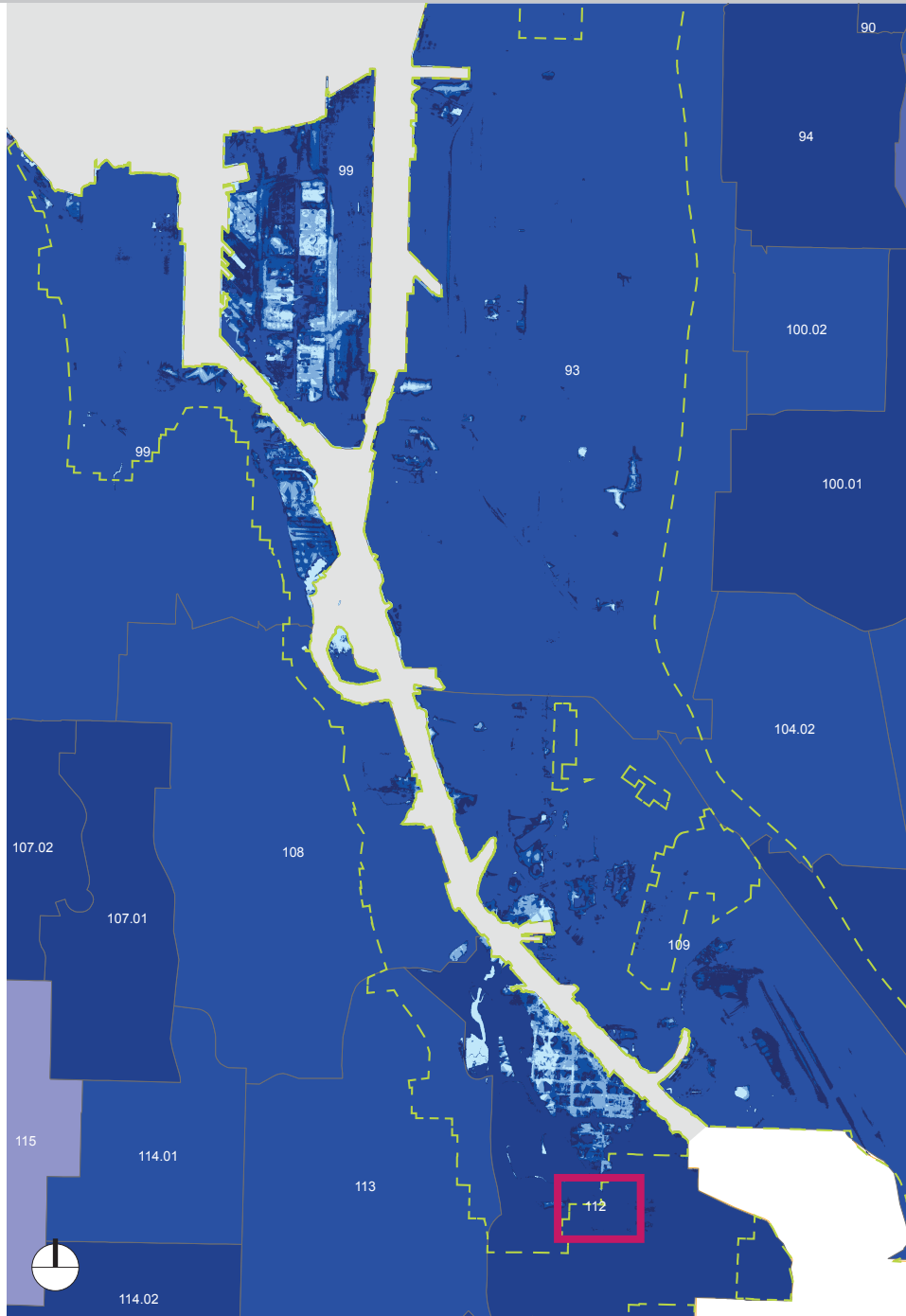


# FRONTLINE COMMUNITIES IMPACTS: Duwamish

The following pages graphically illustrate impacts to Frontline Communities on the enlarged map of the Duwamish by Social Variable & Census Tract.

The enlarged maps show all four water levels (2FT–5FT above MHHW) simultaneously.



