli Park)	Infrastructure Systems	Telecommunications	No	Yes, FEMA	High	High	High	Inundated
23	Boat racks	Natural & Cultural Resources	Parks and Recreation	No	No	High	High	High	Inundated
24	Small Businesses	Economic	Small Business	No	No	High	High	Extreme	Inundated
25	Piermont Public Library	Natural & Cultural Resources	Libraries	No	No	High	High	High	Inundated
26	Small Businesses	Economic		No	No	High	High	High	Inundated
27	Small Businesses	Economic		No	No	High	High	High	Inundated
28	Village Hall	Health & Social Services	Government & Administrative Services	No	Yes, FEMA	High	High	High	Extreme
29	Small Businesses	Economic	Small Business	No	No	Moderate	Moderate	High	High
30	Small Businesses	Economic	Small Business	No	No	High	High	High	Inundated
31	Flywheel Park	Natural & Cultural Resources	Parks and Recreation	No	No	High	High	High	Extreme
32	Flywheel Park business district			No	No	High	High	High	Extreme
33	Piermont Landing Health Club	Housing	Multi-Family Residence	No	No	Moderate	High	High	High
34	Harbor Cove/Paradise Harbor	Housing	Multi-Family Residence	Yes	No	Moderate	Moderate	High	High
35	Walkway	Natural & Cultural Resources	Parks and Recreation	No	No	High	High	High	Inundated
36	Piermont Landing	Housing	Multi-Family Residence	Yes	No	High	High	High	Inundated
37	Piermont Landing/Abbottsford Gate	Housing	Multi-Family Residence	Yes	No	Moderate	Moderate	High	High
38	Piermont Landing	Housing	Multi-Family Residence	Yes	No	High	High	High	Extreme
39	9/11 Memorial	Natural & Cultural Resources	Historic Landmarks and Facilities	No	Locally Significant	Extreme	Extreme	Inundated	Inundated
40	Erie Railroad Pier	Infrastructure Systems	Transportation	No	No	High	High	Extreme	Inundated
41	Pier's East End			No	No	Extreme	Extreme	Inundated	Inundated
42	Mop Top Park	Natural & Cultural Resources	Parks and Recreation	No	No	High	High	Extreme	Inundated
43	Bogartown	Housing	Single-Family Residence	No	No	Extreme	Extreme	Inundated	Inundated
44	The Patch- East			No	No	Extreme	Extreme	Inundated	Inundated
45	Paradise Ave	Infrastructure Systems	Transportation	No	Locally Significant	Extreme	Extreme	Inundated	Inundated

