A Salt Marsh Advancement Zone Assessment of Stamford, Connecticut

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Front cover image: Open space and unprotected parcels critical to the conservation of marsh advancement corridors in Stamford; from the accompanying Comprehensive Map Book of Stamford, Connecticut.

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ACKNOWLEDGEMENTS:

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Introduction

In 2006, The Nature Conservancy established the Coastal Resilience Program (www.coastalresilience.org) that provides tools and a solution framework to reduce the ecological and socio-economic risk of hazards and comprehensively improve community resilience. The Program focuses on helping decision-makers explore locally relevant, downscaled, flooding scenarios from sea-level rise and/or storm surge, analyze the potential ecological, social and economic impacts of each scenario at a local, regional, and state scale, and facilitate solutions to address these issues. Since 2006, The Nature Conservancy has assisted many coastal and inland communities in Connecticut by providing this critical information and a comprehensive, community-based process that improves overall resilience and sustainability.

There is a universal recognition by coastal and inland communities in Connecticut and elsewhere that natural infrastructure – wetlands and forests - is a cost effective, long-term part of the solution to help protect people, infrastructure and natural systems from extreme weather and climatic change. Fortunately, our state has a remarkable diversity and abundance of natural resources that provide habitat for wildlife and fisheries, enhance the aesthetics and quality of life for residents, and, of course, defend the shoreline and rivers against storm surge, inland flooding, and sea level rise. The presence of natural resources across the state – in particular salt marsh, beaches/dunes, forested headwaters, and river floodplains – is the result of previous recognition and commitment to long-term conservation and the requisite balance with socio-economic growth. In order to maintain these natural resources it will require 1) routine and on-going management activities as well as the restoration of degraded areas, 2) forward-looking planning to accommodate changes in habitat composition and location due to climatic change and 3) enforcement, modification and/or development of new land use policies and growth strategies. Opportunities also exist to account for and integrate the services or co-benefits provided by natural infrastructure via new development, redevelopment, or realignment activities. Economically important services/co-benefits from natural infrastructure include wave attenuation, improved water storage and filtering of pollutants from surface runoff, erosion control, and improved aesthetics and desirable public amenities. Taken in total, the immediate and longer-term management of natural infrastructure by the state, towns, private property owners, non-profit organizations, and others will help to reduce hazard risk and improve resilience across Connecticut.

While longer-term changes in temperature and precipitation patterns will alter the species composition and type of habitats in a given location, the more immediate implication is the upslope advancement of habitats such as salt marsh in response to continued sea level rise. Sea level rise and the impacts of flooding have and will continue to alter the presence and abundance of natural resources in Connecticut. One of the most noticeable changes is occurring at the shoreline's edge where salt marsh is in the process of advancing upslope into areas now considered uplands. In order to clearly identify where this will occur along Stamford's shoreline, The Nature Conservancy presents the following report to assist with future planning for natural resources in the context of overall risk reduction and resiliency improvement for the community. Ultimately, it is our hope that this report will serve to inform the community about

future marsh advancement locations, current land use of those locations and which parcels are critical to ensure the persistence of natural resources in Stamford longer term.

The Salt Marsh Advancement Model used in this analysis was co-developed by The Nature Conservancy and the University of Connecticut's Department of Natural Resources Management and Engineering. A full discussion of the Model and underlying methodology is beyond the scope of this report, but a few important details are needed to put the following analysis into context and define how to use the results for planning and implementation.

Suitable vs. Unsuitable Advancement

In the following figures and tables suitable advancement areas are abbreviated as "Yes" and unsuitable areas are abbreviated as "No". Suitable areas are classified based on the current land cover type - "forest" or "agrigrass" - and as such are expected to convert to salt marsh as hydrologic conditions change due to sea level rise, in the absence of further land use conversion. Land cover types classified as "urban" (i.e. roads, buildings, runways, parking lots, etc…) are considered to be unsuitable for salt marsh advancement at this time. Though much of our analysis is grouped by parcel ID and associated characteristics, these classifications – suitable and unsuitable – exist independent of the parcel boundaries. In other words, a given residential parcel can have both suitable (lawn) and unsuitable (building footprint) advancement areas.

Marsh Advancement vs. Wetland Extent

There is a key distinction in this report between the current wetland extent in a municipality and the marsh advancement areas analyzed herein. Marsh advancement areas include only the future projected wetland extent clipped to current upland land cover. Therefore, no assumption should be made about net gain or loss of current wetland extent based on this advancement area analysis. Another key consideration is that in some cases the identified advancement area will include land that converts to wetlands and subsequently to open-water over time. This further demonstrates that net change in both existing and future wetland extent should not be inferred from our analysis.

Planning for the Future

The advancement and eventual establishment of coastal marshes will occur over the course of several decades and as such our analysis extends out to the 2080s. The rate of change is slow and decadal, yet inevitable. There is an abundance of existing property, infrastructure and natural infrastructure assets clustered along the Connecticut coast and communities will need to formulate growth and realignment plans well in advance of the 2080s scenario presented here. The following data analysis and associated map book (Appendix) can assist with a resilient transition through the presentation of marsh advancement areas and an accounting of the projected changes to coastal property.

Total Marsh Advancement

The full extent of marsh advancement in Stamford by the 2080s is projected to be 863.6 acres, with 435.3 acres (50.4%) having suitable (Yes) land cover for wetland advancement. The other 428.4 acres (49.6%) are occupied by built structures and associated infrastructure and are unsuitable for marsh advancement (No), currently.

Total Marsh Advancement by 2080s		
Marsh Adv	Acres	Percent (%)
Yes	435.3	50.4
No	428.4	49.6
Total	863.7	100.0

Marsh Advancement in Open Space Parcels

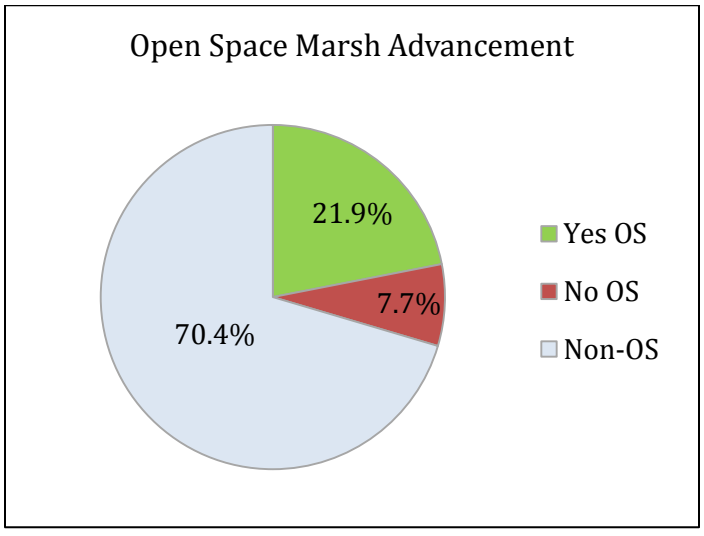
Open space (OS) properties are a critical component of long-term community resilience because they currently have little to no development and are the most likely areas to remain undeveloped through the 2080s. The recognition of the role of these parcels in future wetland extent and improved resilience in Stamford is vital for strategic land management, economic development, and planning.

Total Advancement in Open Space Parcels

The following three categories are considered in this section:

- Yes OS: Areas of open space suitable for marsh advancement
- No OS: Areas of open space unsuitable for marsh advancement
- Non-OS: Unprotected areas both suitable and unsuitable for marsh advancement

Stamford's open space parcels contain 255.5 acres of total marsh advancement area with 189.4 acres (21.9% of total) having a land cover suitable for future wetlands (Yes OS). Further analysis of the 608.2 acres of unprotected parcels (Non-OS) can be found in the following "Marsh Advancement in All Parcels" section.

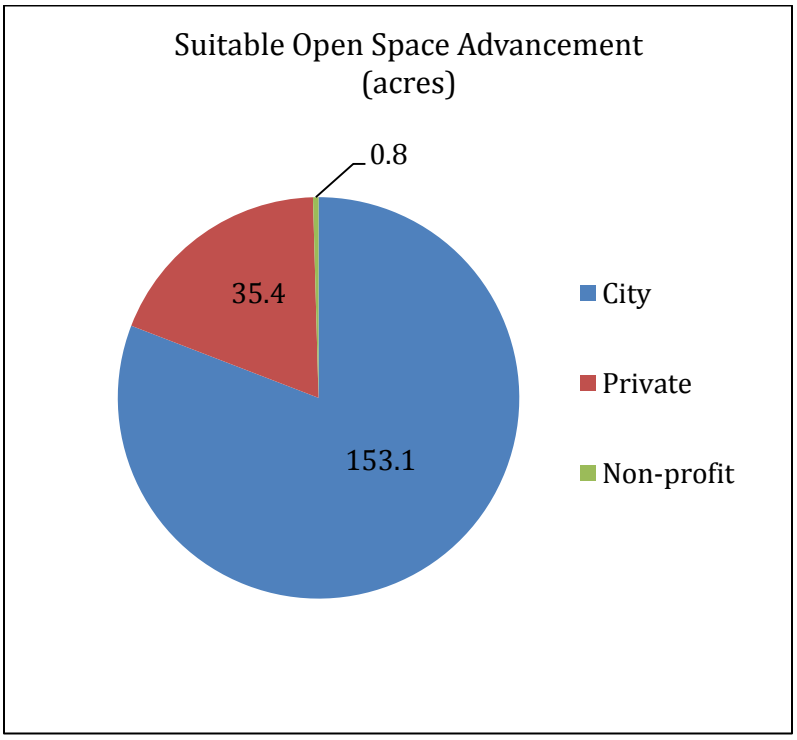


Open Space Marsh Advancement	
OS type	Acres
Yes OS	189.4
No OS	66.1
Non-OS	608.2
Total	863.7

Suitable Open Space Advancement by Owner

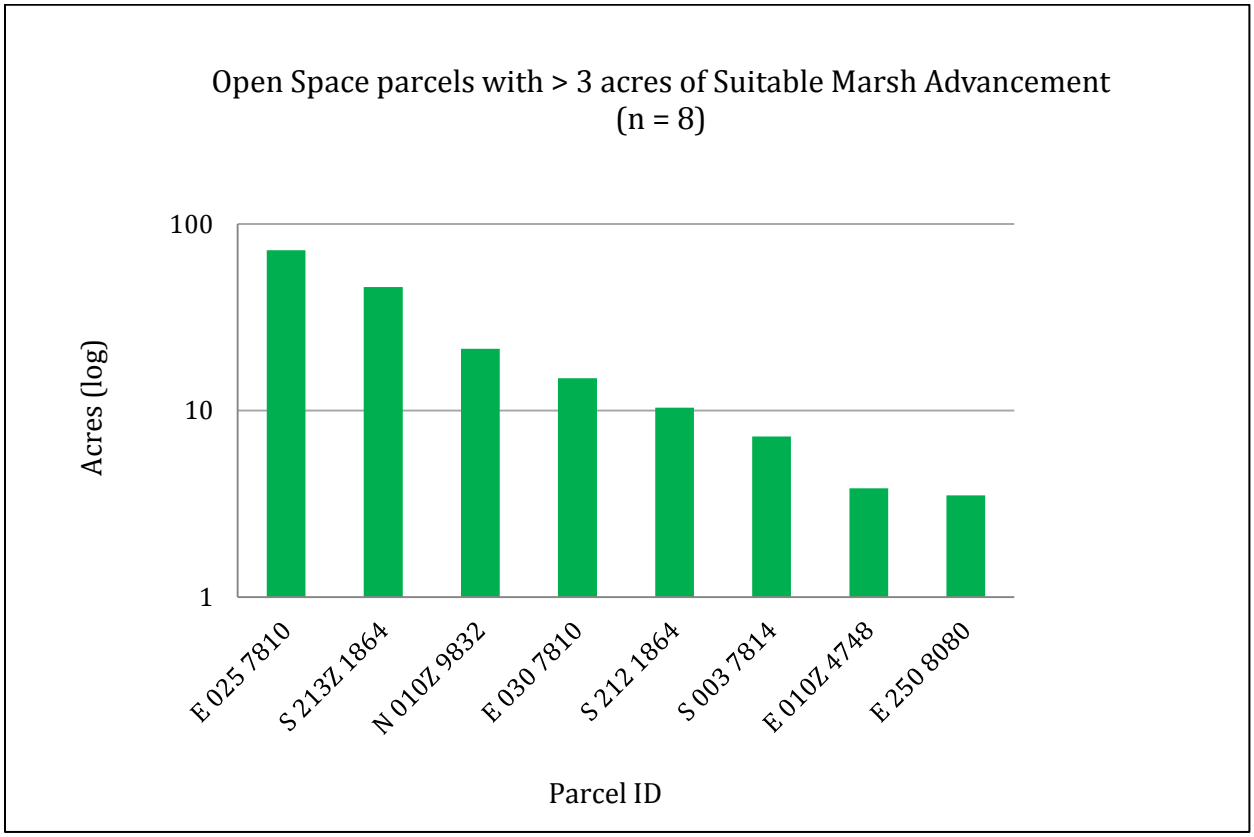
The City of Stamford owns the greatest share of suitable open space for marsh advancement accounting for 153.1 acres (80.9%) across 31 properties. The remaining suitable open space occurs on privately owned properties and to a small extent, on Stamford Land Conservation Trust property.

Suitable Open Space Advancement			
Owner type	Acres	Total "yes" OS (%)	Total "yes" adv (%)
City	153.1	80.9	35.2
Private	35.4	18.7	8.1
Non-profit	0.8	0.4	0.2
Total	189.4	100.0	43.5



Suitable Advancement by Open Space Parcel

Stamford has 44 open space parcels that intersect the full extent of marsh advancement by the 2080s. There are 8 open space parcels that each provides more than 3 acres of advancement area with a total aggregate of 179.4 acres (94.8%) of Stamford's suitable open space marsh advancement area. The parcel with the most suitable marsh advancement zone, Cummings Park, contributes significantly more than all other parcel making up 38.1% of the total.



Open Space parcels with > 3 acres Suitable Marsh Advancement				
Parcel ID	Acres	Total "yes" OS (%)	Owner	Map Book Page #
E 025 7810	72.2	38.1	City	6
S 213Z 1864	46.0	24.3	City	7
N 010Z 9832	21.4	11.3	Private	6
E 030 7810	14.9	7.9	City	6
S 212 1864	10.3	5.4	City	7
S 003 7814	7.3	3.9	Private	6
E 010Z 4748	3.8	2.0	Private	7
E 250 8080	3.5	1.9	City	6
Total	179.4	94.8		

Marsh Advancement in All Parcels

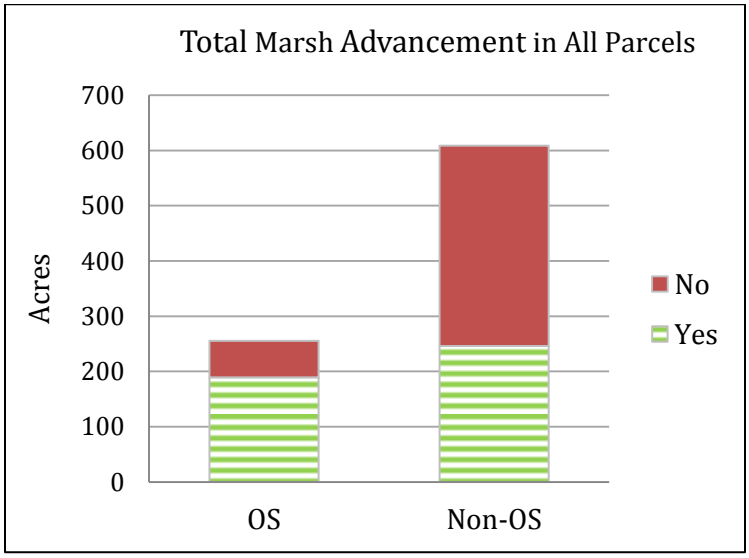
This section incorporates all parcels into the analysis of suitable marsh advancement. These results help put the open space analysis into perspective, as well as identify important unprotected parcels in Stamford's marsh advancement landscape.