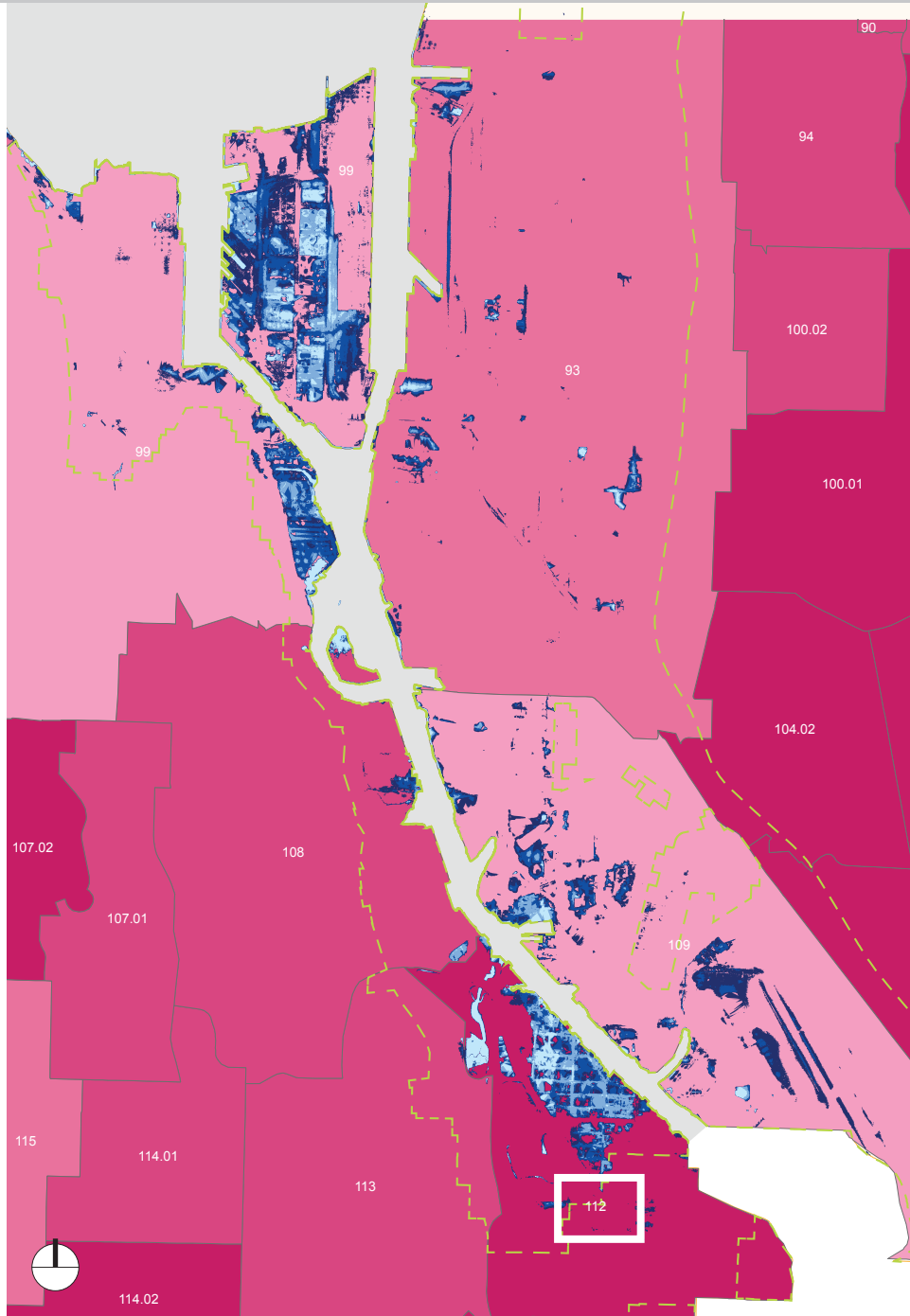


## SOCIOECONOMIC STATUS SUMMARY

| VULNERABILITY RANKING |          |          | IMPACTED CENSUS TRACT |                                      |
|-----------------------|----------|----------|-----------------------|--------------------------------------|
| Index                 | Category | Levels   | Total # Impacted      | Tract Names                          |
| Least                 | 1        | 0-18%    | 4                     | 15,56,97.01,121                      |
|                       | 2        | 19%-39%  | 9                     | 5,16,31,57,58.02,80.01,96,97.02*,116 |
|                       | 3        | 40%-59%  | 5                     | 14,32,71,80.02,106                   |
|                       | 4        | 60%-79%  | 6                     | 81,93,99,108,109,113                 |
| Most                  | 5        | 80%-100% | 3                     | 92,112,117                           |

The enlarged map of the Duwamish River area illustrates flood risk to census tracts 93, 99, 108, 109, 112, and 113. These tracts have a 60–100% vulnerability ranking for socioeconomic status in Seattle.

- Greater Duwamish Planning Area
- # Highest Overall Social Vulnerability Ranking (see pg 56)
- Impacted Area: 2FT above MHHW
- Impacted Area: 3FT above MHHW
- Impacted Area: 4FT above MHHW
- Impacted Area: 5FT above MHHW

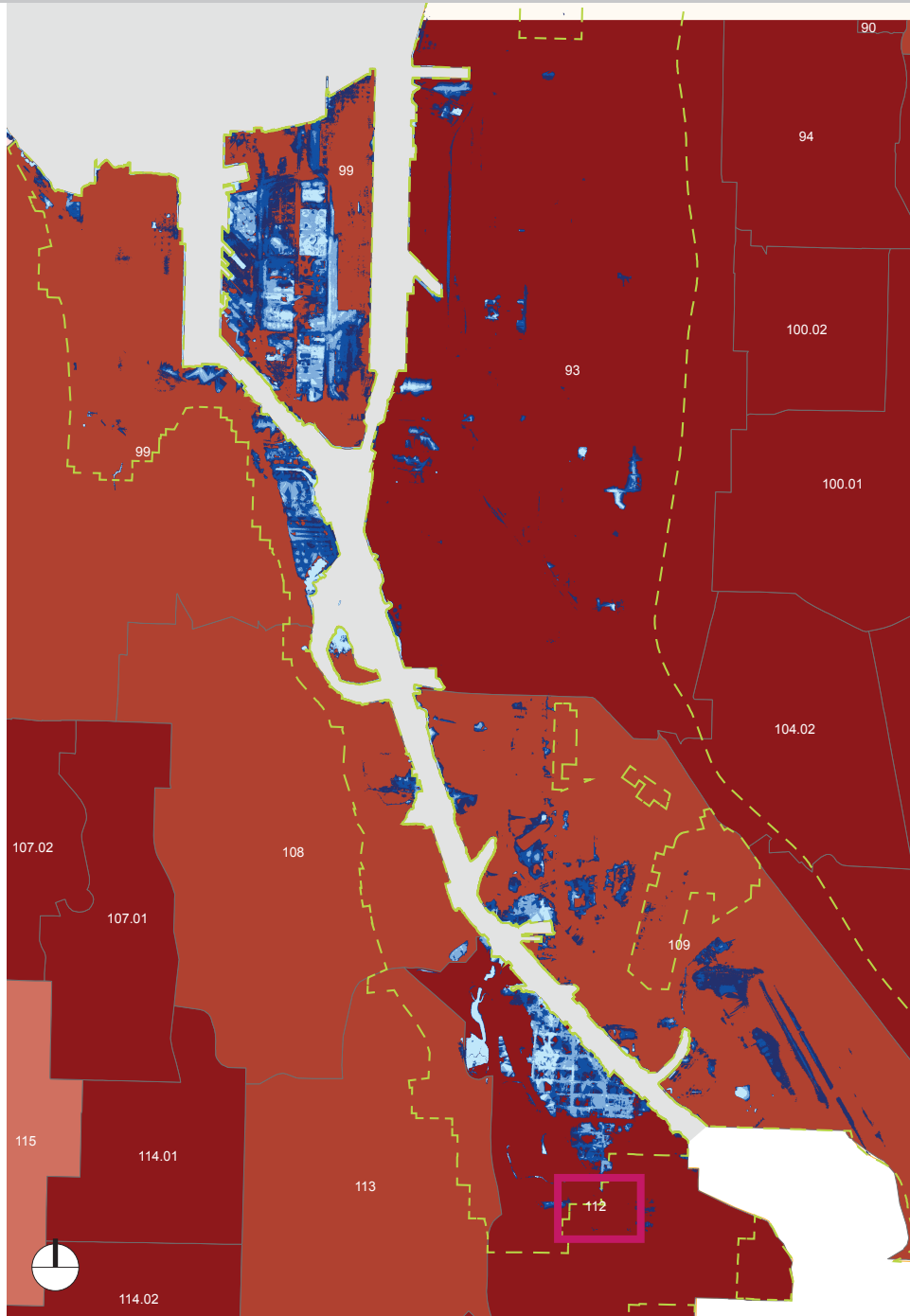


## HOUSEHOLD COMPOSITION/DISABILITY SUMMARY

| VULNERABILITY RANKING |          |          | IMPACTED CENSUS TRACT |                                 |
|-----------------------|----------|----------|-----------------------|---------------------------------|
| Index                 | Category | Levels   | Total # Impacted      | Tract Names                     |
| Least                 | 1        | 0-18%    | 3                     | 71,80.01,80.02                  |
|                       | 2        | 19%-39%  | 6                     | 32,58.02,81,92,99,109           |
|                       | 3        | 40%-59%  | 7                     | 14,15,31,93,96,97.01,106        |
|                       | 4        | 60%-79%  | 8                     | 5,56,57,97.02*, 108,113,116,121 |
| Most                  | 5        | 80%-100% | 3                     | 16, <b>112</b> , 117            |

The enlarged map of the Duwamish River area illustrates flood risk to census tracts 93, 99, 108, 109, 112, and 113. These tracts have a 19–100% vulnerability ranking for household composition and disability in Seattle.