ID	Asset	Asset Class	Asset Sub-category	Socially Vulnerable Populations	Critical Facility	Current Risk Area	10" SLR Risk Area	29" SLR Risk Area	72" SLR Risk Area
46	Small Businesses	Economic	Small Business	No	No	High	High	Extreme	Inundated
47	The Patch- Center			No	No	High	High	Extreme	Inundated
48	The Patch- South			No	Locally Significant	High	High	High	Inundated
49	Memorial park	Natural & Cultural Resources	Cultural/Religious Establishments	No	No	High	High	High	Inundated
50	Creek Mouth Mixed Use			No	No	Extreme	Extreme	Inundated	Inundated
51	Kane Park	Natural & Cultural Resources	Parks and Recreation	No	No	Extreme	Extreme	Inundated	Inundated
52	Post Office area			No	Locally Significant	Extreme	Extreme	Inundated	Inundated
53	Bridges- Creek Mouth	Infrastructure Systems	Transportation	Yes	No	High	High	Extreme	Extreme
54	Ferdon Ave	Infrastructure Systems	Transportation	No	Locally Significant	High	High	Extreme	Inundated
55	Pumping Station	Infrastructure Systems	Water Supply	No	Yes, FEMA	High	High	Extreme	Inundated
56	347-379 Piermont Ave Housing	Housing	Single-Family Residence	No	No	Extreme	Extreme	Inundated	Inundated
57	302-400 Piermont Ave Housing	Housing	Single-Family Residence	No	No	High	High	Extreme	Inundated
58	Piermont Ave- South	Infrastructure Systems	Transportation	No	Locally Significant	High	Extreme	Inundated	Inundated
59	302-310 Ferdon Ave Housing	Housing	Single-Family Residence	No	No	High	High	High	Extreme
60	Public Works Department	Health & Social Services	Government & Administrative Services	No	Yes, FEMA	High	High	High	Inundated
61	300 Ferdon Ave Housing	Housing	Multi-Family Residence	No	No	High	Extreme	Inundated	Inundated
62	Rockland Road Bridge	Infrastructure Systems	Transportation	No	No	Moderate	Moderate	Moderate	High
63	Piermont Marsh	Natural & Cultural Resources	Wetlands and marshes	No	No	Extreme	Extreme	Inundated	Inundated
64	The Shallows	Natural & Cultural Resources	Wetlands and marshes	No	No	Extreme	Extreme	Inundated	Inundated
65	Ferry Road	Infrastructure Systems	Transportation	No	Locally Significant	Extreme	Extreme	Inundated	Inundated