Total Advancement in All Parcels (OS vs. Non-OS)

Stamford's existing open space parcels are made up of a state park, municipal parks, municipal open space, land trust and other conservation non-profit properties, water company land, public schools, cemeteries, and private recreation areas including golf courses. This section provides an analysis of suitable areas for marsh advancement on these open space parcels versus all other parcels. These two types of parcels are designated as:

- 'OS' for open space parcels
- 'Non-OS' for all other parcels

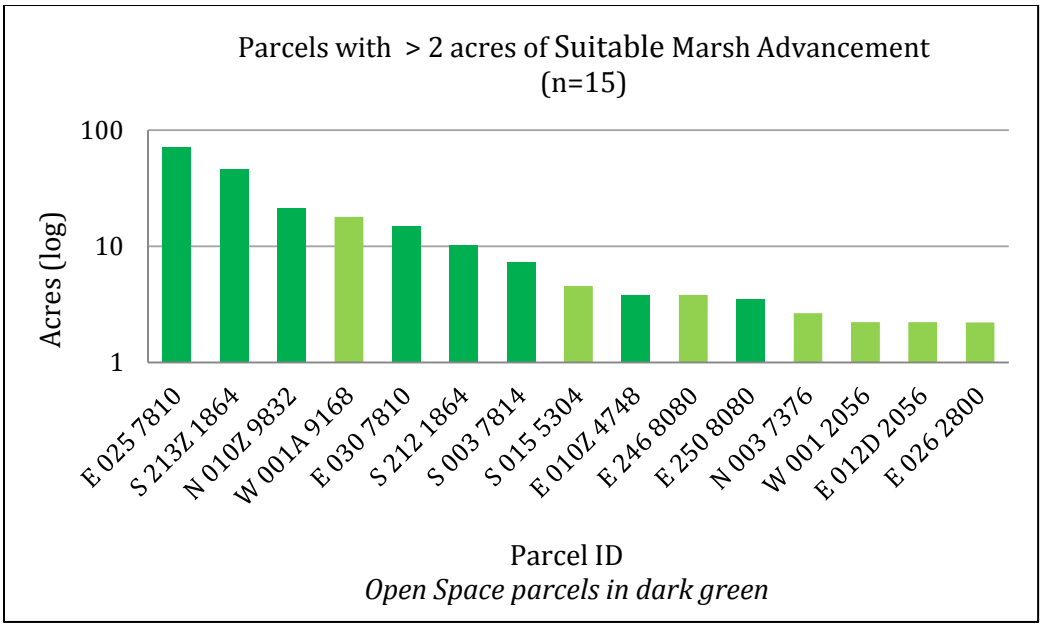
Open space parcels contain 189.4 acres (43.5% of total) of suitable marsh advancement zone. The remaining 245.9 acres of land suitable for marsh advancement (56.5% of total) are unprotected and generally occur on residential, commercial, or industrial properties. The unprotected suitable areas will receive a greater amount of marsh advancement by 2080s. This information has two important implications for future planning: 1) today's unprotected properties will play a vital role in maintaining Stamford's wetland resources in the future, and 2) a large amount of current development (362.4 acres) will be in direct conflict with rising sea levels and advancing marshes.



Total Marsh Advancement			
Parcel type	Yes	No	Total
OS	189.4	66.1	255.5
Non-OS	245.9	362.3	608.2
Total	435.3	428.4	863.7

Suitable Advancement by All Parcels

There are 1,208 parcels in Stamford that provide areas of suitable marsh advancement, but only 15 parcels offer suitable areas greater than 2 acres. This small subset provides 215.0 acres of marsh advancement zone or 49.4% of Stamford's overall total. The specific parcels can be viewed via the corresponding Map Book pages (Appendix) indicated in the table below.



Parcels with > 2 acres of Suitable Marsh Advancement			
Parcel ID	Acres	Total yes adv (%)	Map Book Page #
E 025 7810	72.2	16.6	6
S 213Z 1864	46.0	10.6	7
N 010Z 9832	21.4	4.9	6
W 001A 9168	18.0	4.1	4,6,16,30
E 030 7810	14.9	3.4	6
S 212 1864	10.3	2.4	7
S 003 7814	7.3	1.7	6
S 015 5304	4.6	1.0	4,6,12,26
E 010Z 4748	3.8	0.9	7
E 246 8080	3.8	0.9	4,6,15,29
E 250 8080	3.5	0.8	6
N 003 7376	2.6	0.6	4,6,20,34
W 001 2056	2.2	0.5	4,6,19,33
E 012D 2056	2.2	0.5	4,6,15,29
E 026 2800	2.2	0.5	4,6,16,30
Total	215.0	49.4	

Appendix – Map Book

Please consult your Salt Marsh Advancement Resource Disc for the complete dataset of suitable and unsuitable advancement per parcel.


The Nature Conservancy
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Comprehensive Map Book

of

Stamford, Connecticut

The Nature Conservancy

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Marsh Advancement by the 2080s

City of Stamford, CT

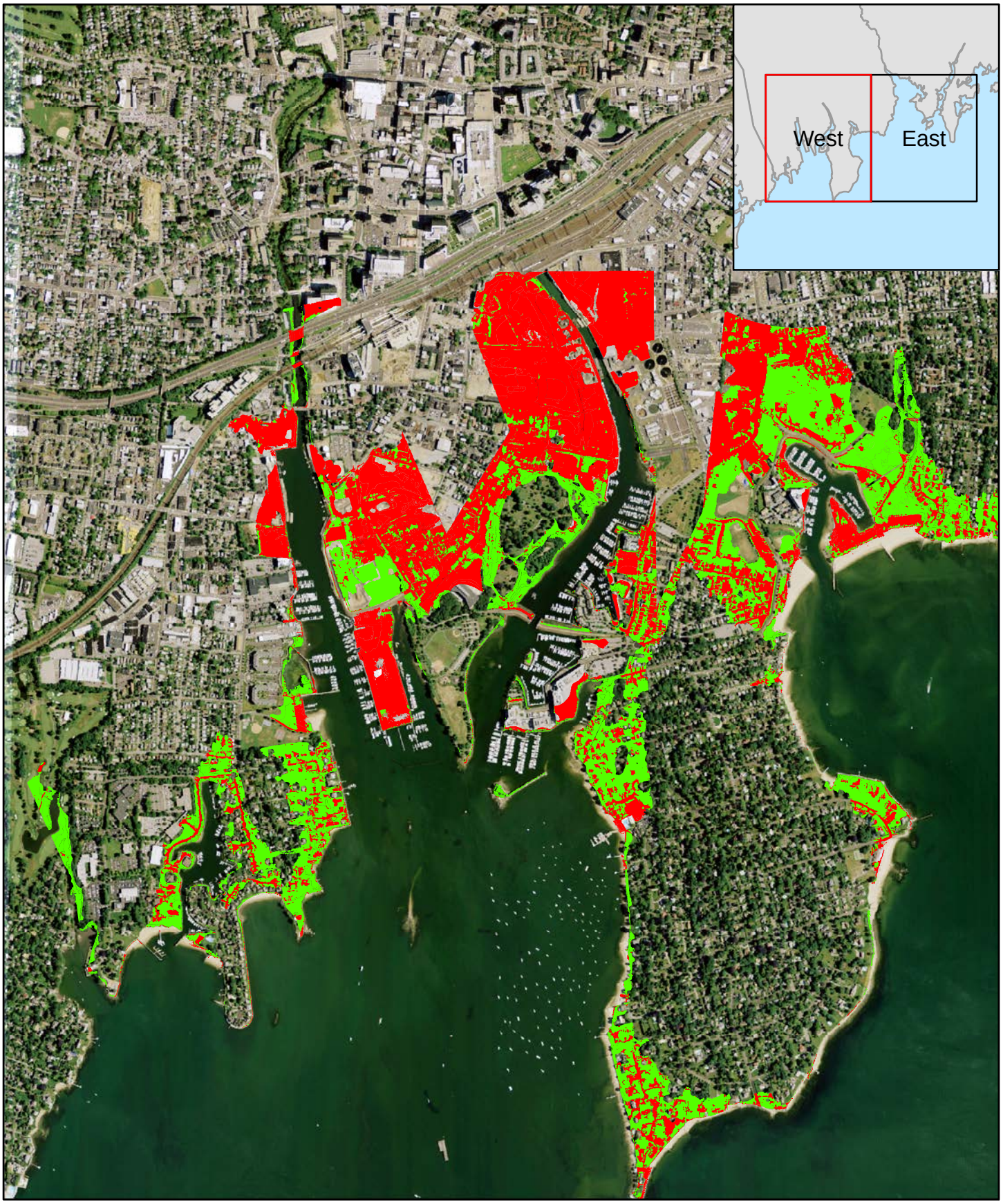
Marsh Advancement - West

0 0.5 1 Mile

N

Marsh Advancement by 2080s

- Developed Land Cover
- Forest, Grass, Ag Land Cover



Marsh Advancement by the 2080s

City of Stamford, CT

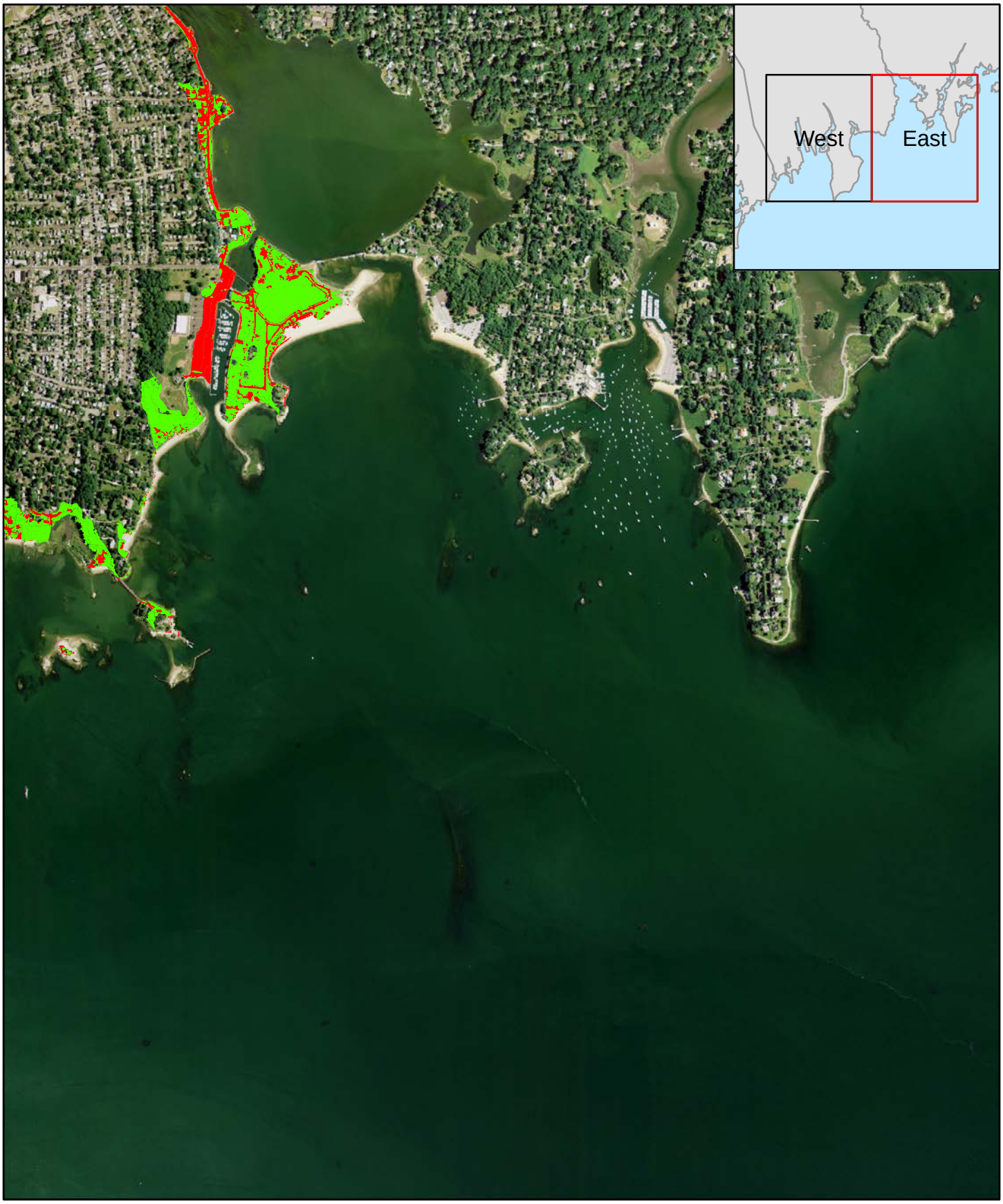
Marsh Advancement - East

0 0.5 1 Mile

N

Marsh Advancement by 2080s

- Developed Land Cover
- Forest, Grass, Ag Land Cover



Marsh Advancement by the 2080s

City of Stamford, CT

Unprotected Parcels - West

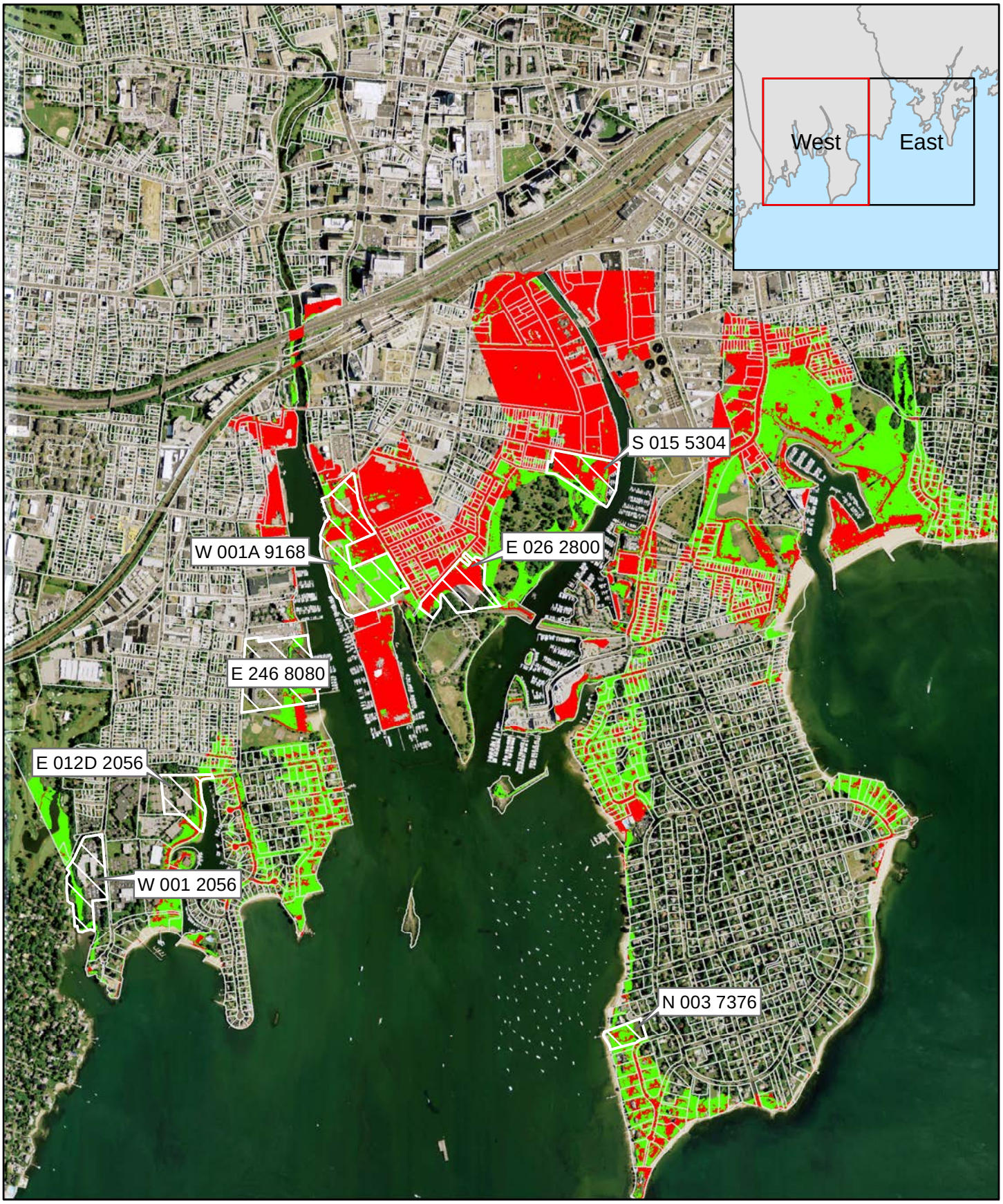
0 0.5 1 Mile

N

Parcels
Unprotected Non-OS

Marsh Advancement by 2080s
Developed Land Cover
Forest, Grass, Ag Land Cover

Note: Only Non-OS parcels with > 2 acres of suitable advancement are shown.