- Greater Duwamish Planning Area
- # Highest Overall Social Vulnerability Ranking (see pg 56)
- Impacted Area: 2FT above MHHW
- Impacted Area: 3FT above MHHW
- Impacted Area: 4FT above MHHW
- Impacted Area: 5FT above MHHW



## MINORITY STATUS & LANGUAGE SUMMARY

| VULNERABILITY RANKING |          |          | IMPACTED CENSUS TRACT |                                    |
|-----------------------|----------|----------|-----------------------|------------------------------------|
| Index                 | Category | Levels   | Total # Impacted      | Tract Names                        |
| Least<br>↓            | 1        | 0-18%    | 9                     | 15,16,31,32,56,96,97.01,97.02*,116 |
|                       | 2        | 19%-39%  | 5                     | 5,71,80.01,106,121                 |
|                       | 3        | 40%-59%  | 5                     | 14,57,58.02,80.02,81               |
|                       | 4        | 60%-79%  | 4                     | 99,108,109,113                     |
| Most                  | 5        | 80%-100% | 4                     | 92,93,112,117                      |

The enlarged map of the Duwamish River area illustrates flood risk to census tracts 93, 99, 108, 109, 112, and 113. These tracts have a 60–100% vulnerability ranking for minority status and language in Seattle.

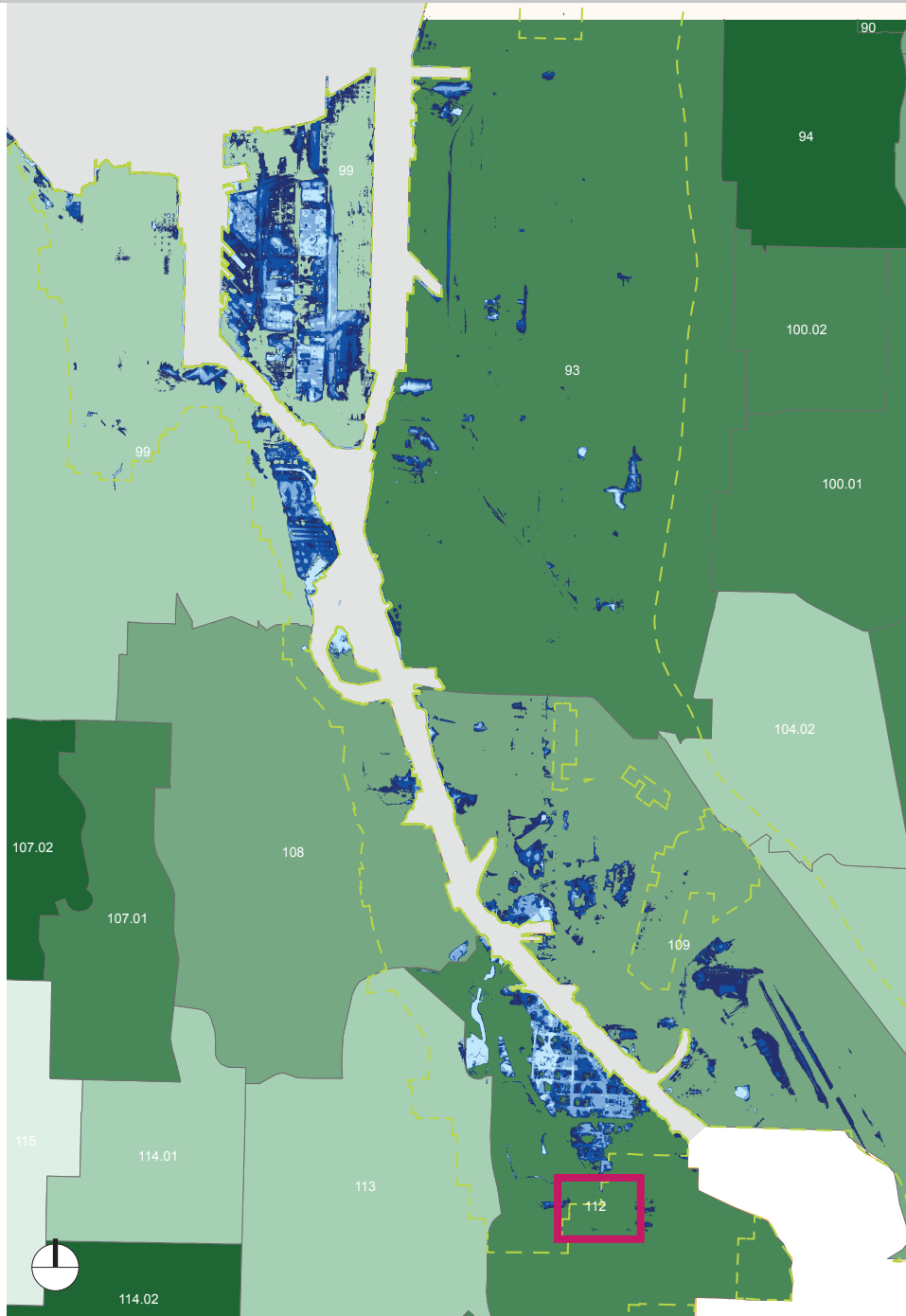
- Greater Duwamish Planning Area
- # Highest Overall Social Vulnerability Ranking (see pg 56)
- Impacted Area: 2FT above MHHW
- Impacted Area: 3FT above MHHW
- Impacted Area: 4FT above MHHW
- Impacted Area: 5FT above MHHW