66	PFD Boat House & Launch	Health & Social Services	Emergency Operations/Response	No	Yes, FEMA	Extreme	Inundated	Inundated	Inundated
67	Lamont-Doherty Weather Station	Health & Social Services		No	No	High	High	Extreme	Inundated
68	DPW Parking Lot	Infrastructure Systems	Transportation	No	Yes, FEMA	Extreme	Extreme	Inundated	Inundated
69	Janis Enzenbacher, MD PLLC	Health & Social Services	Healthcare Facilities	Yes	Yes, FEMA	High	High	High	High
70	Upstairs Residential	Housing	Single-Family Residence	No	No	High	High	High	Inundated
71	Reformed Church of Piermont	Natural & Cultural Resources	Cultural/Religious Establishments	No	Locally Significant	N/A	N/A	Moderate	High
72	Canzona's Deli	Economic	Restaurants	No	No	N/A	N/A	N/A	Moderate
73	GPS Real Estate	Economic	Small Business	No	No	N/A	N/A	N/A	High
74	The Outside In	Economic	Small Business	No	No	N/A	N/A	N/A	N/A

ID	Asset	Current Landscape Attribute Score	10" SLR Landscape Attribute Score	29" SLR Landscape Attribute Score	72" SLR Landscape Attribute Score	Hazard Score	Current Exposure Score	10" SLR Exposure Score	29" SLR Exposure Score	72" SLR Exposure Score	Vulnerability Score	Current Risk Score	10 " SLR Risk Score	29" SLR Risk Score	72" SLR Risk Score
1	St John's Stream Culvert	1.5	1.5	1.5	1.5	3	N/A	N/A	N/A	N/A	1	0	0	0	0
2	St John's Catholic Church	1.5	2	2	2	3	2.50	3.00	3.00	3.00	1	8	9	9	9
3	869-873 Piermont Ave Housing	1.5	2	2	2	3	2.50	3.00	4.00	Inundated	3	23	27	36	Inundated
4	811-855 Piermont Ave Housing	1.5	2	2	2	3	2.50	3.00	3.00	4.00	3	23	27	27	36
5	795-809 Piermont Ave Housing	1.5	2	2	2	3	2.50	3.00	3.00	Inundated	3	23	27	27	Inundated
6	768-800 Piermont Ave Housing	1	1.5	1.5	2	3	1.50	2.00	2.50	3.00	1	5	6	8	9
7	Onderdonk House	1	1.5	1.5	1.5	3	N/A	N/A	N/A	2.00	1	0	0	0	6
8	712-748 Piermont Ave Housing	1	1.5	2	2	3	2.00	2.50	4.00	Inundated	3	18	23	36	Inundated
9	709-747 Piermont Ave Housing	1.5	2	2	2	3	2.50	3.00	4.00	Inundated	3	23	27	36	Inundated
10	Piermont Ave- North (River Rd)	1.5	1.5	2	2	3	2.50	3.50	Inundated	Inundated	1	8	11	Inundated	Inundated
11	Pier 701	2	2	2	2	3	3.00	3.00	3.00	Inundated	4	36	36	36	Inundated
12	Tappan Zee Marina	2.5	2.5	2.5	2.5	3	3.50	3.50	3.50	Inundated	4	42	42	42	Inundated