Marsh Advancement by the 2080s

City of Stamford, CT

Unprotected Parcels - East

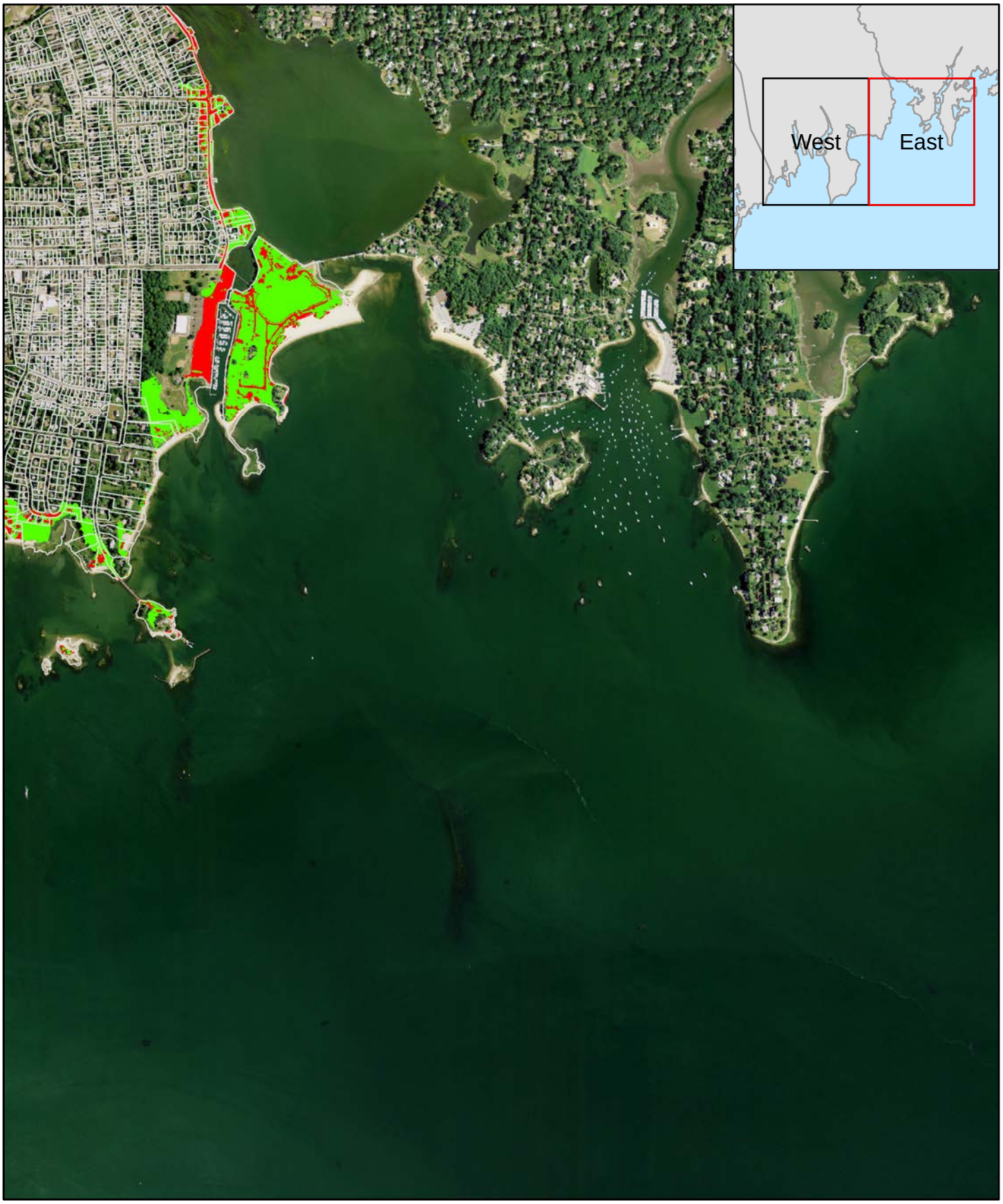
0 0.5 1 Mile

N

Parcels
Unprotected Non-OS

Marsh Advancement by 2080s
Developed Land Cover
Forest, Grass, Ag Land Cover

Note: Only Non-OS parcels with > 2 acres of suitable advancement are shown.



Marsh Advancement by the 2080s

City of Stamford, CT

Critical Parcels - West

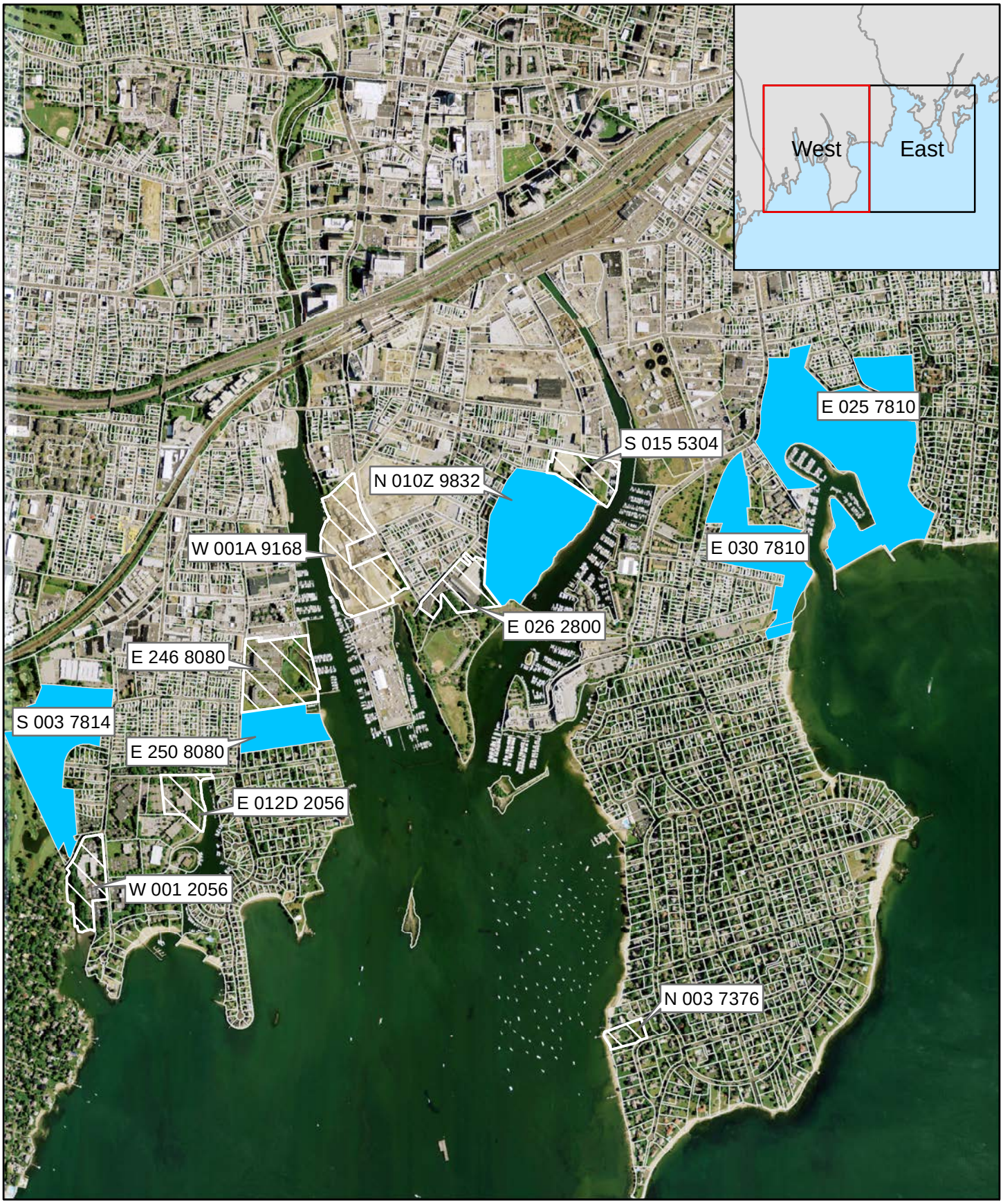
0 0.5 1 Mile

N

Note: Only Non-OS parcels with > 2 acres of suitable advancement and OS parcels with > 3 acres of suitable advancement are shown.

Parcels

- Unprotected Non-OS
- Protected OS



Marsh Advancement by the 2080s

City of Stamford, CT

Critical Parcels - East

0 0.5 1 Mile

N

Note: Only Non-OS parcels with > 2 acres of suitable advancement and OS parcels with > 3 acres of suitable advancement are shown.

Parcels

Unprotected Non-OS

Protected OS

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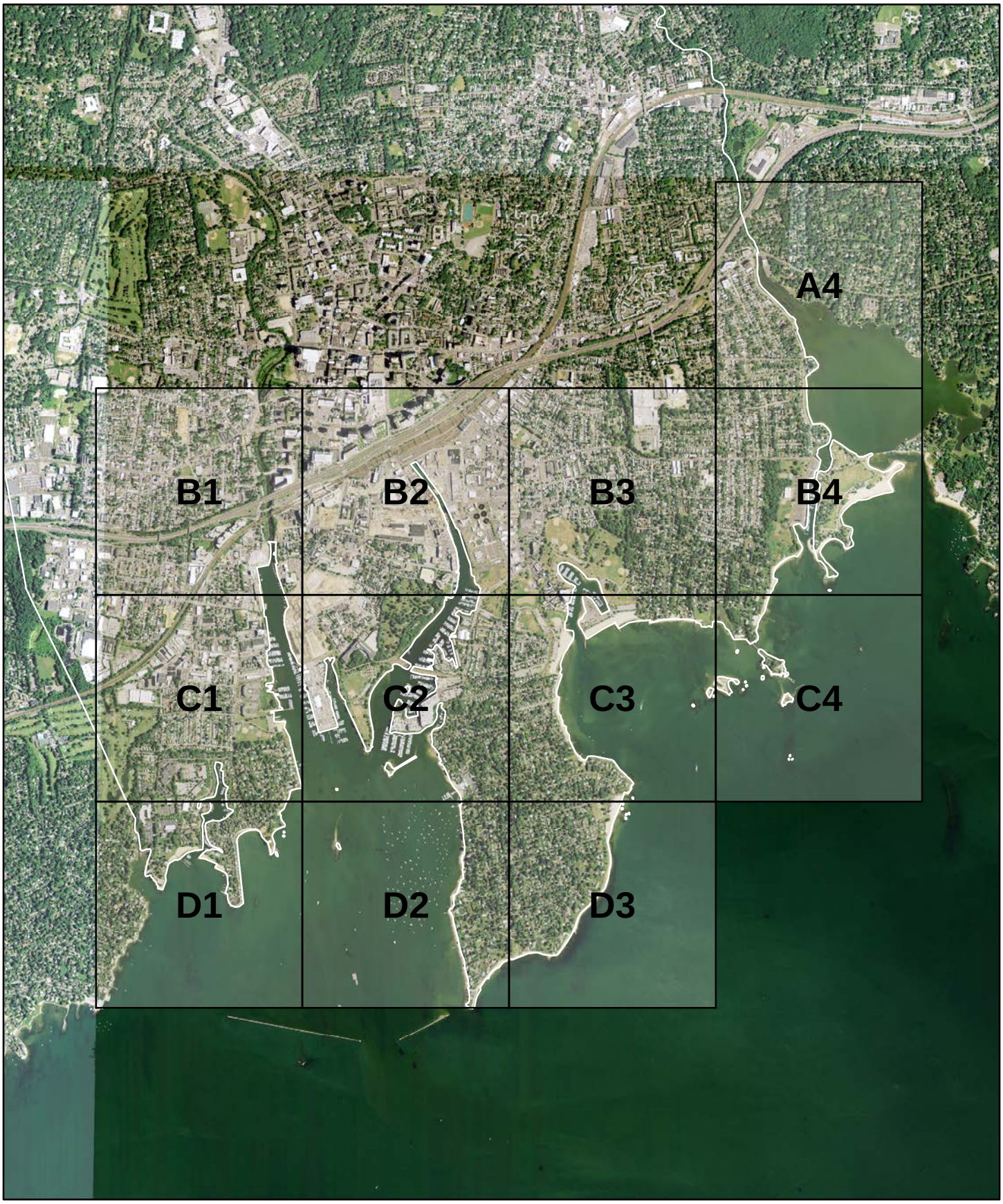
Marsh Advancement by the 2080s

City of Stamford, CT

Map Index - Unprotected Parcels



0 500 1,000 2,000 Feet

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Marsh Advancement by the 2080s

City of Stamford, CT

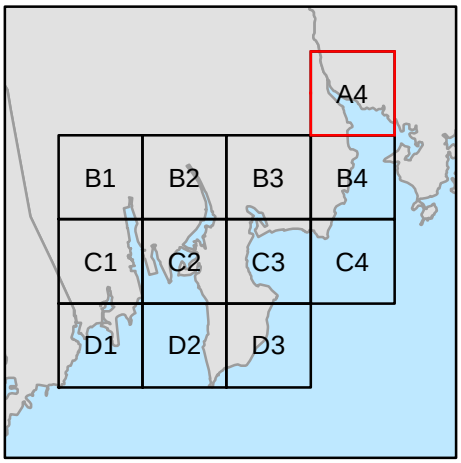
Unprotected Parcels - Map A4

Parcels
- Unprotected Non-OS

Marsh Advancement
- Developed Land Cover
- Forest, Grass, Ag Land Cover

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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see page 15