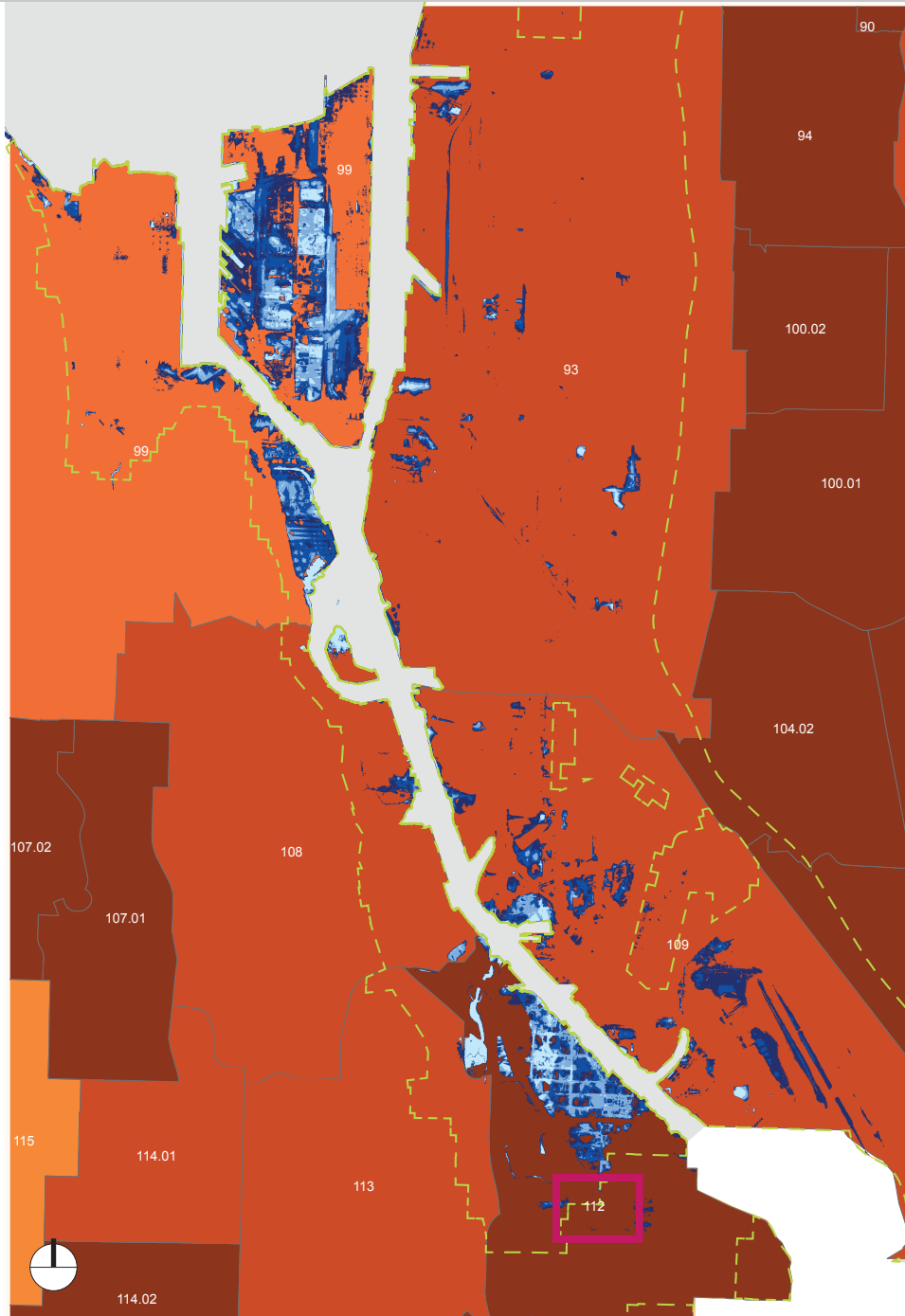
## HOUSING & TRANSPORTATION SUMMARY

| VULNERABILITY RANKING |          |          | IMPACTED CENSUS TRACT |                          |
|-----------------------|----------|----------|-----------------------|--------------------------|
| Index                 | Category | Levels   | Total # Impacted      | Tract Names              |
| ↓                     | 1        | 0-18%    | 7                     | 5,15,16,56,97.01,116,121 |
|                       | 2        | 19%-39%  | 6                     | 32,57,97.02*,99,106,113  |
|                       | 3        | 40%-59%  | 6                     | 14,31,58.02,96,108,109   |
|                       | 4        | 60%-79%  | 3                     | 93,112,117               |
| Most                  | 5        | 80%-100% | 5                     | 71,80.01,80.02,81,92     |

The enlarged map of the Duwamish River area illustrates flood risk to census tracts 93, 99, 108, 109, 112, and 113. These tracts have a 19–100% vulnerability ranking for housing and transportation in Seattle.



- Greater Duwamish Planning Area
- # Highest Overall Social Vulnerability Ranking (see pg 56)
- Impacted Area: 2FT above MHHW
- Impacted Area: 3FT above MHHW
- Impacted Area: 4FT above MHHW
- Impacted Area: 5FT above MHHW