13	Fort Comfort Inn	1.5	1.5	2	2	3	2.50	2.50	4.00	Inundated	1	8	8	12	Inundated
14	674-696 Piermont Ave Housing	1.5	1.5	1.5	2	3	2.50	2.50	2.50	4.00	1	8	8	8	12
15	Marinas	2	2	2	2	3	4.00	4.00	Inundated	Inundated	4	48	48	Inundated	Inundated
16	616-660 Piermont Ave Housing	1.5	1.5	1.5	2	3	2.50	2.50	2.50	Inundated	3	23	23	23	Inundated
17	549-625 Piermont Ave Mixed use	2	2	2	2	3	3.00	3.00	4.00	Inundated	3	27	27	36	Inundated
18	Marina	2	2	2	2	3	4.00	4.00	Inundated	Inundated	4	48	48	Inundated	Inundated
19	Empire Hose company	0.5	1	1.5	2	3	1.50	2.00	2.50	4.00	1	5	6	8	12
20	Mixed Use	0.5	1	1.5	1.5	3	1.50	2.00	2.50	3.50	1	5	6	8	11
21	Garden/Park	1.5	2	2	2	3	3.50	4.00	Inundated	Inundated	4	42	48	Inundated	Inundated
22	Siren Tower (Parelli Park)	2	2	2	2	3	3.00	3.00	3.00	Inundated	4	36	36	36	Inundated
23	Boat racks	1.5	2	2	2	3	2.50	3.00	3.00	Inundated	1	8	9	9	Inundated
24	Small Businesses	1	1.5	2	2	3	2.00	2.50	4.00	Inundated	3	18	23	36	Inundated
25	Piermont Public Library	1	1.5	2	2	3	2.00	2.50	3.00	Inundated	2	12	15	18	Inundated
26	Small Businesses	0.5	1	1.5	2	3	1.50	2.00	2.50	Inundated	3	14	18	23	Inundated
27	Small Businesses	0.5	1	1.5	2	3	1.50	2.00	2.50	Inundated	3	14	18	23	Inundated
28	Village Hall	0.5	1	1.5	2	3	1.50	2.00	2.50	4.00	1	5	6	8	12
29	Small Businesses	0.5	1	1.5	1.5	3	1.00	1.50	2.50	2.50	1	3	5	8	8
30	Small Businesses	0.5	1	1.5	2	3	1.50	2.00	2.50	Inundated	4	18	24	30	Inundated
31	Flywheel Park	1.5	2	2	2	3	2.50	3.00	3.00	4.00	1	8	9	9	12
32	Flywheel Park business district	1.5	2	2	2	3	2.50	3.00	3.00	4.00	1	8	9	9	12
33	Piermont Landing Health Club	0.5	1	1.5	2	3	1.00	2.00	2.50	3.00	1	3	6	8	9
34	Harbor Cove/Paradise Harbor	1.5	2	2	2	3	2.00	2.50	3.00	3.00	1	6	8	9	9
35	Walkway	1.5	2	2	2	3	2.50	3.00	3.00	Inundated	4	30	36	36	Inundated
36	Piermont Landing	2	2.5	2.5	2.5	3	3.00	3.50	3.50	Inundated	1	9	11	11	Inundated
37	Piermont Landing/Abbottsford Gate	2	2.5	2.5	2.5	3	2.50	3.00	3.50	3.50	1	8	9	11	11
38	Piermont Landing	2	2.5	2.5	2.5	3	3.00	3.50	3.50	4.50	1	9	11	11	14
39	9/11 Memorial	2.5	2.5	2.5	2.5	3	4.50	4.50	Inundated	Inundated	1	14	14	Inundated	Inundated