Marsh Advancement by the 2080s

City of Stamford, CT

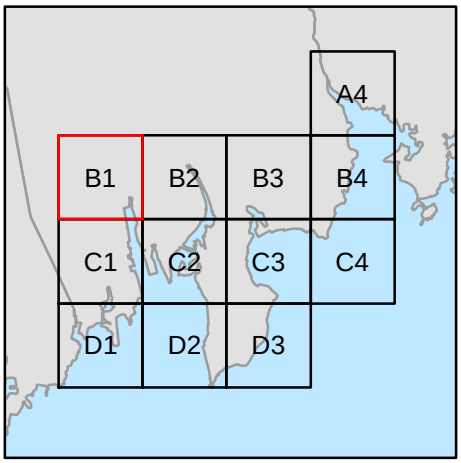
Unprotected Parcels - Map B1

Parcels
- Unprotected Non-OS

Marsh Advancement
- Developed Land Cover
- Forest, Grass, Ag Land Cover

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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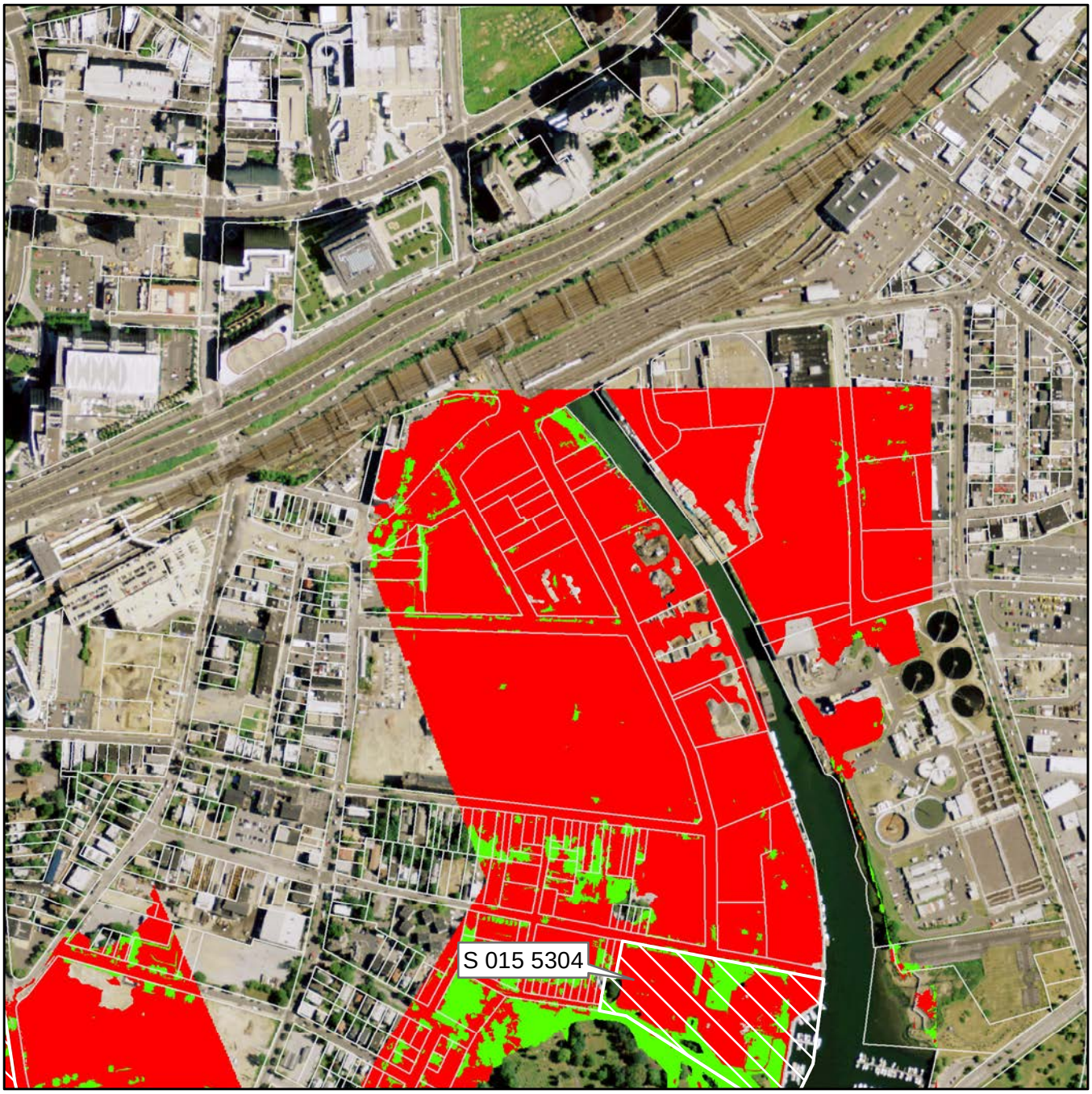

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Marsh Advancement by the 2080s

City of Stamford, CT

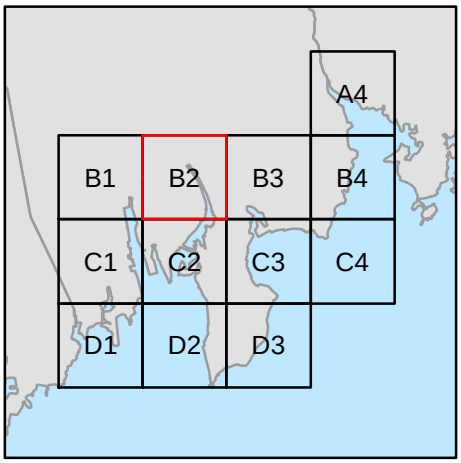
Unprotected Parcels - Map B2

Parcels
- Unprotected Non-OS

Marsh Advancement
- Developed Land Cover
- Forest, Grass, Ag Land Cover

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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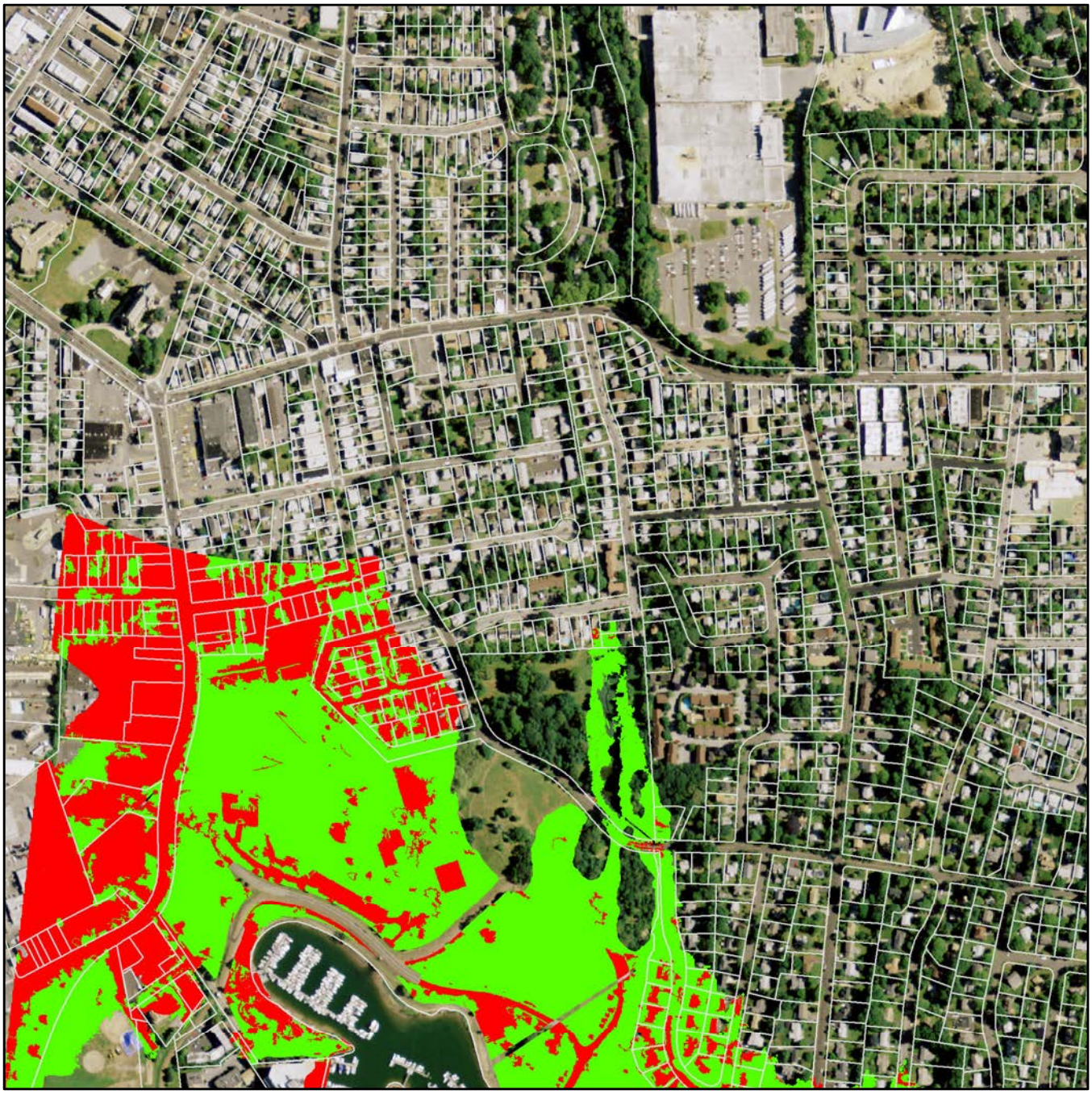

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Marsh Advancement by the 2080s

City of Stamford, CT

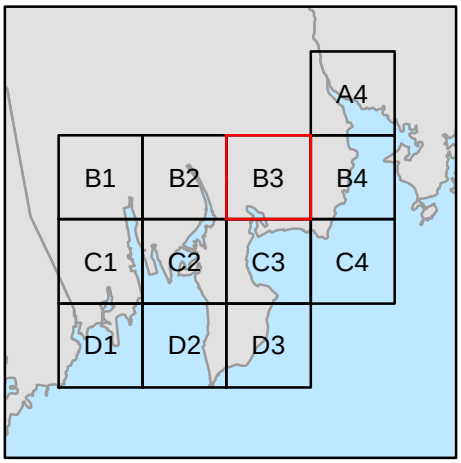
Unprotected Parcels - Map B3

Parcels
Unprotected Non-OS

Marsh Advancement
Developed Land Cover
Forest, Grass, Ag Land Cover

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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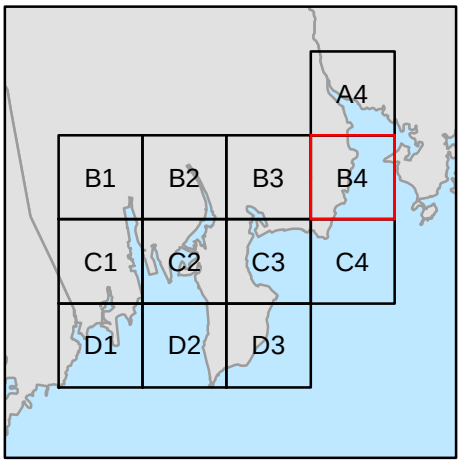
Marsh Advancement by the 2080s

City of Stamford, CT

Unprotected Parcels - Map B4



Parcels

Unprotected Non-OS

Marsh Advancement

Developed Land Cover

Forest, Grass, Ag Land Cover

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.

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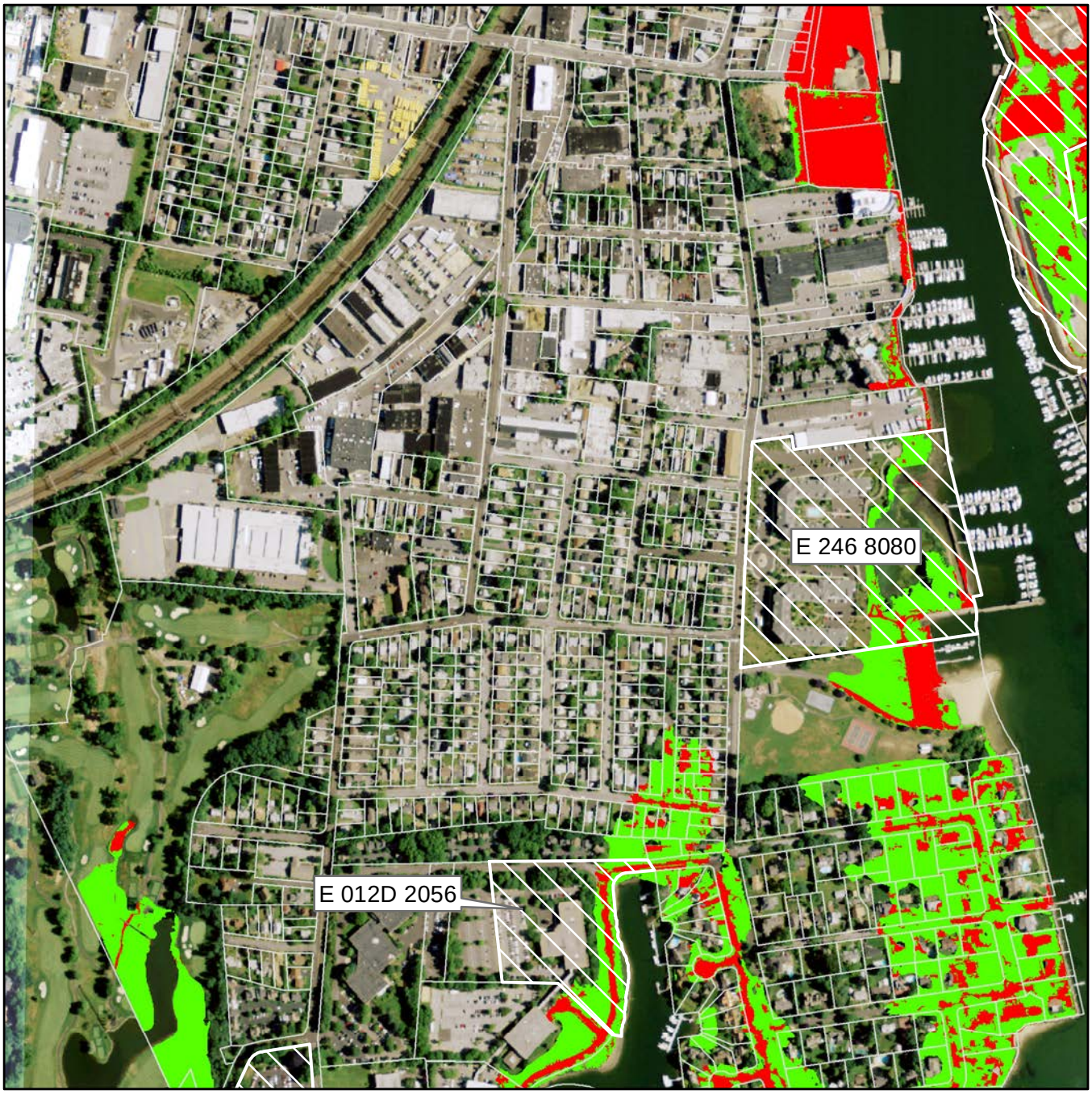

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Marsh Advancement by the 2080s

City of Stamford, CT

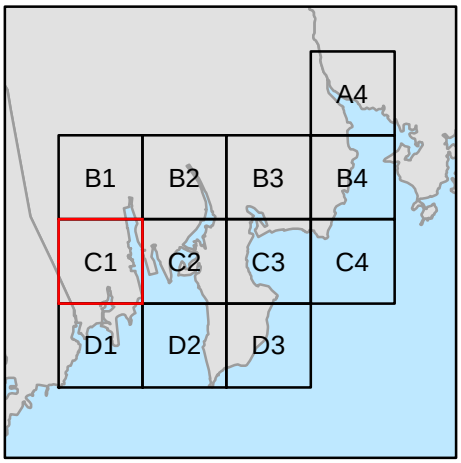
Unprotected Parcels - Map C1

Parcels
Unprotected Non-OS

Marsh Advancement
Developed Land Cover
Forest, Grass, Ag Land Cover

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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Feet
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Marsh Advancement by the 2080s

City of Stamford, CT

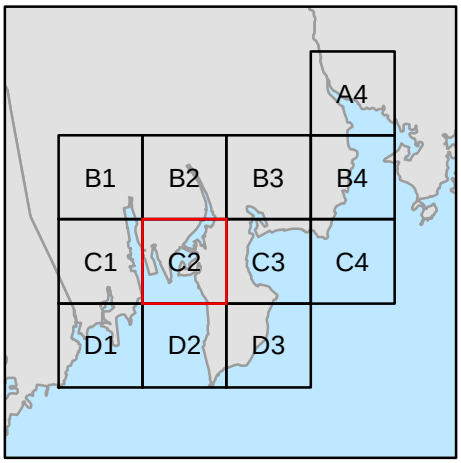
Unprotected Parcels - Map C2

Parcels
Unprotected Non-OS

Marsh Advancement
Developed Land Cover
Forest, Grass, Ag Land Cover

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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Marsh Advancement by the 2080s