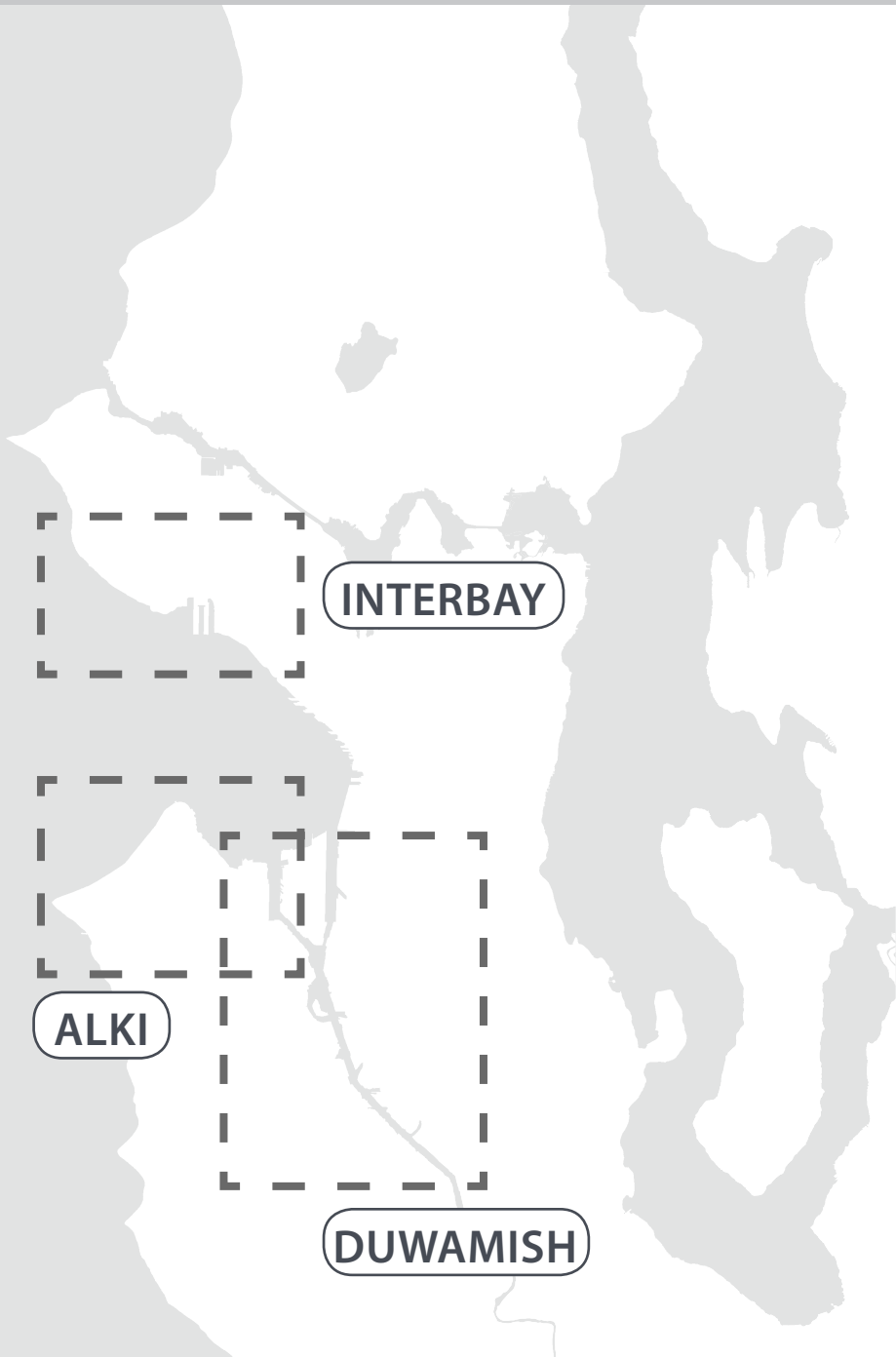
## OVERALL RANKING SUMMARY

| VULNERABILITY RANKING |          |          | IMPACTED CENSUS TRACT |                                     |
|-----------------------|----------|----------|-----------------------|-------------------------------------|
| Index                 | Category | Levels   | Total # Impacted      | Tract Names                         |
| Least                 | 1        | 0-18%    | 5                     | 15,56,97.01,116,121                 |
|                       | 2        | 19%-39%  | 9                     | 5,16,31,32,57,58.02,71,80.01,97.02* |
|                       | 3        | 40%-59%  | 5                     | 14,80.02,96,99,106                  |
|                       | 4        | 60%-79%  | 5                     | 81,93,108,109,113                   |
| Most                  | 5        | 80%-100% | 3                     | 92,112,117                          |

The enlarged map of the Duwamish River area illustrates flood risk to census tracts 93, 99, 108, 109, 112, and 113. These tracts have a 40–100% overall vulnerability ranking in Seattle.

- Greater Duwamish Planning Area
- # Highest Overall Social Vulnerability Ranking (see pg 56)
- Impacted Area: 2FT above MHHW
- Impacted Area: 3FT above MHHW
- Impacted Area: 4FT above MHHW
- Impacted Area: 5FT above MHHW

# FOCUS AREAS IMPACTS



The following pages zoom in on the Citywide maps (shown on pages 9–12), to illustrate impacts in the three most impacted areas of the city. Focus areas include:

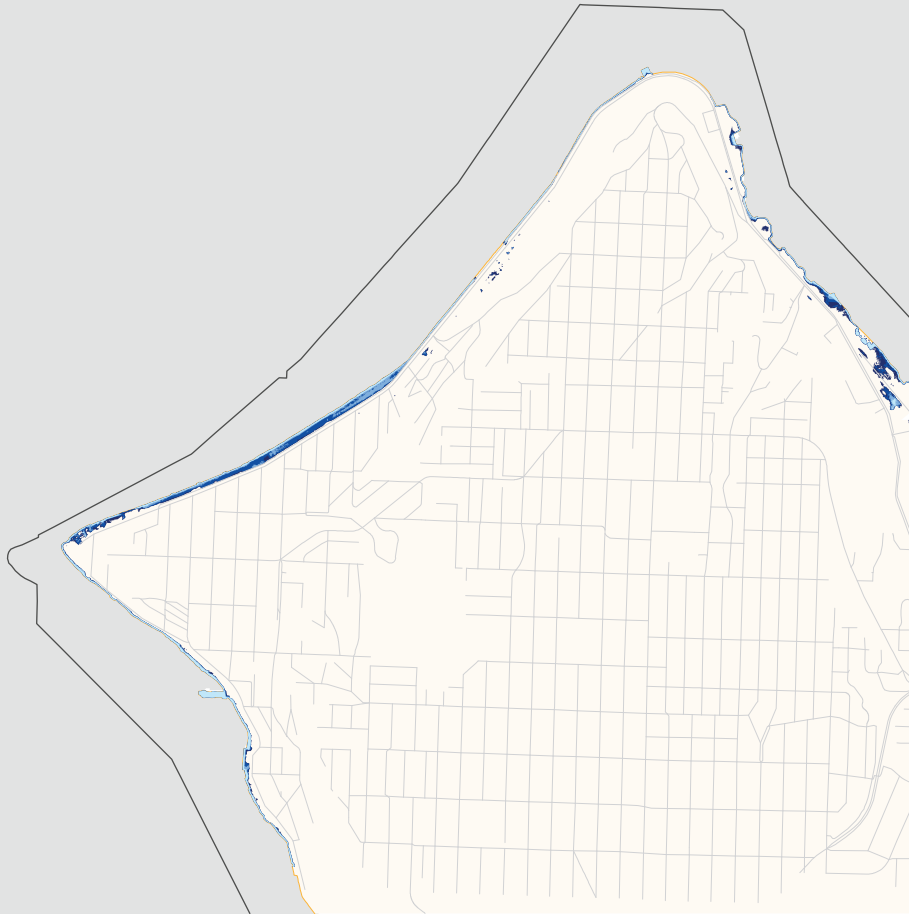
- ALKI
- INTERBAY
- DUWAMISH

Each map shows all four water levels (2FT through 5FT above MHHW) at once to show total projected impacts.

Note: Unlike the Citywide maps, these maps are not at the same scale to one another; they are scaled to fit on the page as appropriate.

This enlarged view of the Alki region highlights total impacts for water levels: 2, 3, 4, and 5 feet above MHHW. Darker blue areas indicate higher sea level rise as described in the key below.

Citywide impacts are summarized in the preceding sections.



- Seattle Land Area
- Seattle City Limits (Political Boundary)
- Water Body & Streams
- Streets
- Impacted Area: 2FT above MHHW
- Impacted Area: 3FT above MHHW
- Impacted Area: 4FT above MHHW
- Impacted Area: 5FT above MHHW