40	Erie Railroad Pier	2	2	2	2	3	3.00	3.00	4.00	Inundated	3	27	27	36	Inundated
41	Pier's East End	2	2	2	2	3	4.00	4.00	Inundated	Inundated	4	48	48	Inundated	Inundated
42	Mop Top Park	1.5	2	2	2	3	2.50	3.00	4.00	Inundated	4	30	36	48	Inundated
43	Bogartown	1.5	2	2	2	3	3.50	4.00	Inundated	Inundated	4	42	48	Inundated	Inundated
44	The Patch- East	1.5	2	2	2	3	3.50	4.00	Inundated	Inundated	3	32	36	Inundated	Inundated
45	Paradise Ave	2	2.5	2.5	2.5	3	4.00	4.50	Inundated	Inundated	2	24	27	Inundated	Inundated

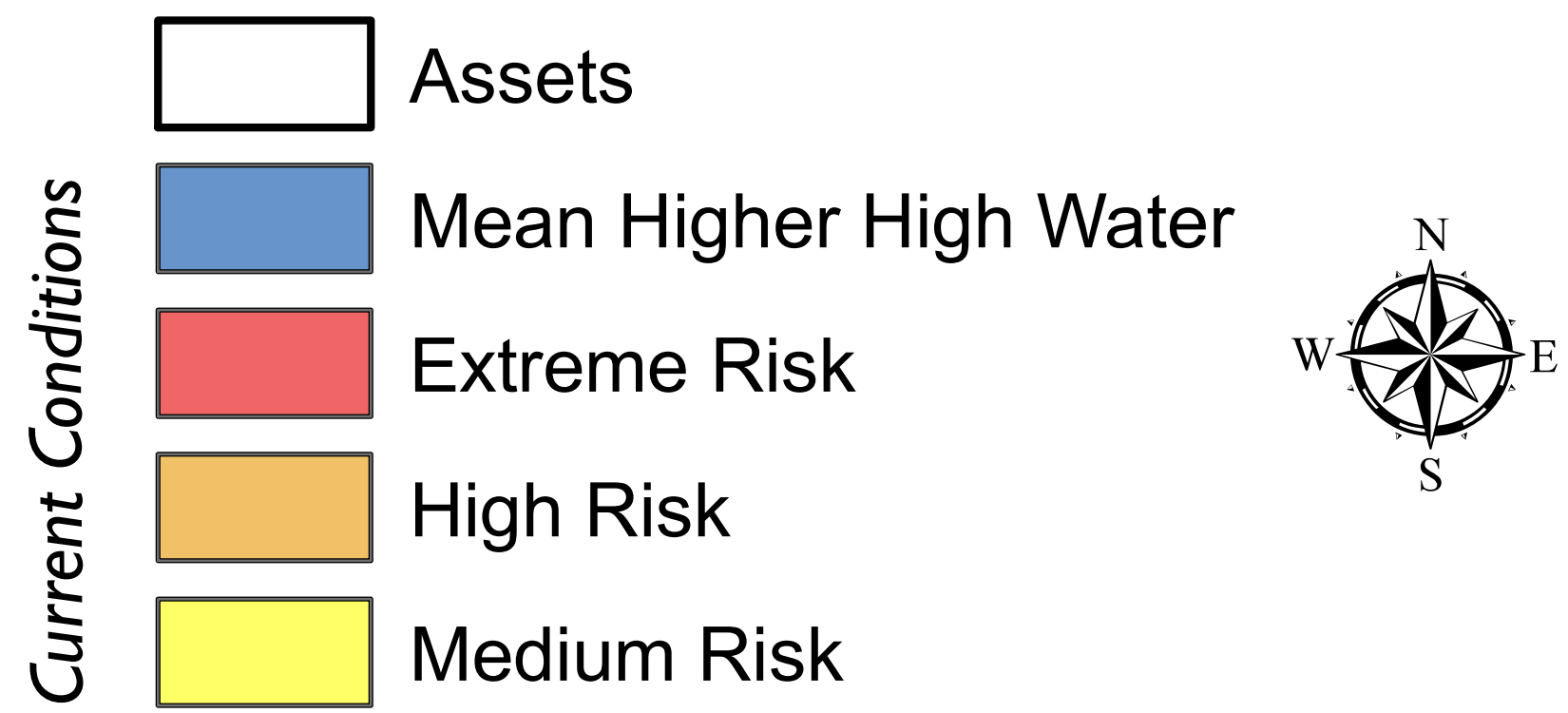
ID	Asset	Current Landscape Attribute Score	10" SLR Landscape Attribute Score	29" SLR Landscape Attribute Score	72" SLR Landscape Attribute Score	Hazard Score	Current Exposure Score	10" SLR Exposure Score	29" SLR Exposure Score	72" SLR Exposure Score	Vulnerability Score	Current Risk Score	10 " SLR Risk Score	29" SLR Risk Score	72" SLR Risk Score
46	Small Businesses	0.5	1	2	2	3	1.50	2.00	4.00	Inundated	5	23	30	60	Inundated
47	The Patch- Center	1	1.5	2	2	3	2.00	2.50	4.00	Inundated	3	18	23	36	Inundated
48	The Patch- South	1	1.5	1.5	2	3	2.00	2.50	2.50	Inundated	3	18	23	23	Inundated
49	Memorial park	1	1.5	1.5	2	3	2.00	2.50	2.50	Inundated	1	6	8	8	Inundated
50	Creek Mouth Mixed Use	1.5	2	2	2	3	3.50	4.00	Inundated	Inundated	4	42	48	Inundated	Inundated
51	Kane Park	1	2	2	2	3	3.00	4.00	Inundated	Inundated	1	9	12	Inundated	Inundated
52	Post Office area	1.5	2	2	2	3	3.50	4.00	Inundated	Inundated	4	42	48	Inundated	Inundated
53	Bridges- Creek Mouth	2	2	2	2	3	3.00	3.00	4.00	4.00	1	9	9	12	12
54	Ferdon Ave	2	2	2	2	3	3.00	3.00	4.00	4.00	1	9	9	12	Inundated
55	Pumping Station	1.5	2	2	2	3	2.50	3.00	4.00	Inundated	4	30	36	48	Inundated
56	347-379 Piermont Ave Housing	1.5	2	2	2	3	3.50	4.00	Inundated	Inundated	3	32	36	Inundated	Inundated
57	302-400 Piermont Ave Housing	1	1.5	2	2	3	2.00	2.50	4.00	Inundated	2	12	15	24	Inundated
58	Piermont Ave- South	2	2	2	2	3	3.00	4.00	Inundated	Inundated	1	9	12	Inundated	Inundated
59	302-310 Ferdon Ave Housing	2	2	2	2	3	3.00	3.00	3.00	4.00	1	9	9	9	12
60	Public Works Department	1	1.5	1.5	2	3	2.00	2.50	2.50	Inundated	1	6	8	8	Inundated
61	300 Ferdon Ave Housing	1.5	2	2	2	3	2.50	4.00	Inundated	Inundated	1	8	12	Inundated	Inundated