City of Stamford, CT

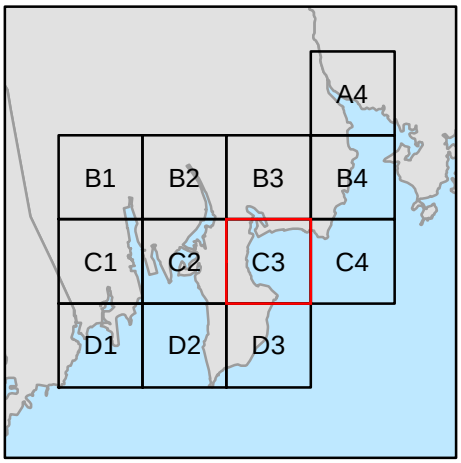
Unprotected Parcels - Map C3

Parcels
- Unprotected Non-OS

Marsh Advancement
- Developed Land Cover
- Forest, Grass, Ag Land Cover

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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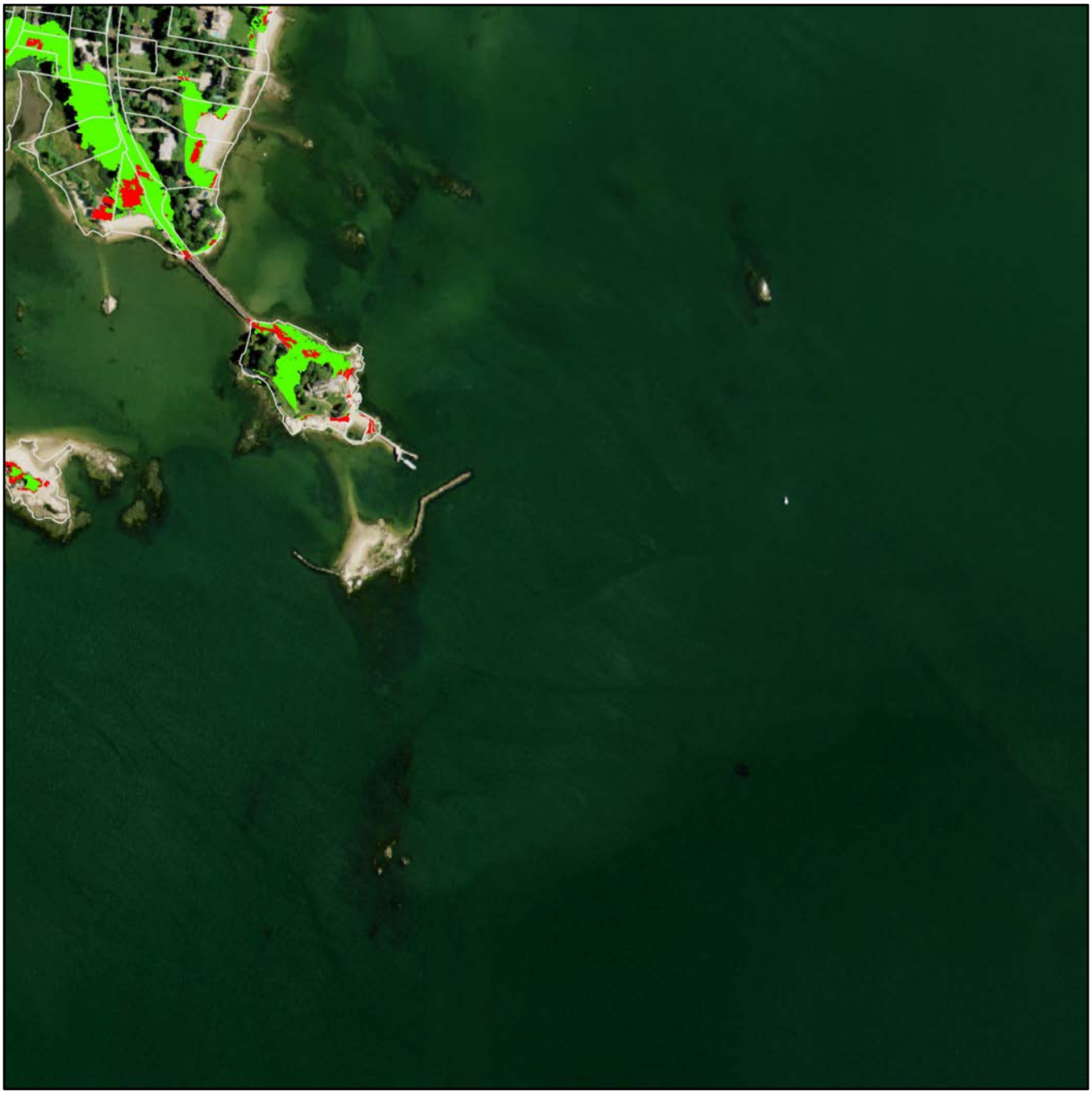


Feet
0 500 1,000 2,000

Marsh Advancement by the 2080s

City of Stamford, CT

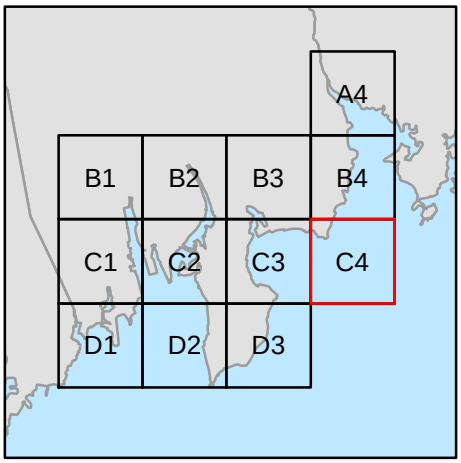
Unprotected Parcels - Map C4

Parcels
Unprotected Non-OS

Marsh Advancement
Developed Land Cover
Forest, Grass, Ag Land Cover

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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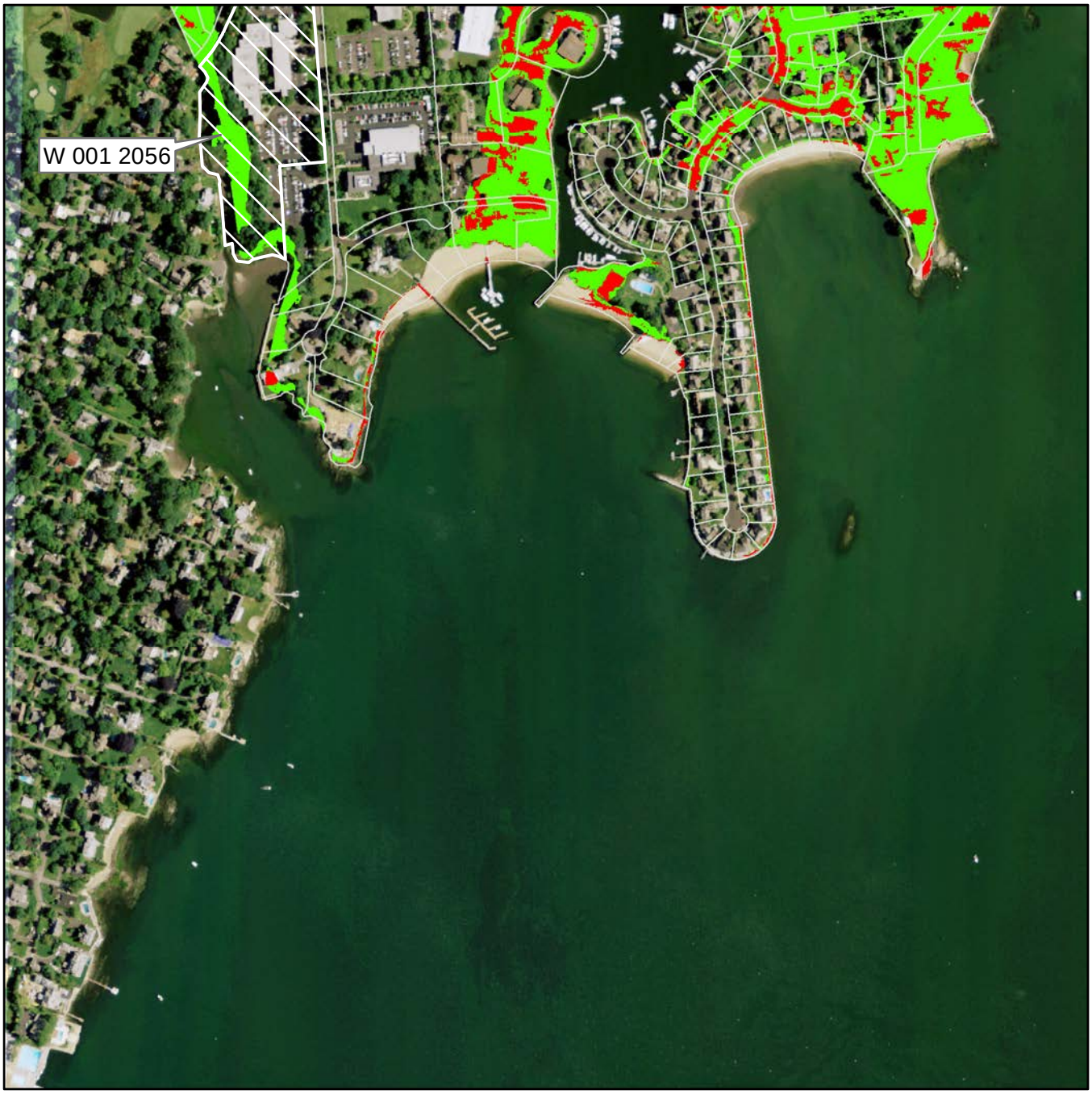

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Feet
0 500 1,000 2,000

Marsh Advancement by the 2080s

City of Stamford, CT

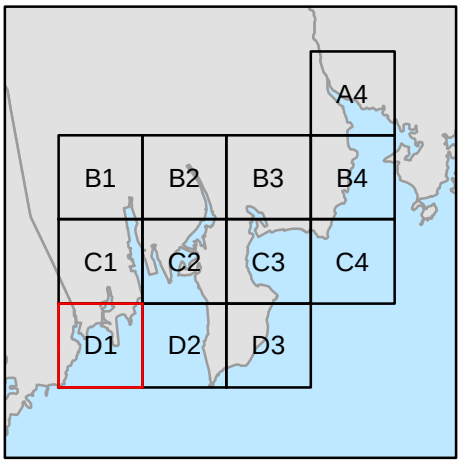
Unprotected Parcels - Map D1

Parcels
Unprotected Non-OS

Marsh Advancement
Developed Land Cover
Forest, Grass, Ag Land Cover

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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see page 19

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Marsh Advancement by the 2080s

City of Stamford, CT

Unprotected Parcels - Map D2

Parcels

Unprotected Non-OS

Marsh Advancement

Developed Land Cover

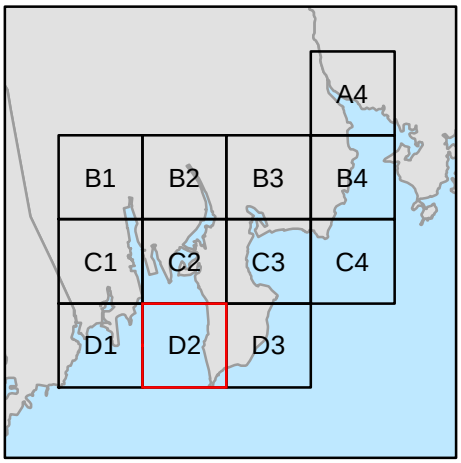
Forest, Grass, Ag Land Cover

N

W E

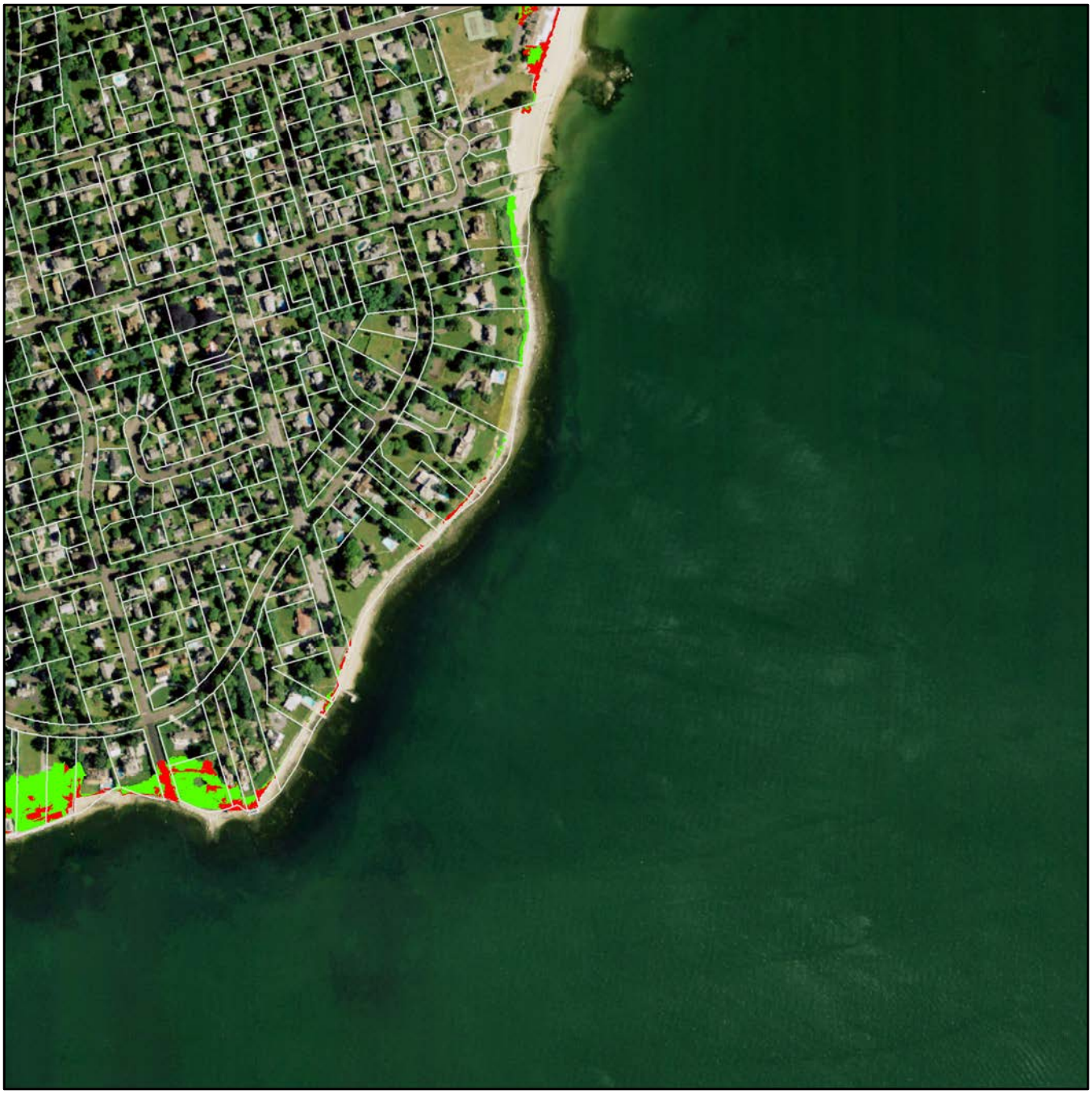
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