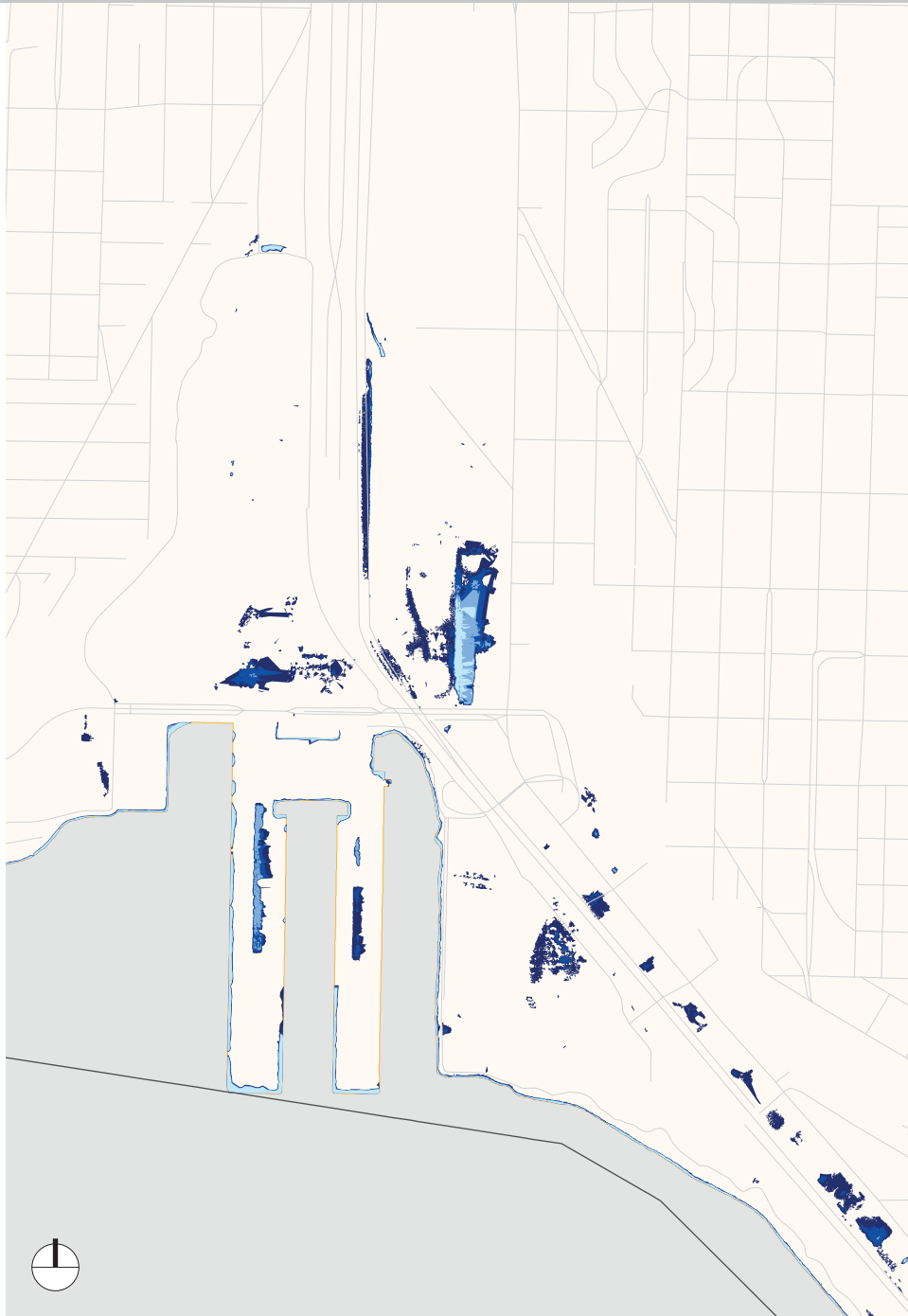
# FOCUS AREA IMPACTS: Interbay

# 2-5FT

ABOVE MHHW

This enlarged view of the Interbay region highlights total impacts for water levels: 2, 3, 4, and 5 feet above MHHW. Darker blue areas indicate higher sea level rise as described in the key below.

Citywide impacts are summarized in the preceding sections.

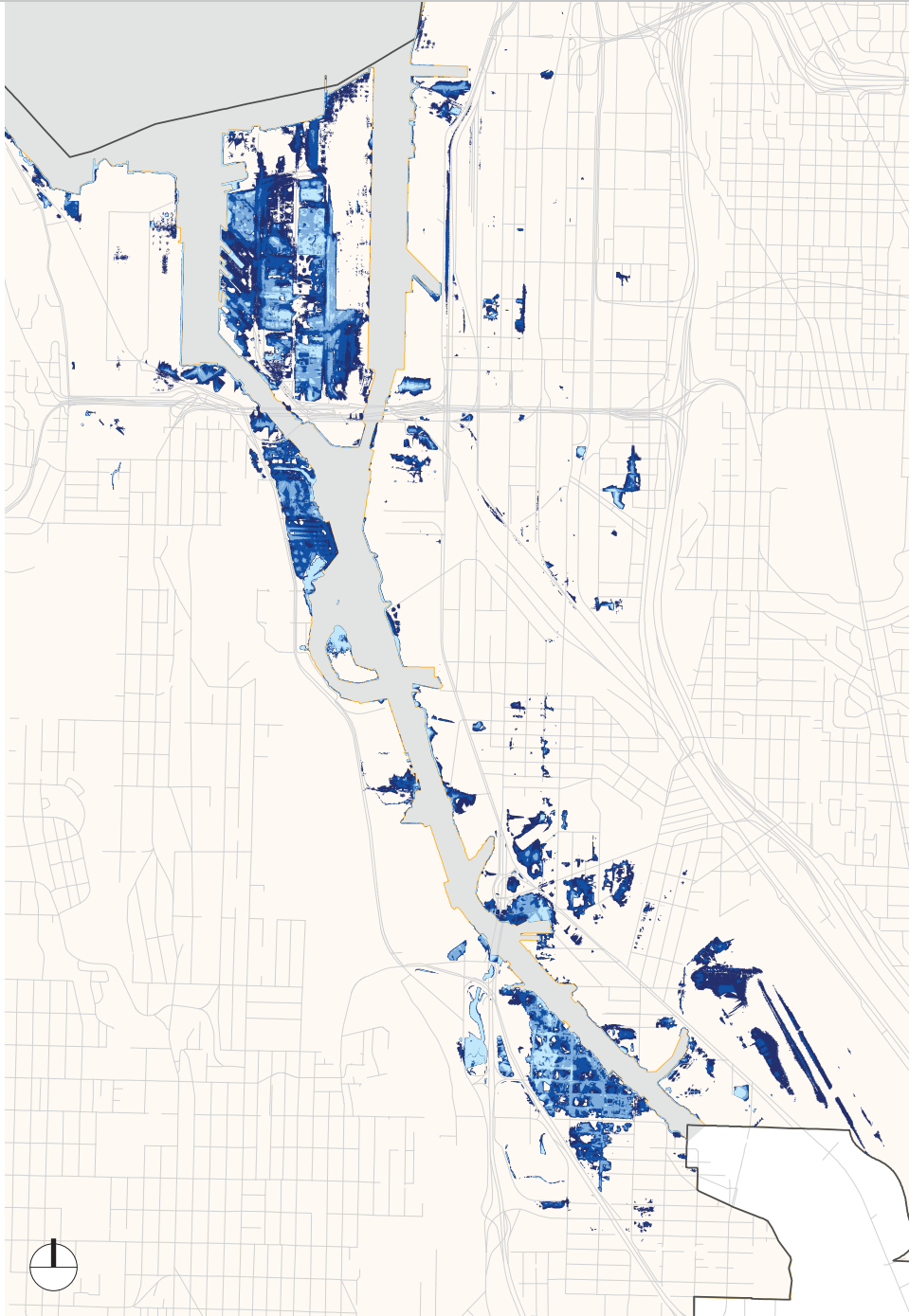


- Seattle Land Area
- Seattle City Limits (Political Boundary)
- Water Body & Streams
- Streets
- Impacted Area: 2FT above MHHW
- Impacted Area: 3FT above MHHW
- Impacted Area: 4FT above MHHW
- Impacted Area: 5FT above MHHW