62	Rockland Road Bridge	2	2	2	2	3	2.50	2.50	2.50	3.00	1	8	8	8	9
63	Piermont Marsh	1.5	2	2	2	3	3.50	4.00	Inundated	Inundated	1	11	12	Inundated	Inundated
64	The Shallows	2	2	2	2	3	4.00	4.00	Inundated	Inundated	1	12	12	Inundated	Inundated
65	Ferry Road	2.5	2.5	2.5	2.5	3	4.50	4.50	Inundated	Inundated	2	27	27	Inundated	Inundated
66	PFD Boat House & Launch	2	2	2	2	3	4.00	Inundated	Inundated	Inundated	1	12	Inundated	Inundated	Inundated
67	Lamont-Doherty Weather Station	2	2	2	2	3	3.00	3.00	4.00	Inundated	4	36	36	48	Inundated
68	DPW Parking Lot	1	2	2	2	3	3.00	4.00	Inundated	Inundated	3	27	36	Inundated	Inundated
69	Janis Enzenbacher, MD PLLC	1.5	2	2	2	3	2.50	3.00	3.00	3.00	1	8	9	9	9
70	Upstairs Residential	0.5	1	1.5	2	3	1.50	2.00	2.50	Inundated	1	5	6	8	Inundated
71	Reformed Church of Piermont	1.5	1.5	1.5	2	3	N/A	N/A	2.00	3.00	1	0	0	6	9
72	Canzona's Deli	1.5	1.5	1.5	1.5	3	N/A	N/A	N/A	2.00	1	0	0	0	6
73	GPS Real Estate	2	2	2	2	3	N/A	N/A	N/A	3.00	1	0	0	0	9
74	The Outside In	1.5	1.5	1.5	1.5	3	N/A	N/A	N/A	N/A	1	0	0	0	0

ID	Asset	Notes
1	St John's Stream Culvert	
2	St John's Catholic Church	
3	869-873 Piermont Ave Housing	Vulnerability estimated
4	811-855 Piermont Ave Housing	Vulnerability estimated
5	795-809 Piermont Ave Housing	Vulnerability estimated
6	768-800 Piermont Ave Housing	Vulnerability estimated; some may be in Moderate risk area
7	Onderdonk House	
8	712-748 Piermont Ave Housing	Vulnerability estimated
9	709-747 Piermont Ave Housing	Vulnerability estimated
10	Piermont Ave- North (River Rd)	Vulnerability estimated
11	Pier 701	
12	Tappan Zee Marina	
13	Fort Comfort Inn	
14	674-696 Piermont Ave Housing	Vulnerability estimated
15	Marinas	Includes Cornetta's and T&R Marinas (vulnerability scores generalized)
16	616-660 Piermont Ave Housing	Vulnerability estimated
17	549-625 Piermont Ave Mixed use	Includes 595-625 Piermont Ave homes (vulnerability estimated), O lar and Cafe Portofino restaurants, 549-585 Piermont Ave homes (vulnerability estimated)
18	Marina	Vulnerability estimated
19	Empire Hose company	