see page 17

see page 20



Feet
0 500 1,000 2,000

Marsh Advancement by the 2080s

City of Stamford, CT

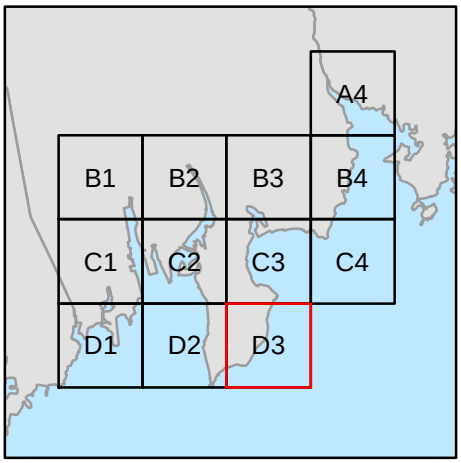
Unprotected Parcels - Map D3

Parcels
Unprotected Non-OS

Marsh Advancement
Developed Land Cover
Forest, Grass, Ag Land Cover

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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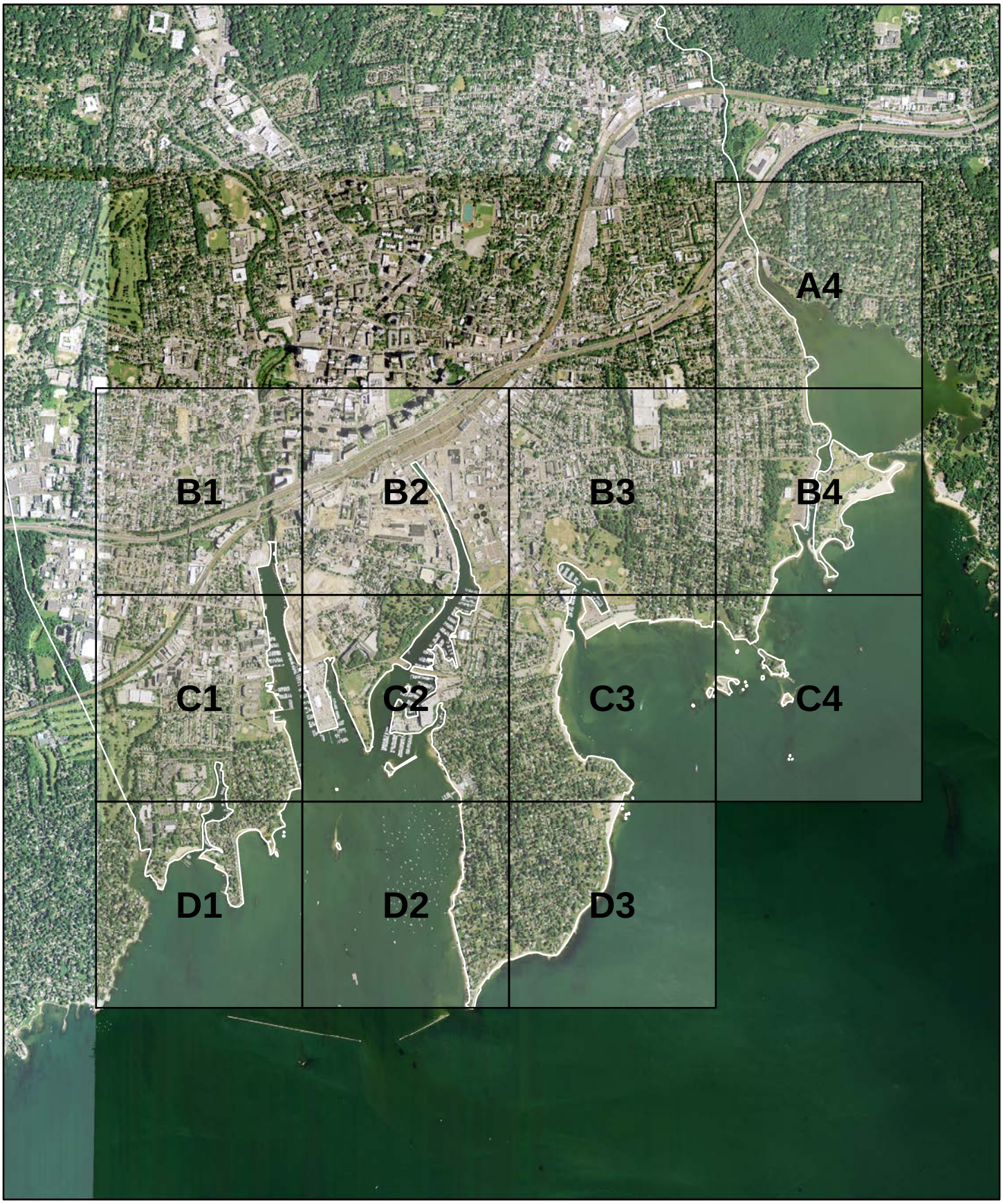
Marsh Advancement by the 2080s

City of Stamford, CT

Map Index - Advancement per Parcel



0 500 1,000 2,000 Feet

see page 28

Marsh Advancement by the 2080s

City of Stamford, CT

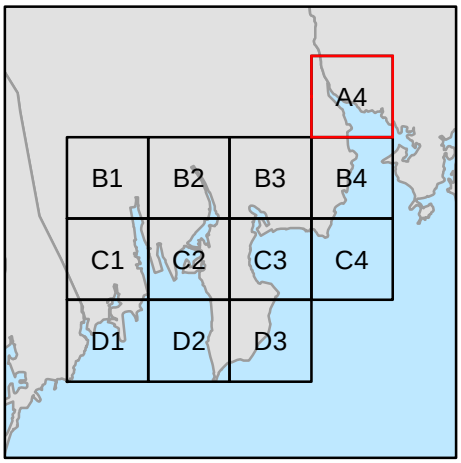
Advancement per Parcel - Map A4

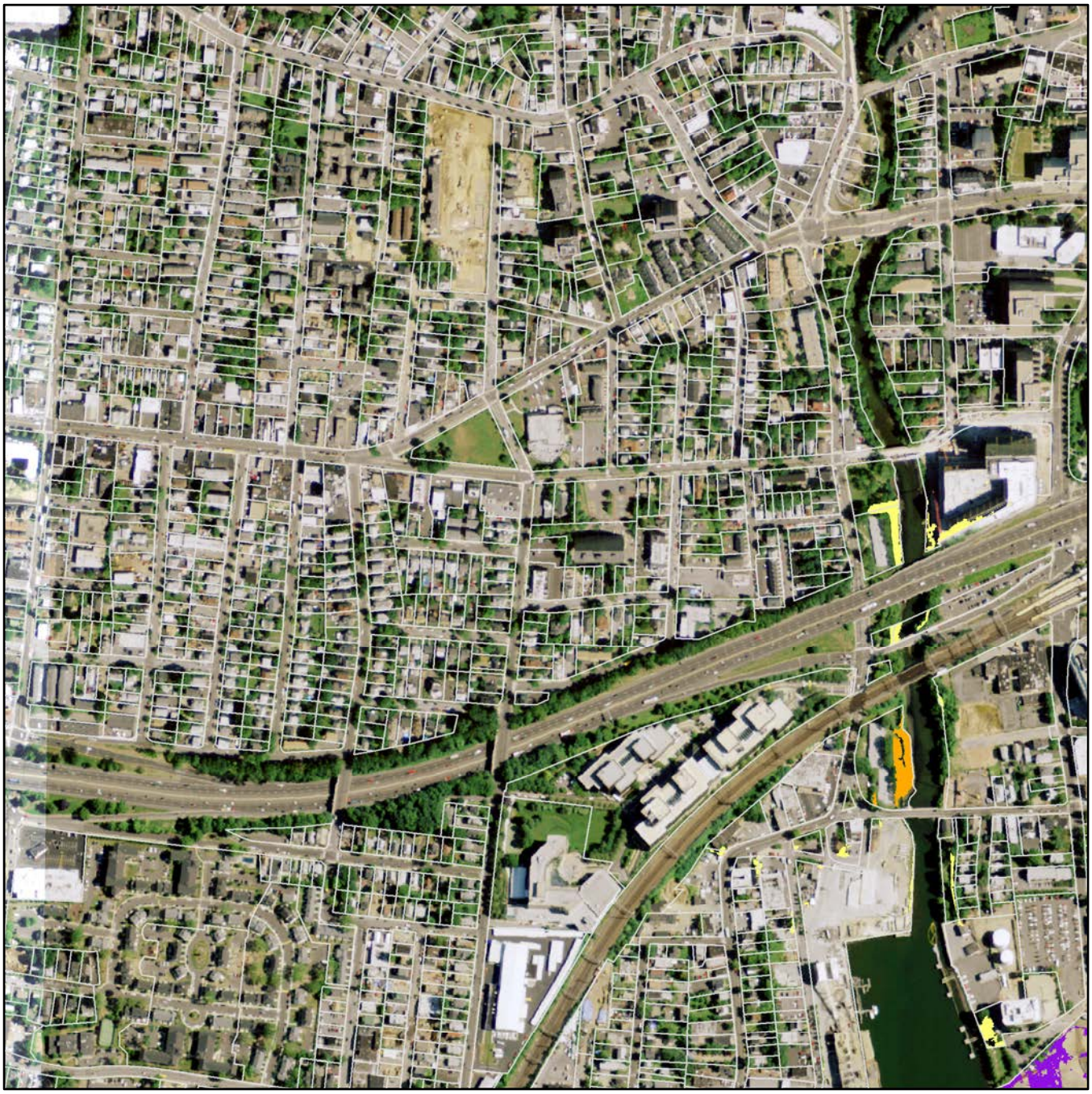
Area of Suitable Advancement

- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.





see page 26

0 500 1,000 2,000 Feet

see page 29

Marsh Advancement by the 2080s

City of Stamford, CT

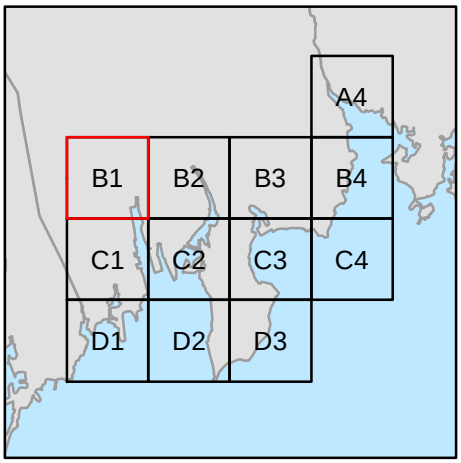
Advancement per Parcel - Map B1

Area of Suitable Advancement

- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

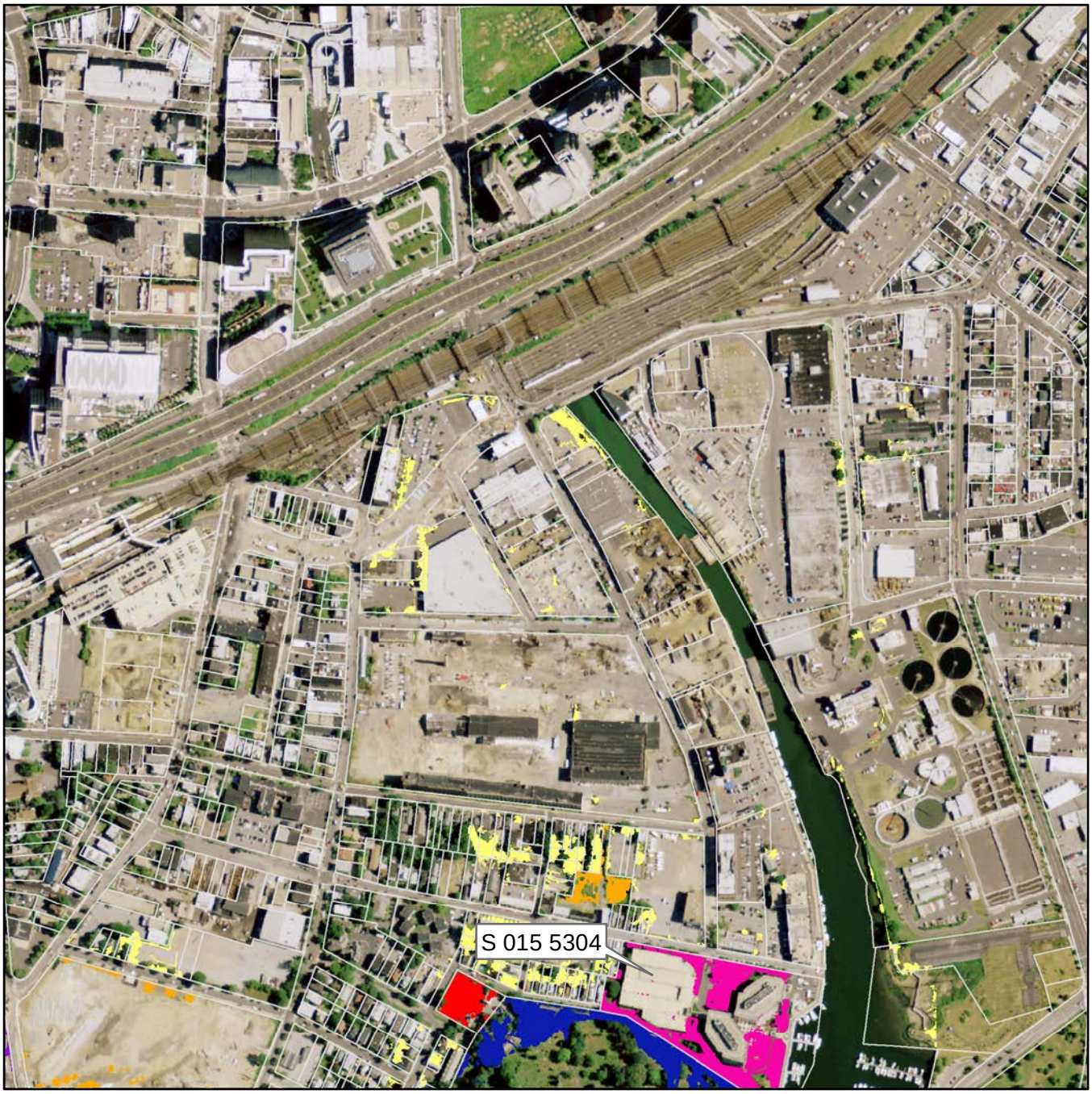
N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



see page 25

see page 27



Feet
0 500 1,000 2,000

see page 30

Marsh Advancement by the 2080s

City of Stamford, CT

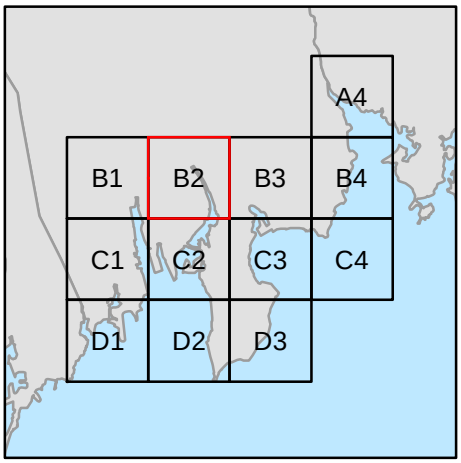
Advancement per Parcel - Map B2

Area of Suitable Advancement

- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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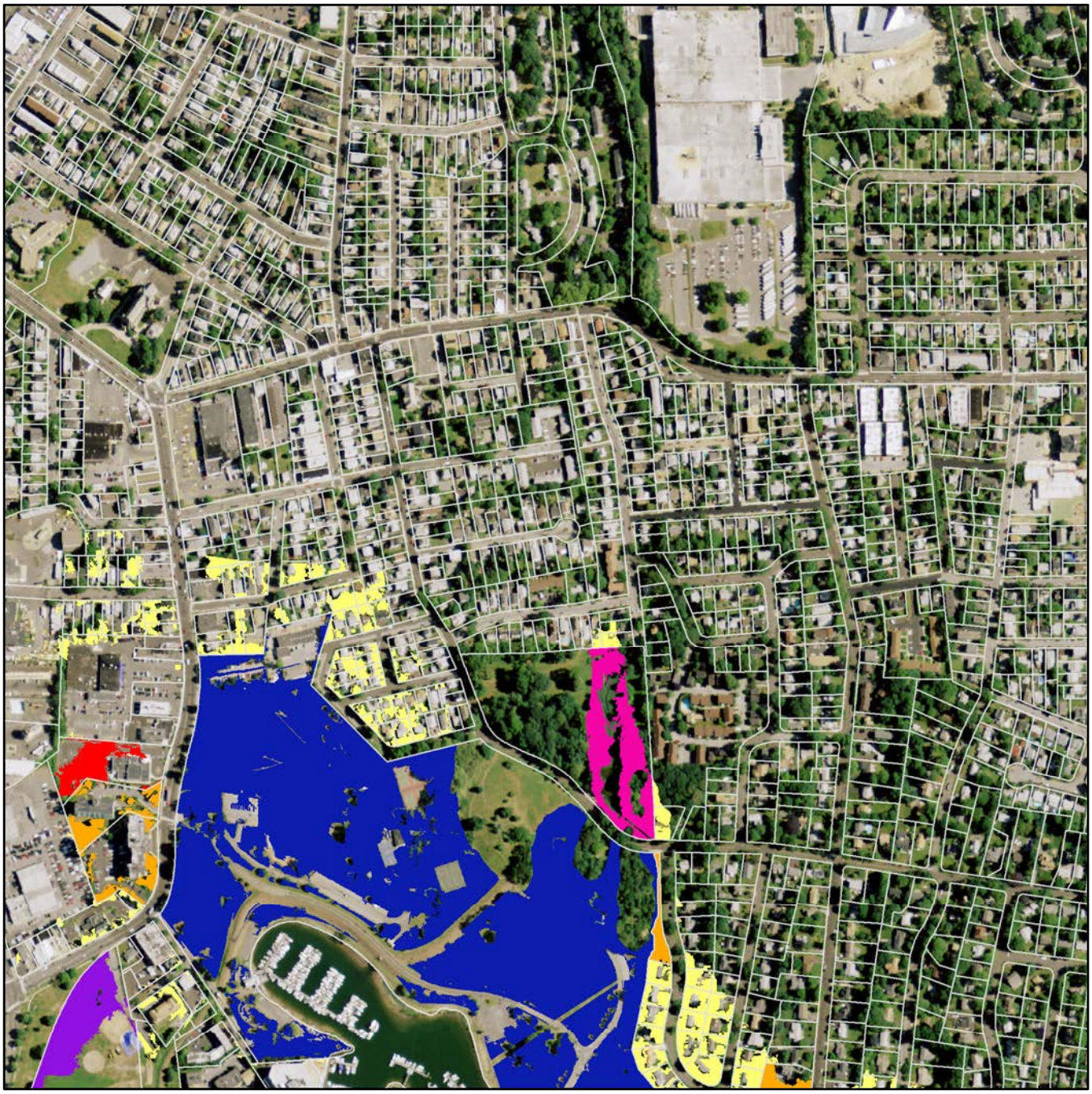