# FOCUS AREA IMPACTS: Duwamish

# 2-5FT

ABOVE MHHW



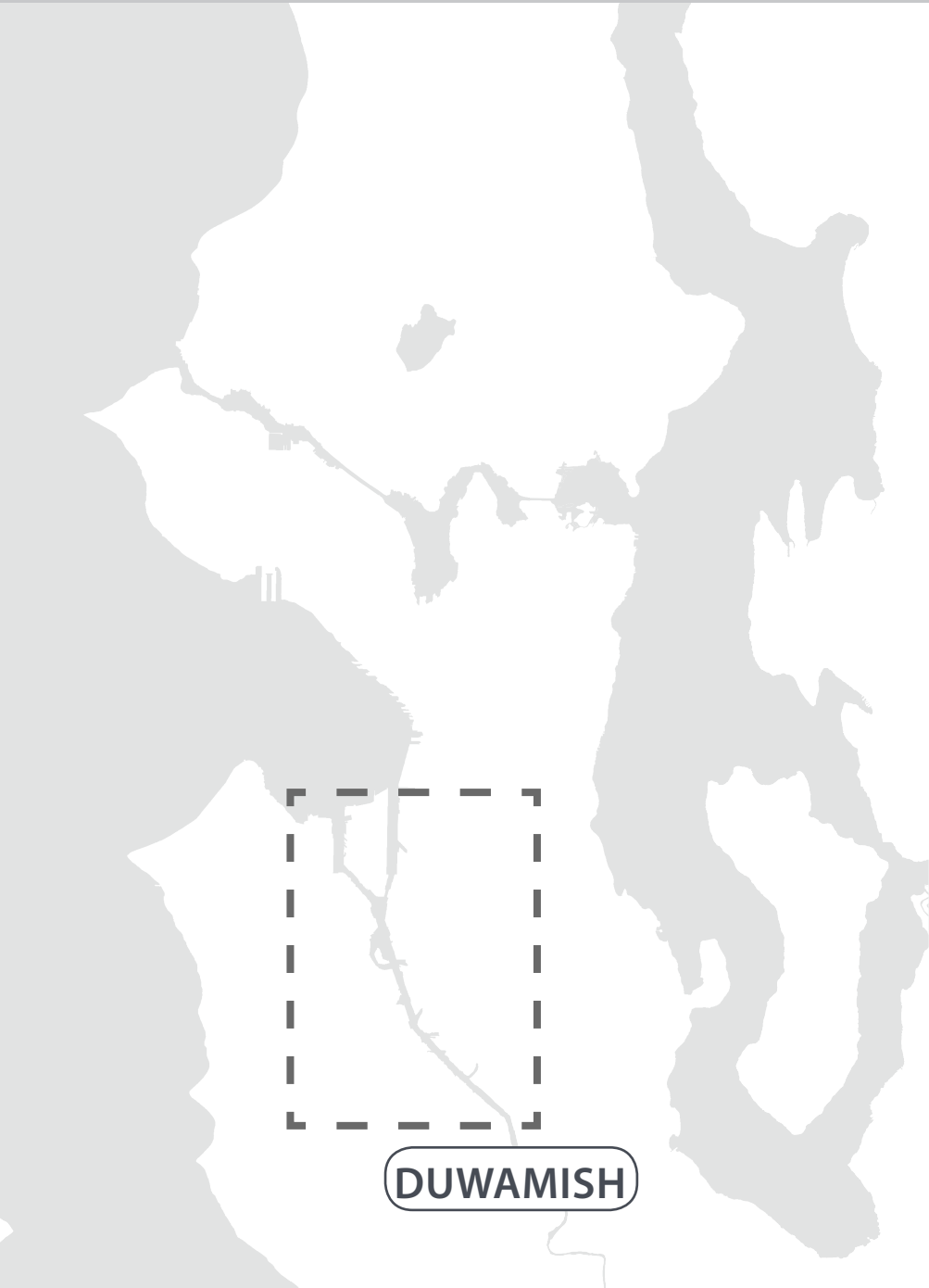
This enlarged view of the Duwamish highlights total impacts for water levels: 2, 3, 4, and 5 feet above MHHW. Darker blue areas indicate higher sea level rise as described in the key below.

Citywide impacts are summarized in the preceding sections.

- Seattle Land Area
- Seattle City Limits (Political Boundary)
- Water Body & Streams
- Streets
- Impacted Area: 2FT above MHHW
- Impacted Area: 3FT above MHHW
- Impacted Area: 4FT above MHHW
- Impacted Area: 5FT above MHHW