20	Mixed Use	Includes Athlete Recovery Center (healthcare facility), Kennedy & Kennedy, Piermont Straus, Empire Hose Company (FEMA emergency operations/response), Veterans Memorial Association, 42-50 Kinney St (housing)
21	Garden/Park	Includes Frank Parelli Park and Community Garden (Agricultural)
22	Siren Tower (Parelli Park)	
23	Boat racks	
24	Small Businesses	Includes Buttercup & Friends, Pamaya Red, M&T Bank
25	Piermont Public Library	
26	Small Businesses	
27	Small Businesses	
28	Village Hall	
29	Small Businesses	Includes Turning Point Cafe (#468 downstairs), Tequila Sal y Limon (#468 upstairs), The Yoga House, Bunbury's Coffee Shop, Ned Kelly and Co, Tappan Zee Thrift Store, Dranoff Glass Law Office
30	Small Businesses	
31	Flywheel Park	
32	Flywheel Park business district	Includes 2 parking areas (with some High risk areas in them), Enzenbacher, MD- FEMA
33	Piermont Landing Health Club	
34	Harbor Cove/Paradise Harbor	Includes 51-318 Harbor Cove
35	Walkway	
36	Piermont Landing	
37	Piermont Landing/Abbottsford Gate	
38	Piermont Landing	Eastern building
39	9/11 Memorial	
40	Erie Railroad Pier	Includes Ferry Road powerlines (FEMA- power supply, vulnerability=1)
41	Pier's East End	Includes PFD Boat House & Boat Launch (FEMA), Lamont-Doherty Weather/Tide Station, Dock, Dock flag pole/monuments (both Locally Significant); vulnerabilities range 1-4; some assets in High risk area
42	Mop Top Park	Includes Goswick Pavillion, the Dog Run (dog park), and Rittenburg Field
43	Bogartown	Vulnerability estimated; Multiple single residences and Paradise Ave
44	The Patch- East	Includes Parking Lot D, Michigan St and eastern Ohio St, and single-family residences
45	Paradise Ave	Vulnerability estimated

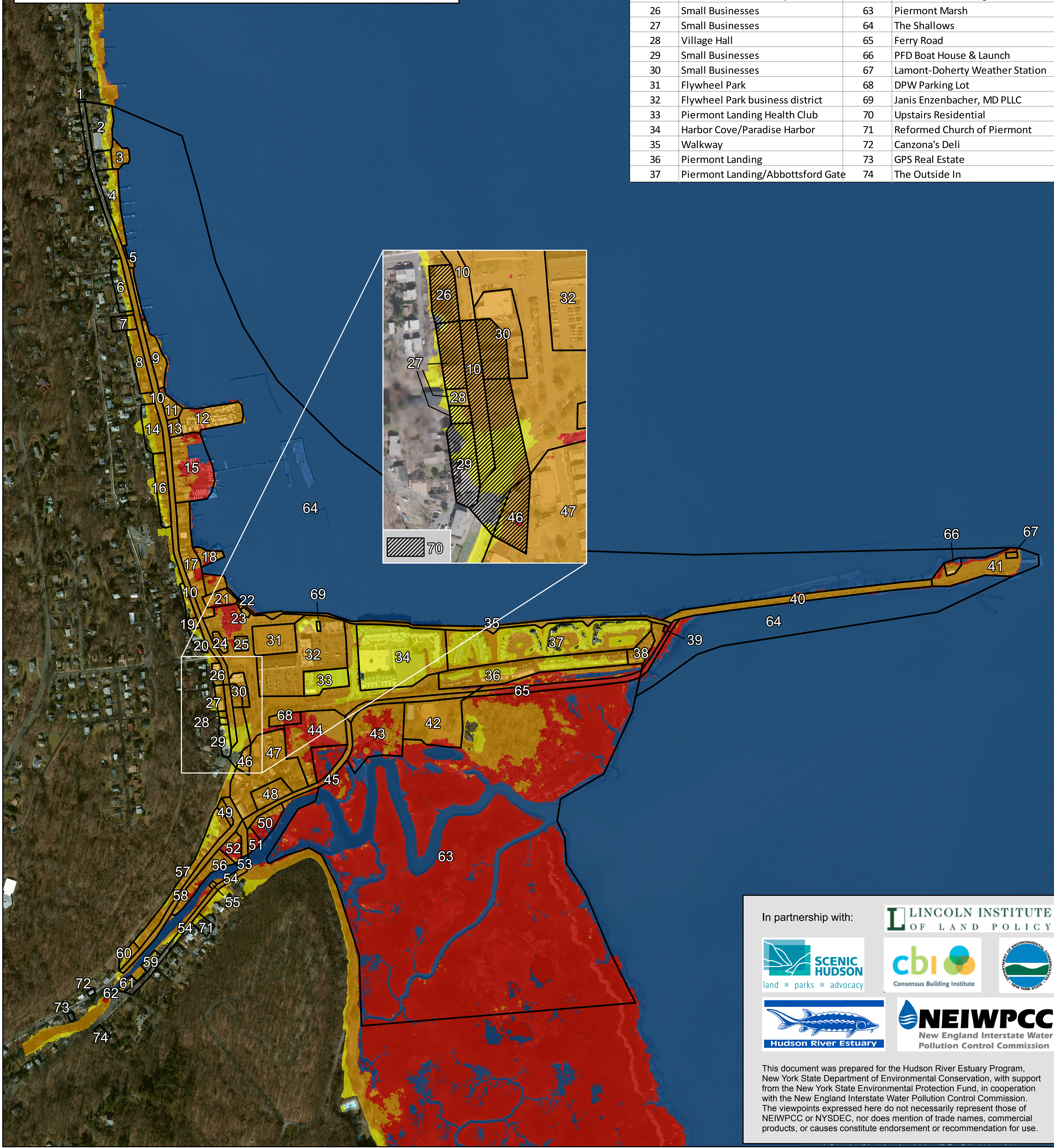
ID	Asset	Notes
46	Small Businesses	Includes Harbour House (vulnerability=5), Piermont Pizza, Elements Spa; vulnerability ranges 3-5
47	The Patch- Center	Vulnerability estimated; Includes Ladik St and Liberty St (lower vulnerability), Macedonia Baptist Church (locally significant), and single-family residences
48	The Patch- South	Includes Sneden House (Locally Significant: Historic, cultural), single-family houses