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Feet
0 500 1,000 2,000

see page 31

Marsh Advancement by the 2080s

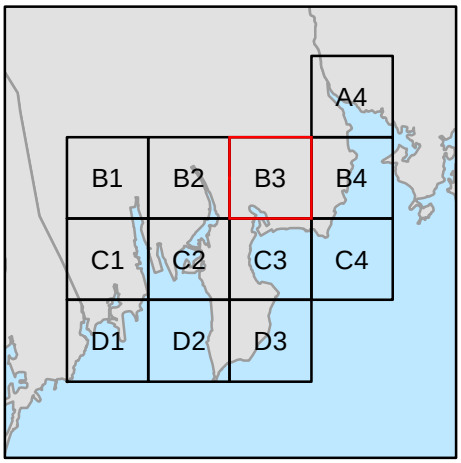
City of Stamford, CT

Advancement per Parcel - Map B3

Area of Suitable Advancement
- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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Feet
0 500 1,000 2,000

see page 32

Marsh Advancement by the 2080s

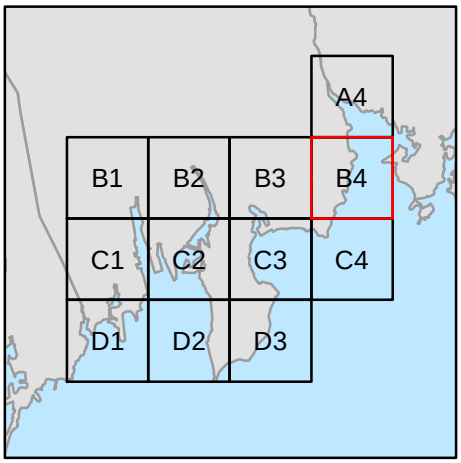
City of Stamford, CT

Advancement per Parcel - Map B4

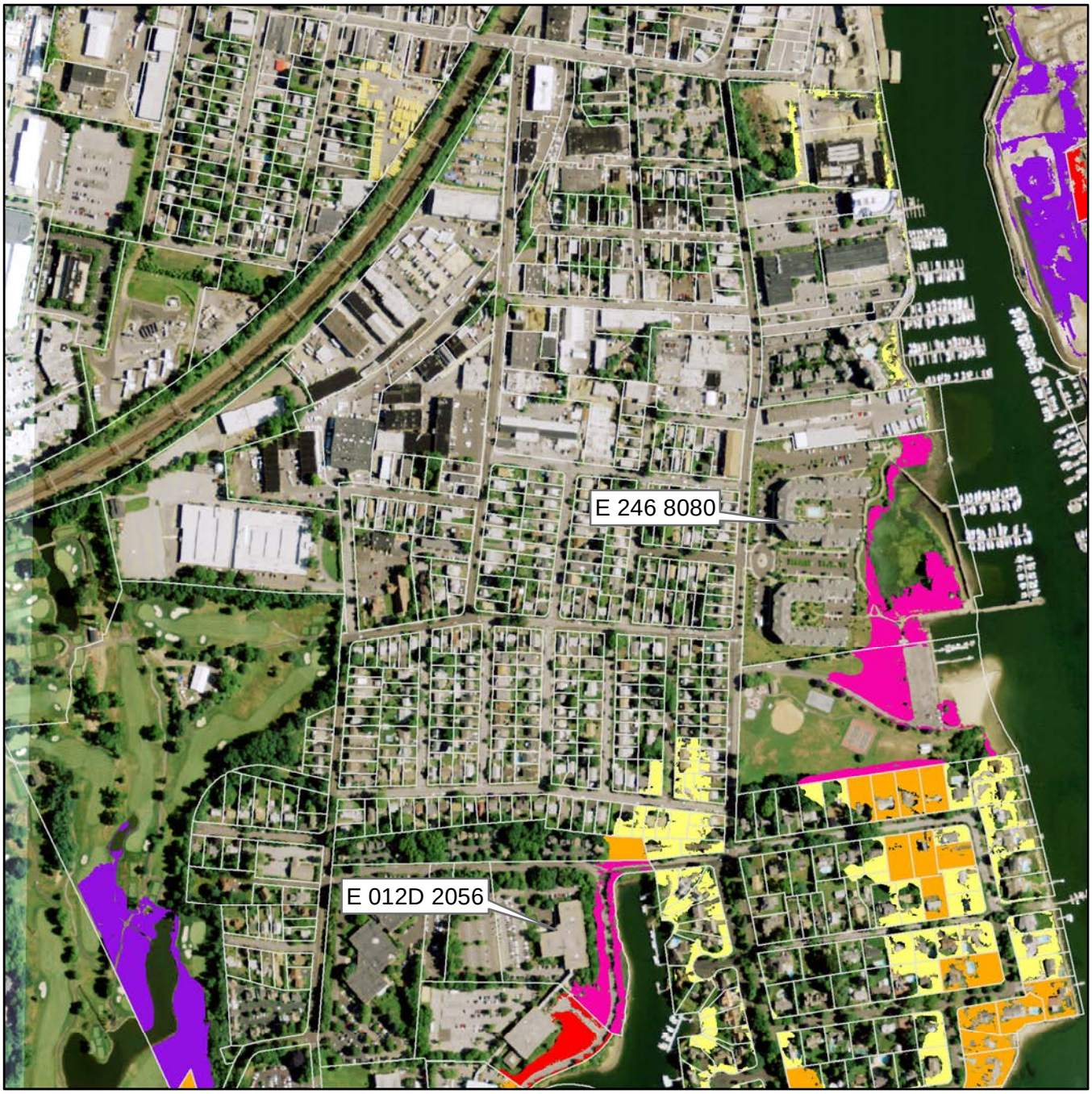
Area of Suitable Advancement
- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



see page 25



see page 30

Feet
0 500 1,000 2,000

see page 33

Marsh Advancement by the 2080s

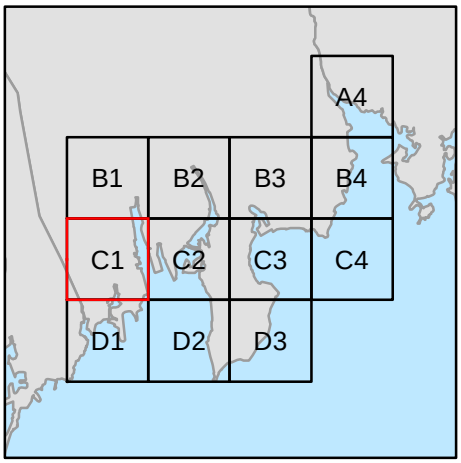
City of Stamford, CT

Advancement per Parcel - Map C1

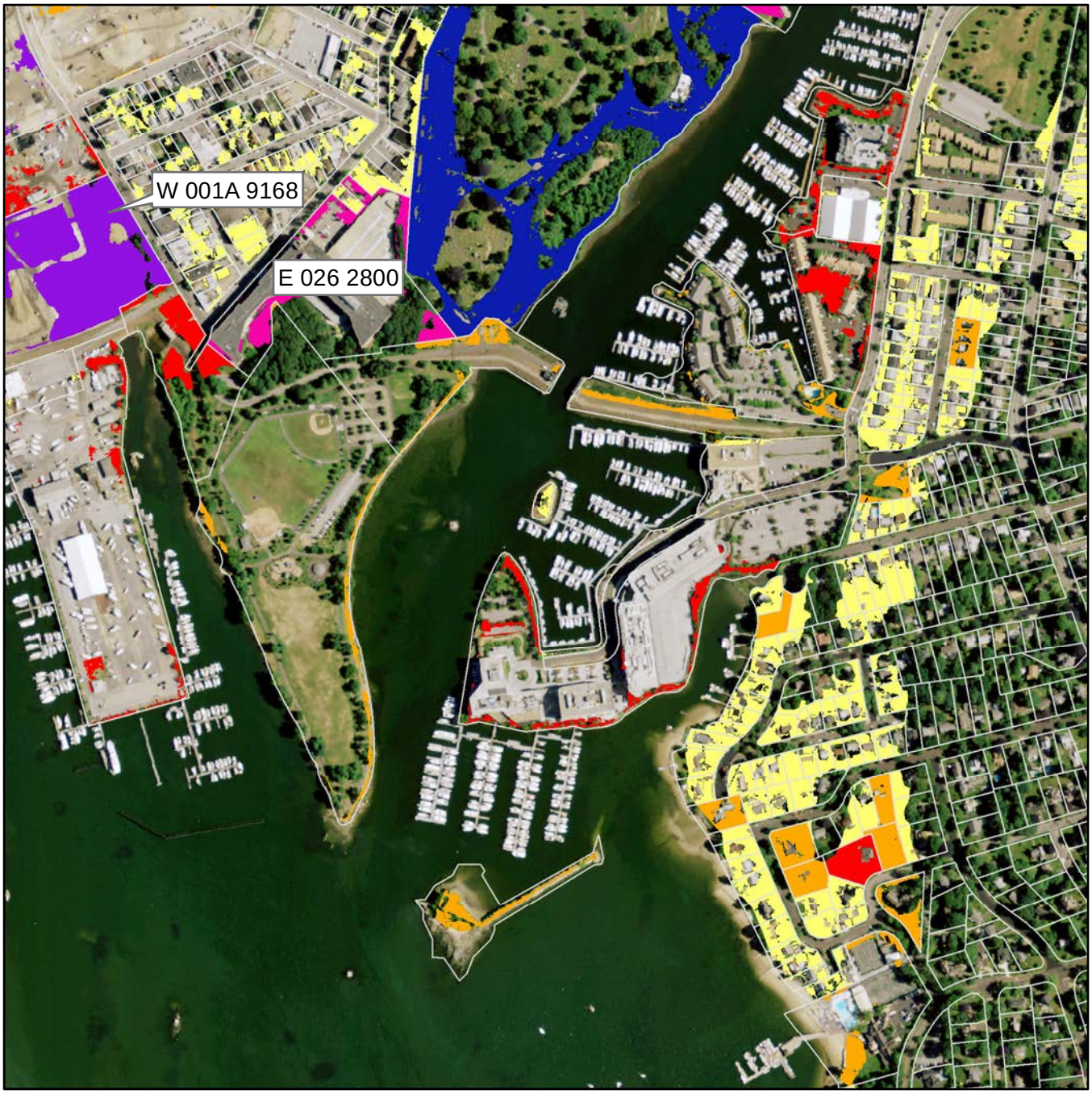
Area of Suitable Advancement
- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



see page 26



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see page 31

Feet
0 500 1,000 2,000

see page 34

Marsh Advancement by the 2080s

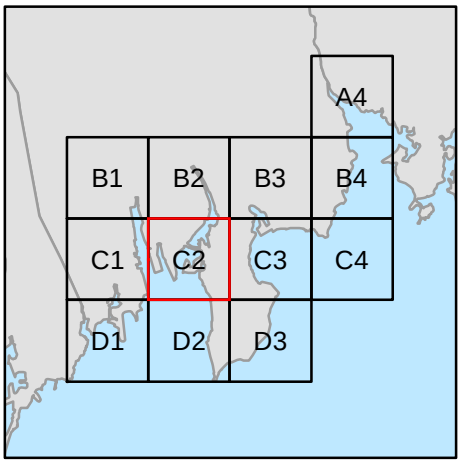
City of Stamford, CT

Advancement per Parcel - Map C2

Area of Suitable Advancement
- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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see page 32

0 500 1,000 2,000 Feet

see page 35

Marsh Advancement by the 2080s

City of Stamford, CT

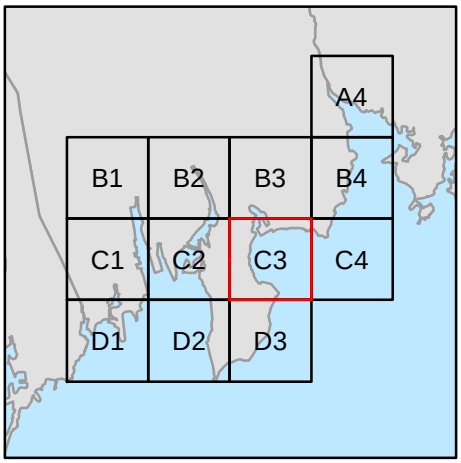
Advancement per Parcel - Map C3

Area of Suitable Advancement

- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N W E S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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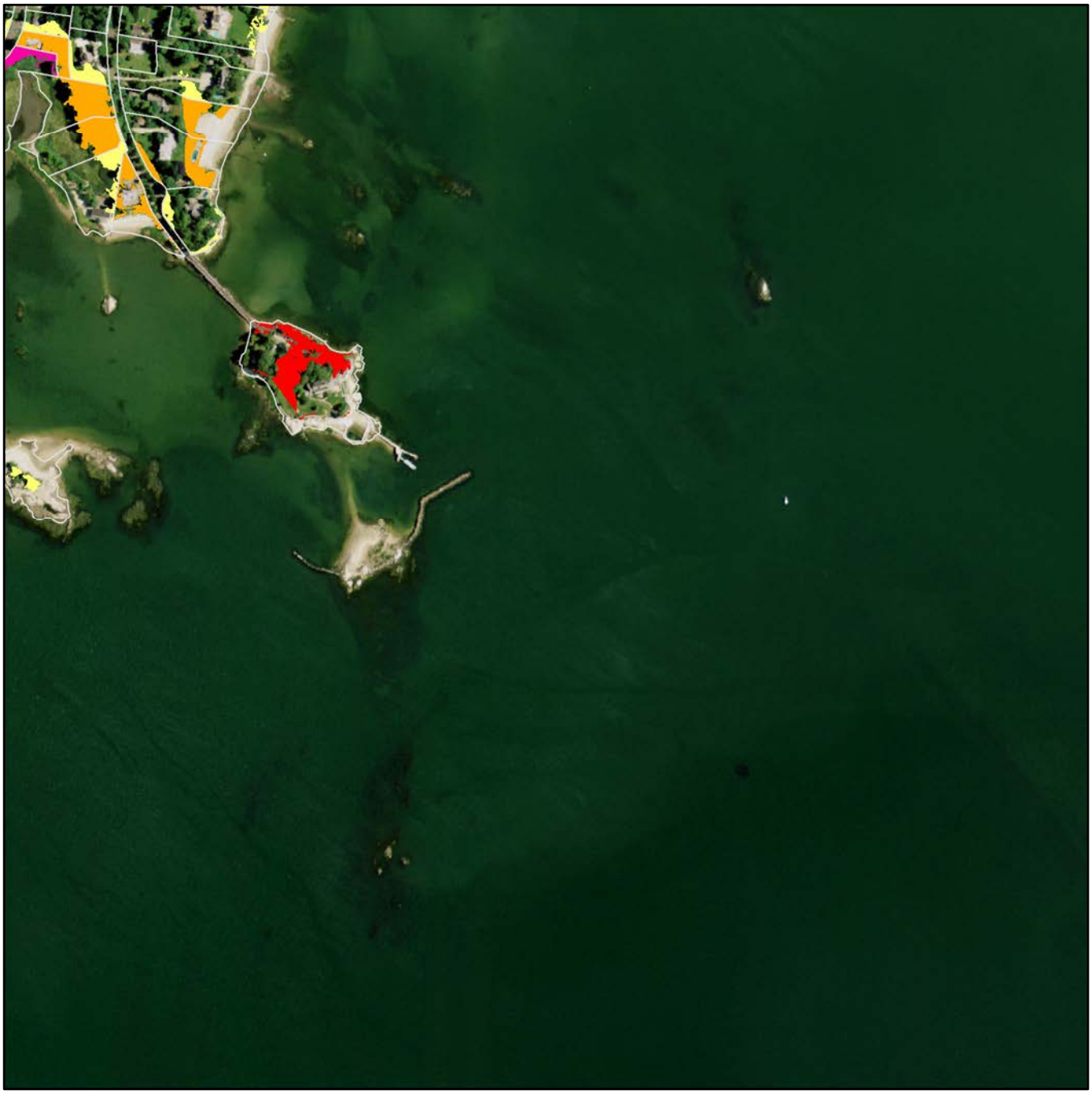