49	Memorial park	Vulnerability estimated
50	Creek Mouth Mixed Use	Includes Paradise Boats, single-family houses
51	Kane Park	
52	Post Office area	Includes post office (Locally Significant), Bridge Street, multi-family houses
53	Bridges- Creek Mouth	Includes Ferdon Ave Bridge, Sparkill Creek drawbridge (Historic)
54	Ferdon Ave	Vulnerability estimated
55	Pumping Station	
56	347-379 Piermont Ave Housing	Vulnerability estimated; some houses in High risk area
57	302-400 Piermont Ave Housing	Vulnerability estimated; some in Moderate risk area
58	Piermont Ave- South	
59	302-310 Ferdon Ave Housing	Vulnerability estimated
60	Public Works Department	
61	300 Ferdon Ave Housing	Vulnerability estimated
62	Rockland Road Bridge	
63	Piermont Marsh	Includes DEC pocket park
64	The Shallows	
65	Ferry Road	Vulnerability estimated
66	PFD Boat House & Launch	Boat House- currenty risk area is High
67	Lamont-Doherty Weather Station	Originally erroneously labeled as the PFD boat house
68	DPW Parking Lot	
69	Janis Enzenbacher, MD PLLC	
70	Upstairs Residential	Vulnerability is due to power outage only; Risk areas of buildings vary from N/A to Extreme
71	Reformed Church of Piermont	
72	Canzona's Deli	
73	GPS Real Estate	
74	The Outside In	

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12	Tappan Zee Marina	49	Memorial park
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14	674-696 Piermont Ave Housing	51	Kane Park
15	Marinas	52	Post Office area
16	616-660 Piermont Ave Housing	53	Bridges- Creek Mouth
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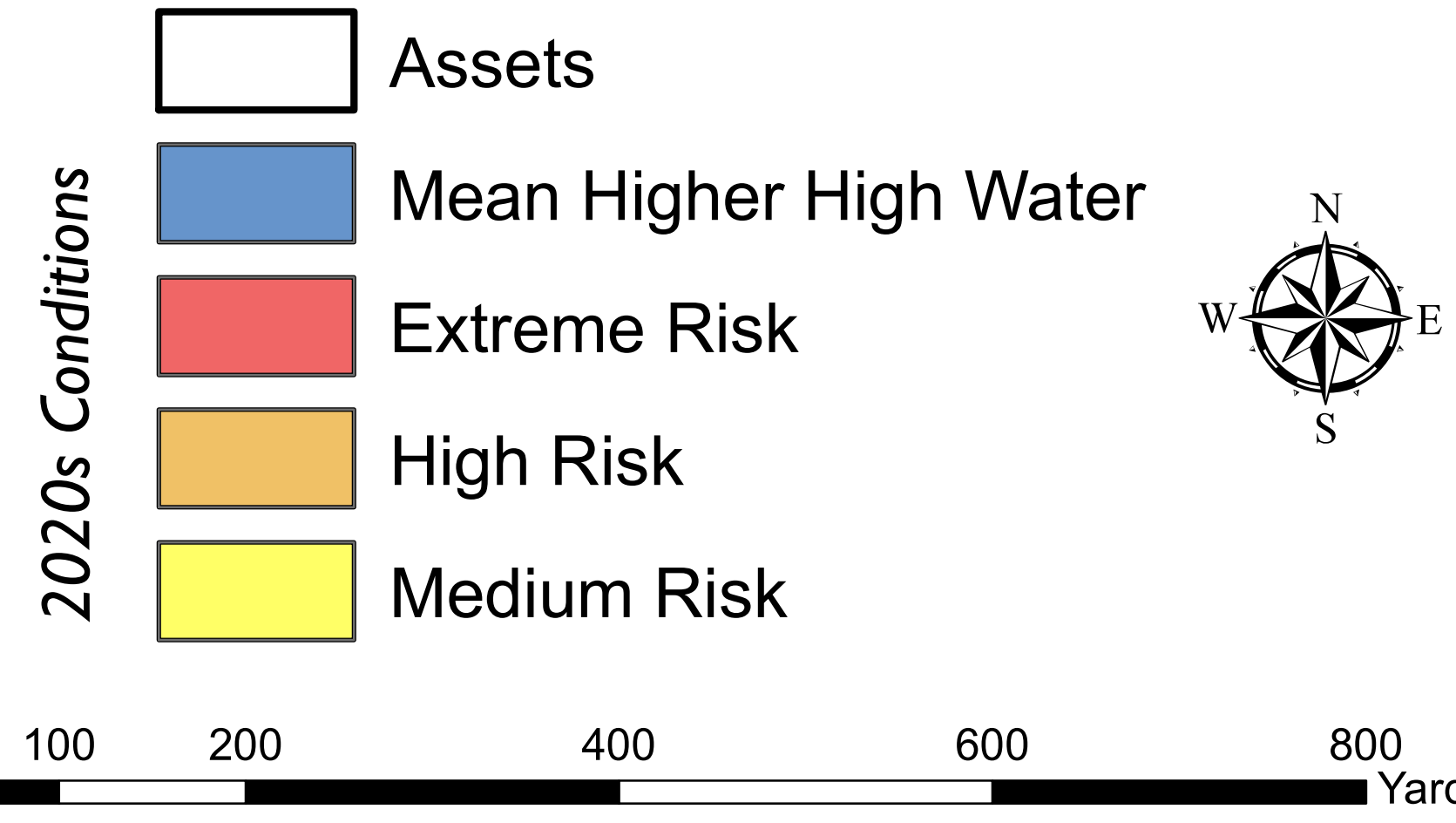


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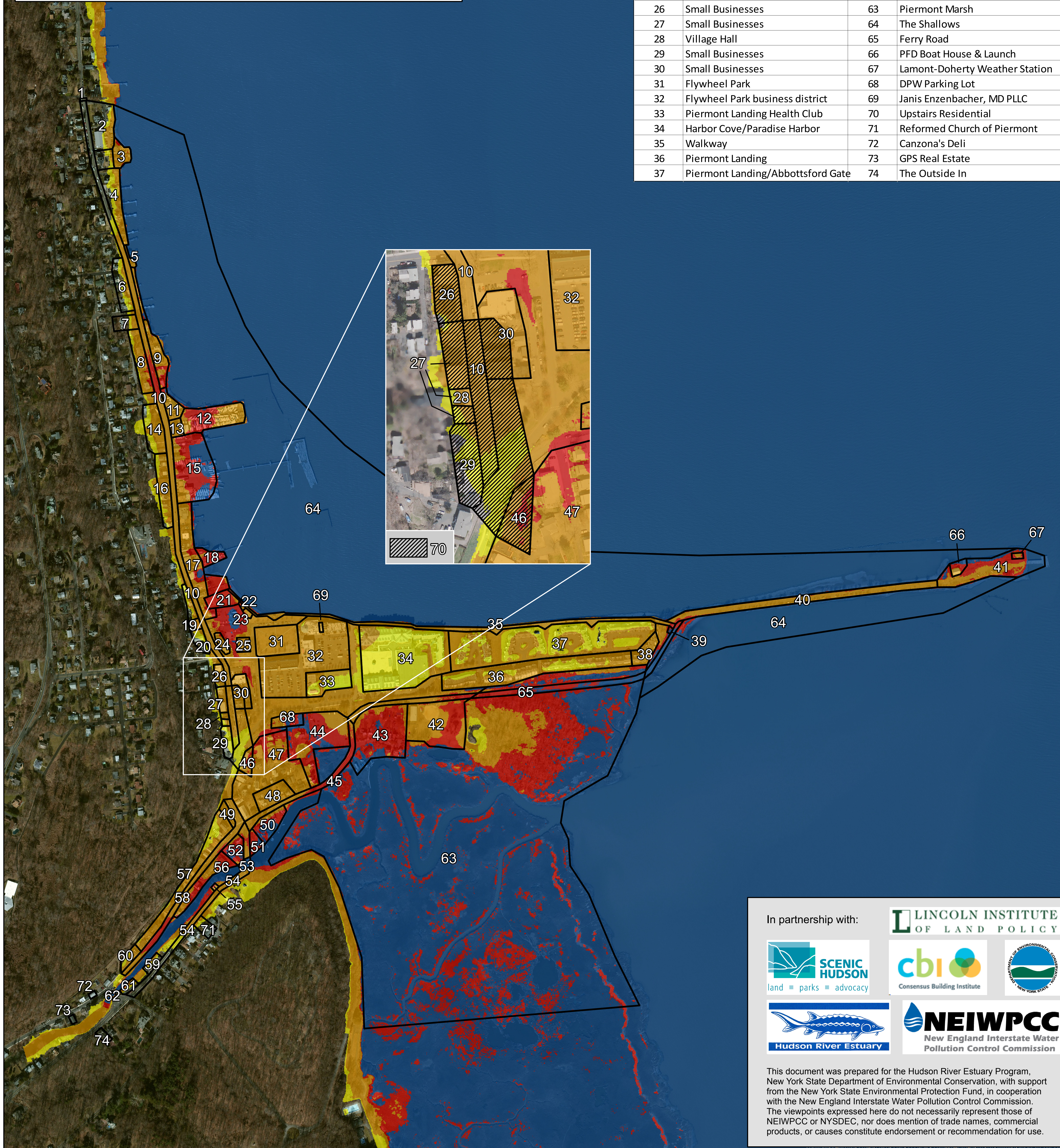
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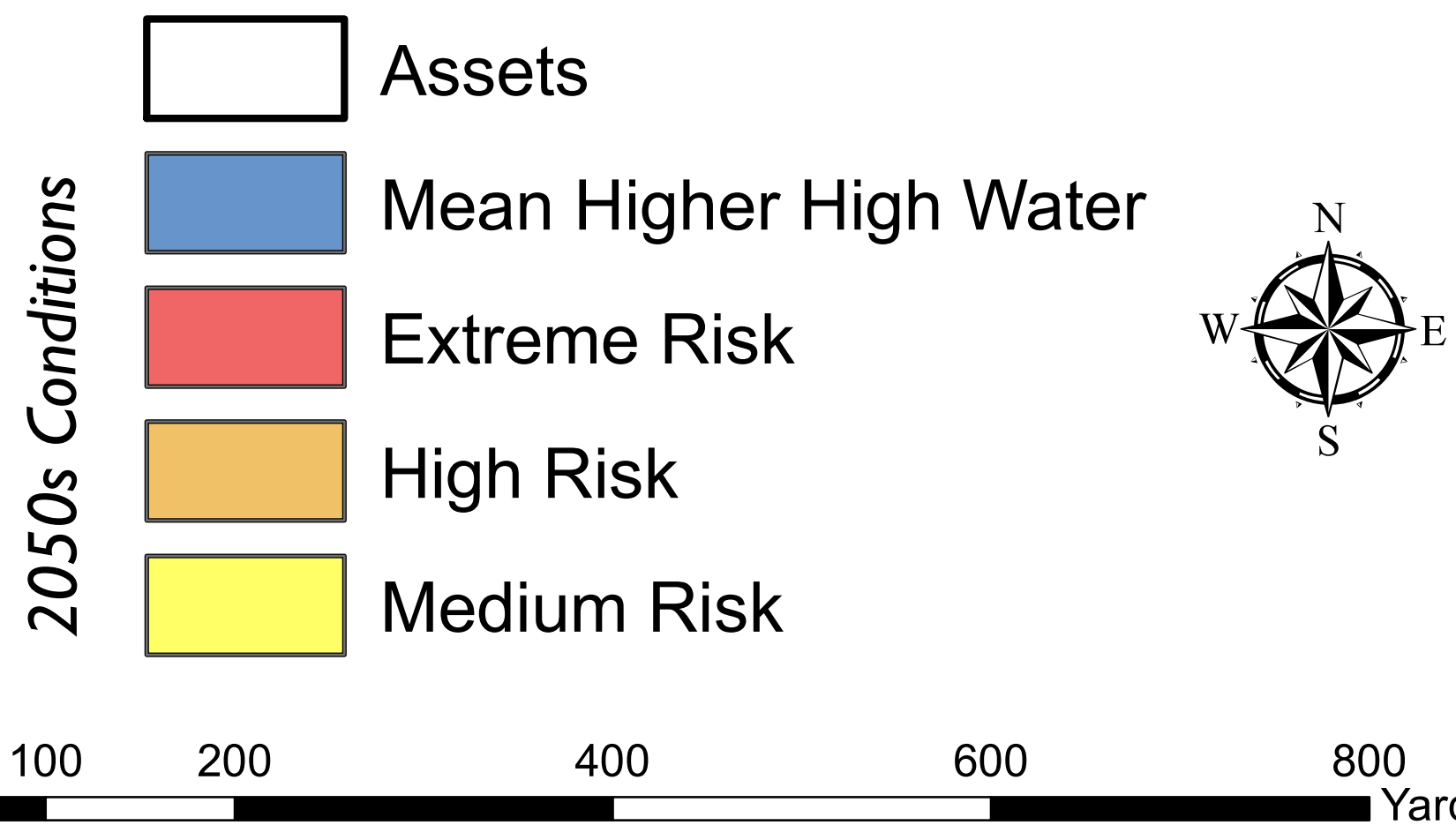


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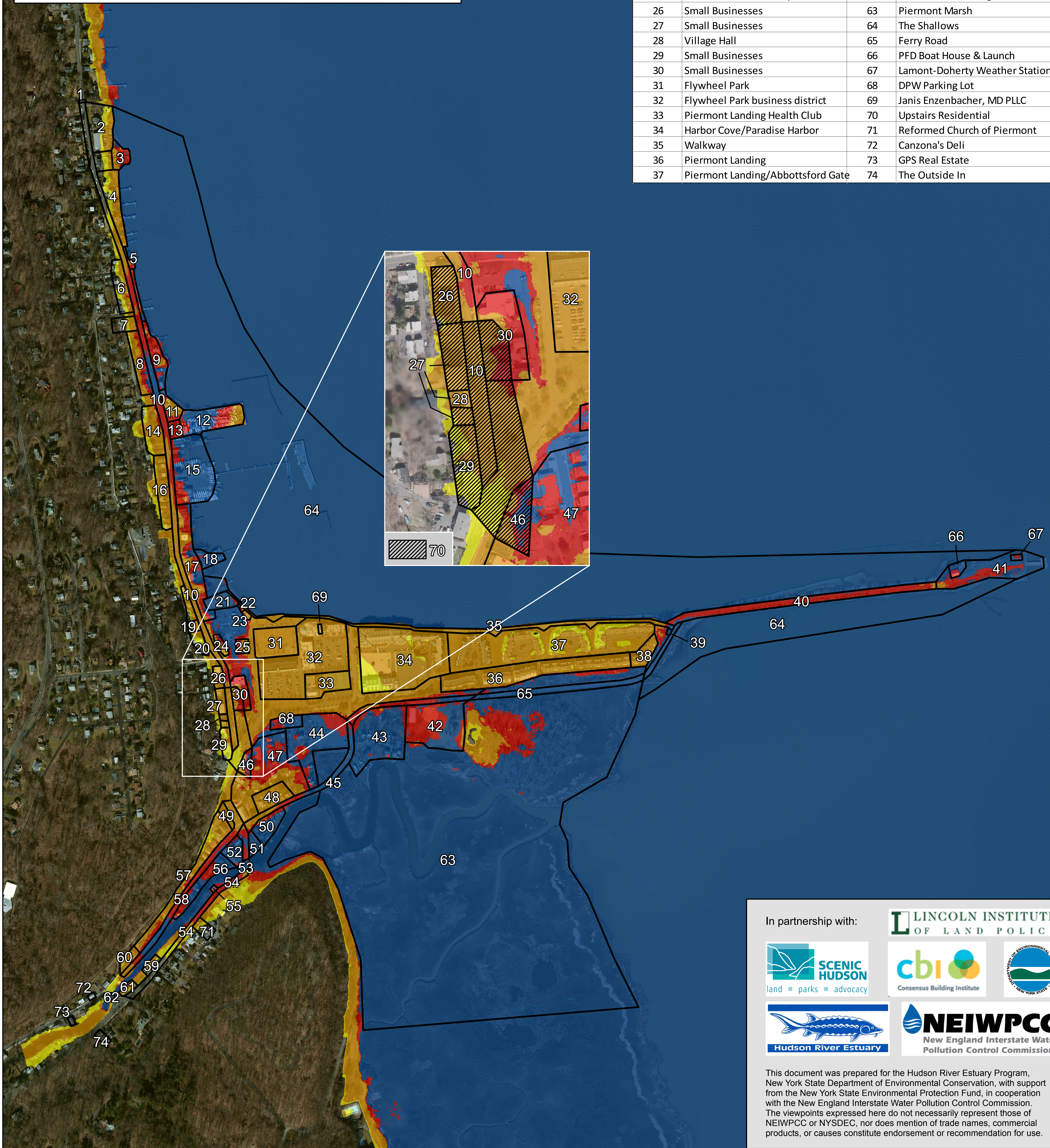
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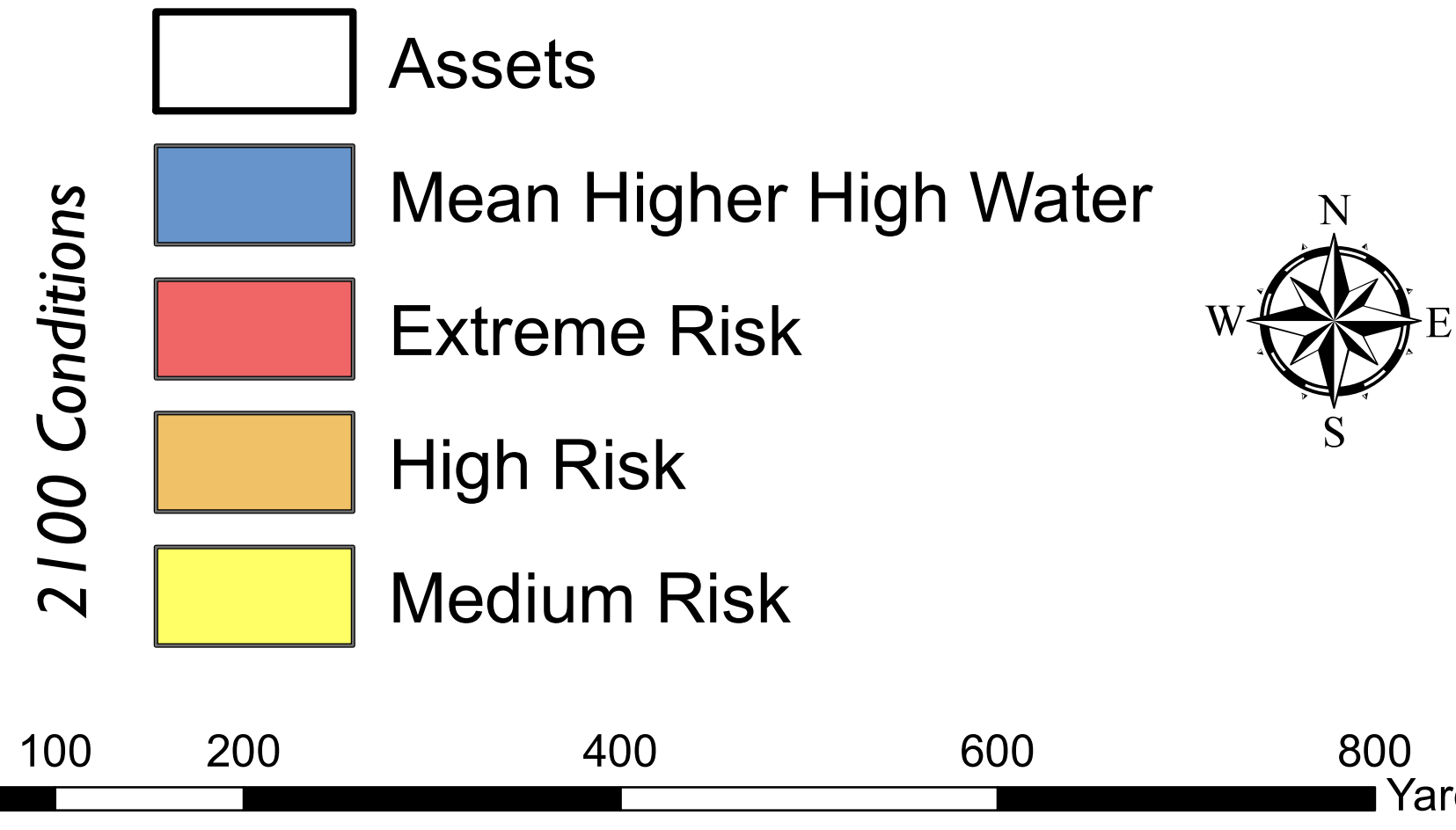
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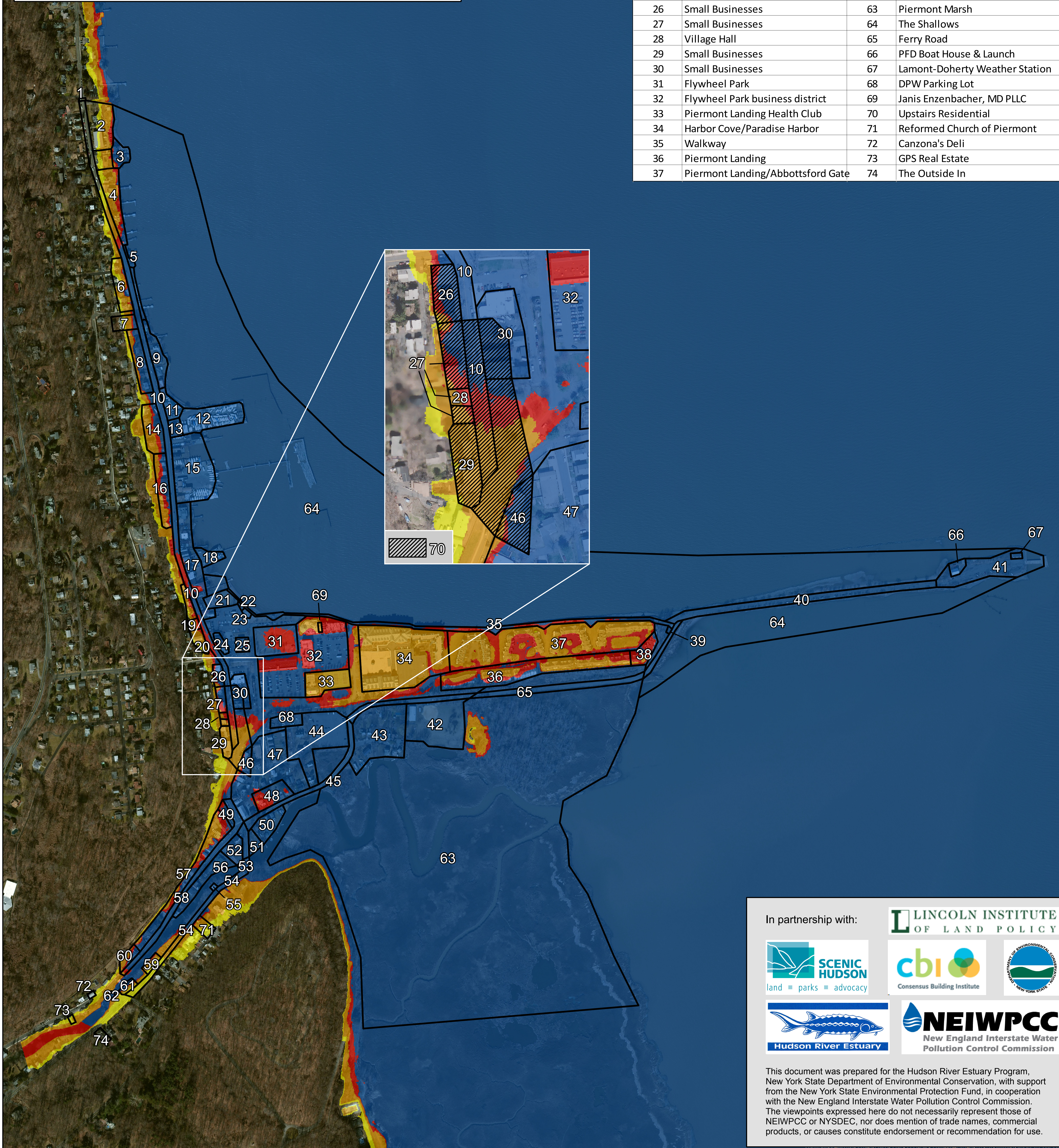
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