Feet
0 500 1,000 2,000

Marsh Advancement by the 2080s

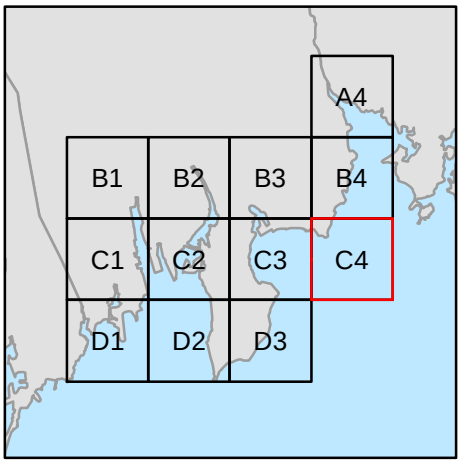
City of Stamford, CT

Advancement per Parcel - Map C4

Area of Suitable Advancement
- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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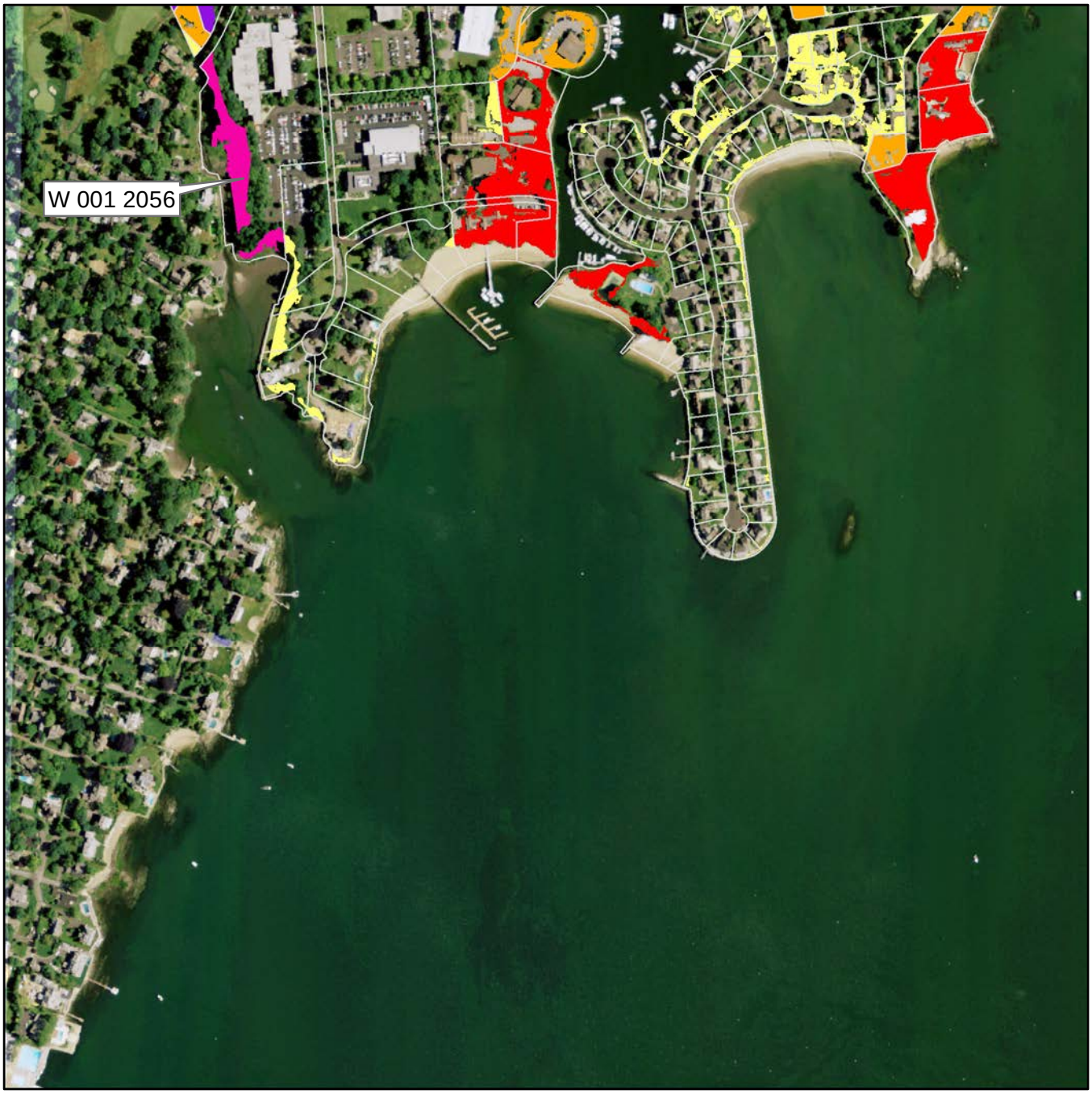


see page 34

Feet
0 500 1,000 2,000

Marsh Advancement by the 2080s

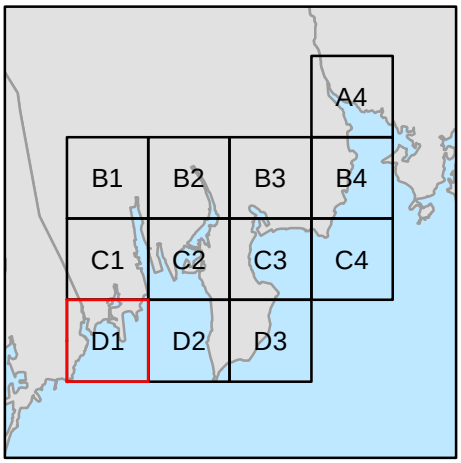
City of Stamford, CT

Advancement per Parcel - Map D1

Area of Suitable Advancement
- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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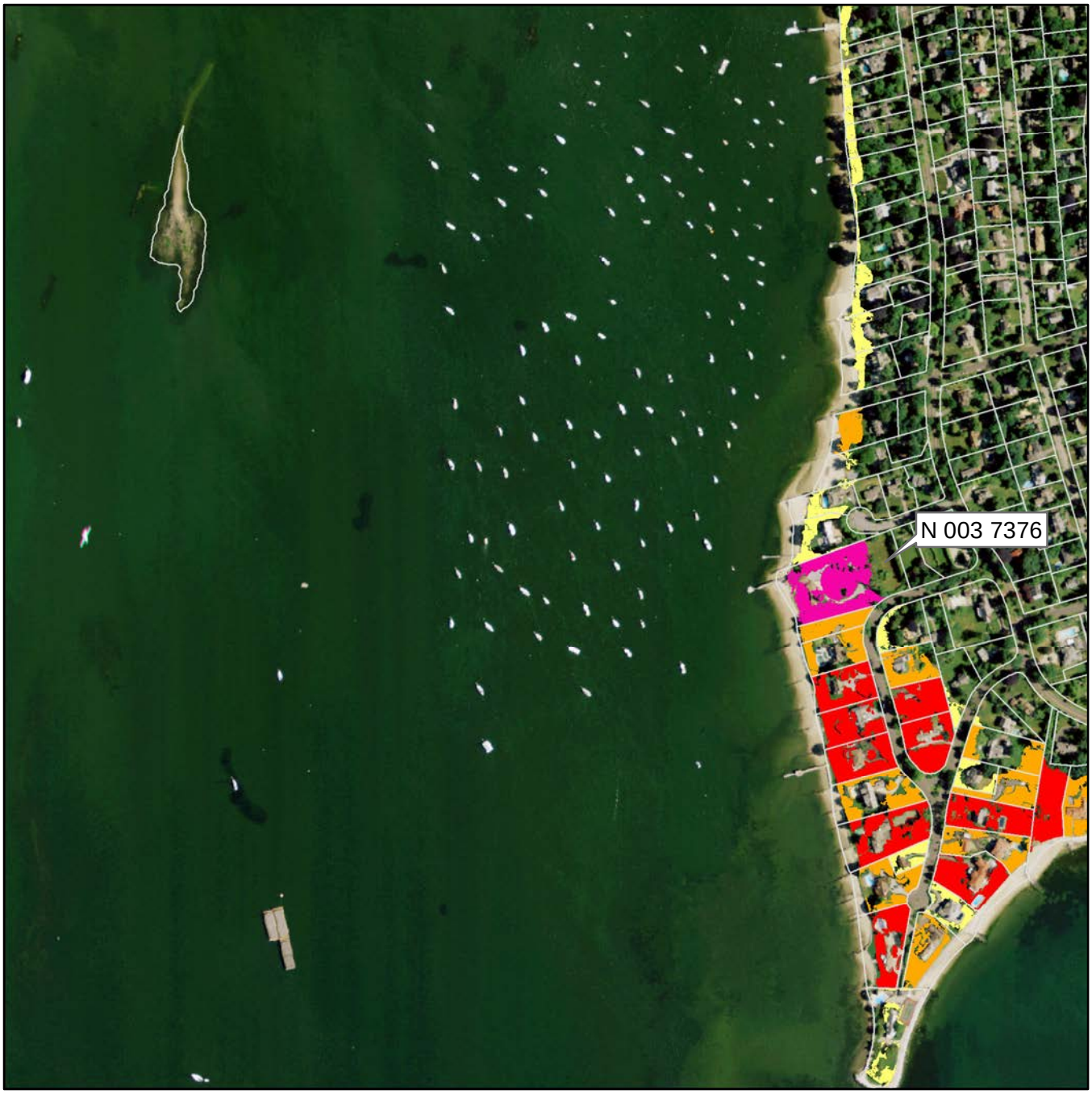
see page 33



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Marsh Advancement by the 2080s

City of Stamford, CT

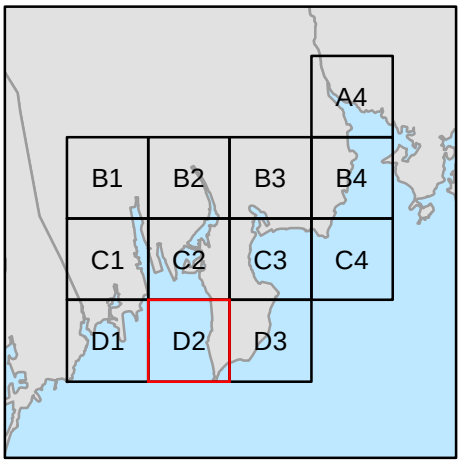
Advancement per Parcel - Map D2

Area of Suitable Advancement

- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.



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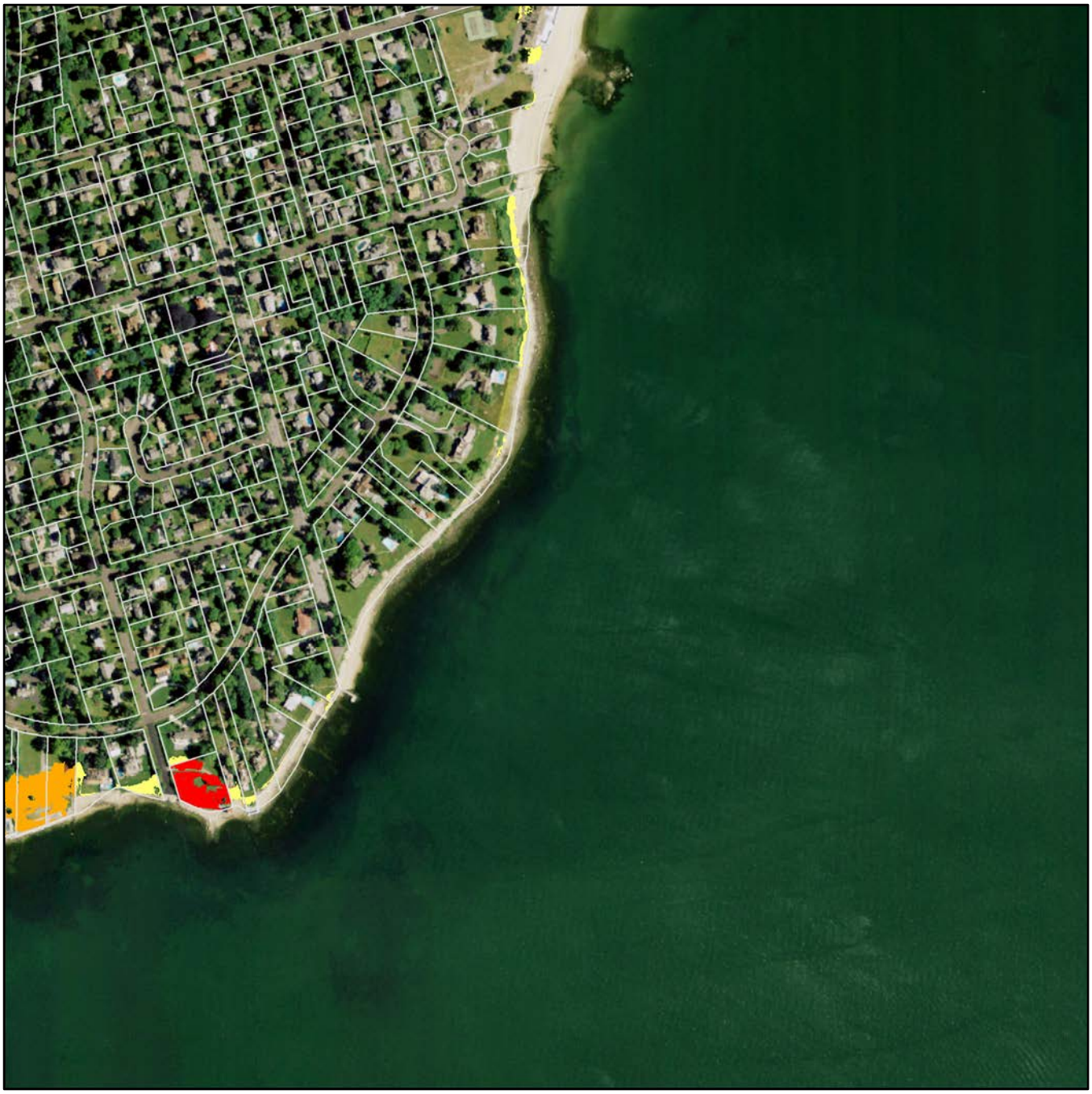


Feet
0 500 1,000 2,000

Marsh Advancement by the 2080s

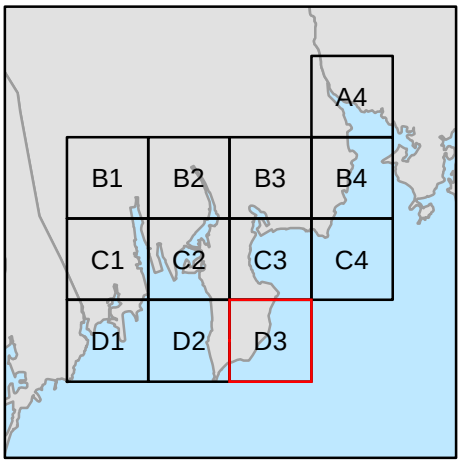
City of Stamford, CT

Advancement per Parcel - Map D3

Area of Suitable Advancement
- < 0.5 acres
- 0.5 - 1
- 1 - 2
- 2 - 5
- 5 - 20
- > 20 acres

N
W E
S

Note: Only Non-OS parcels with > 2 acres of suitable marsh advancement are shown.

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