# APPENDIX

# IMPACTS TO DUWAMISH

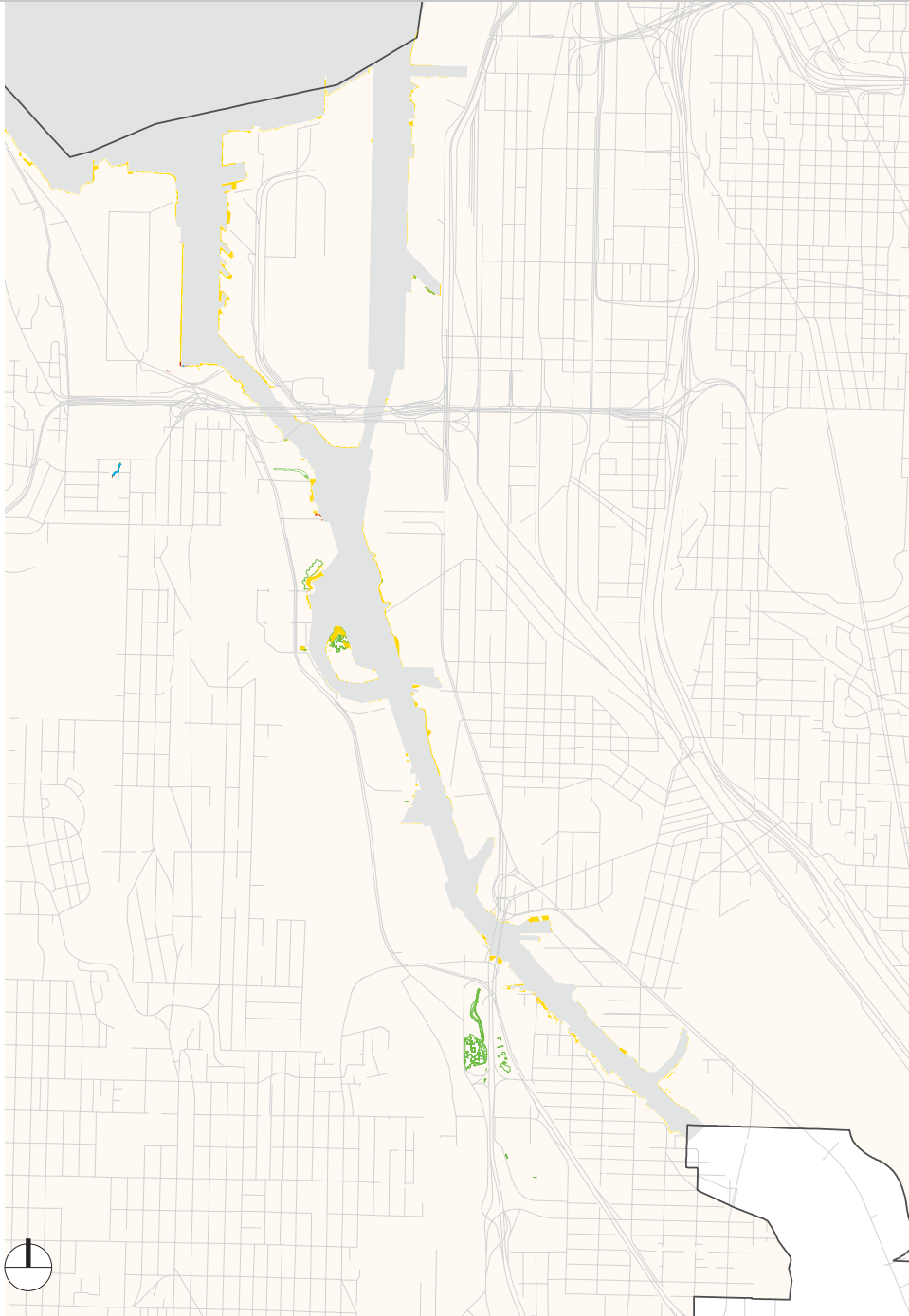


The following pages graphically illustrate impacts on the enlarged map of the Duwamish by study area category for water levels 2 feet above MHHW. The 2ft level is highlighted because it greatly impacts the Duwamish now at an annual frequency and in the 2060 scenario at a daily frequency.

A summary of baseline and impacted areas are not included in the scope of this mapping inventory, but can be easily accessed in the GIS files and are recommended for future evaluation.

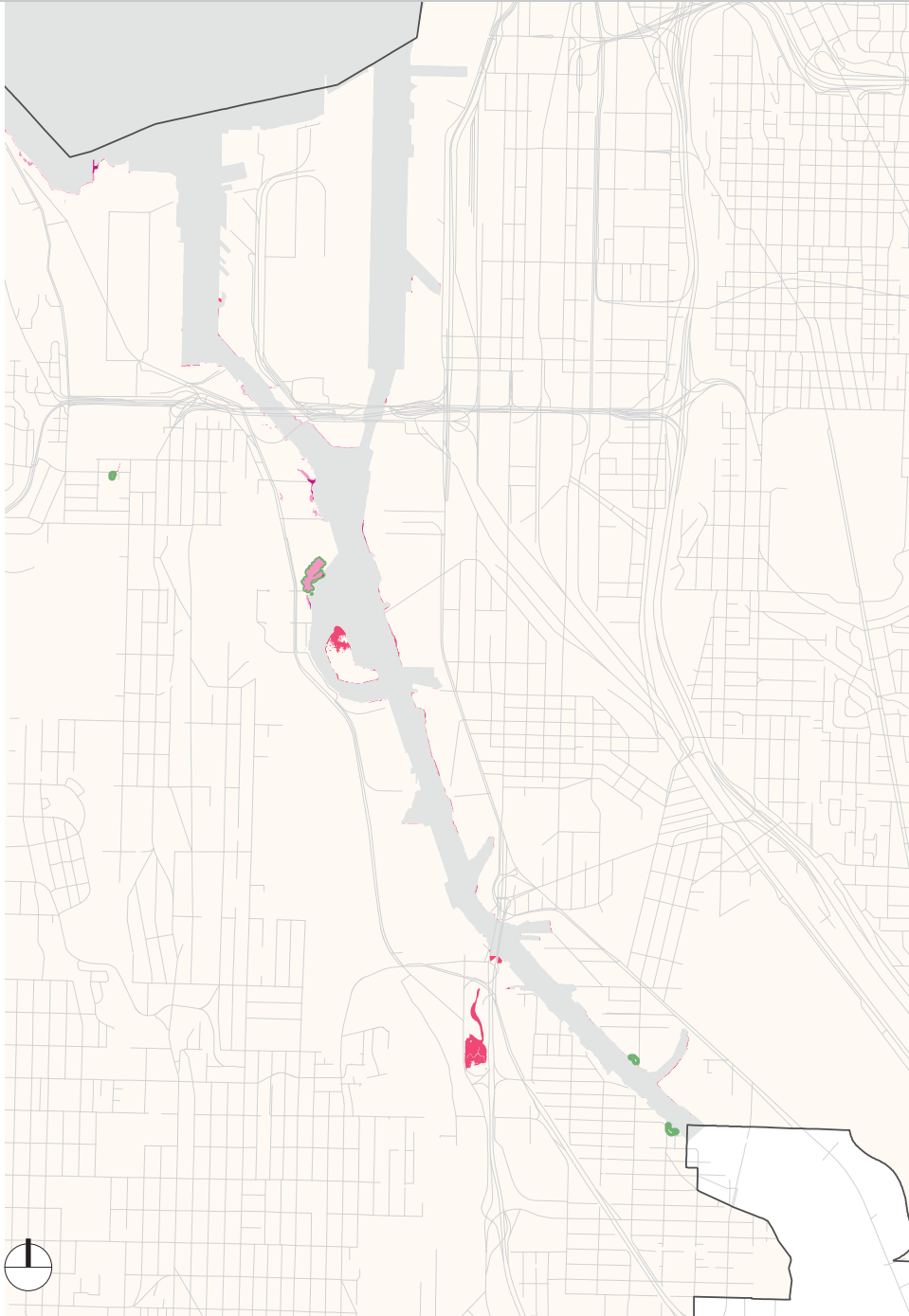


# DUWAMISH: Aquatic Critical Areas Impacts



| Year of Occurrence: FREQUENCY<br><b>Now: ANNUALLY</b><br><b>2035: MONTHLY</b><br><b>2060: DAILY</b> |  | <h1>2FT</h1><br>ABOVE MHHW        |  |
|---|--|-----------------------------------|--|
| KEY   | GIS SHAPEFILE                            |                                   |  |
|   | Seattle Land Area                        | City_of_Seattle                   |  |
|   | Seattle City Limits (Political Boundary) | SeattleLimits                     |  |
|   | Water Body & Streams                     | n/a (negative of City_of_Seattle) |  |
|   | Streets                                  | StreetNetworkDatabase             |  |
| CRITICAL AREAS  |  |                                   |  |
| Aquatic Critical Areas  |  |                                   |  |
|   | Riparian Corridors                       | SLR11_RiparianSeattleLimits       |  |
|   | Wetlands                                 | SLR11_WetlandsSeattleLimits       |  |
|   | Shoreline Buffer                         | SLR11_ShorelineHabitatSeattleLim  |  |
|   | Streams                                  | SLR11_StreamsLandOnly             |  |

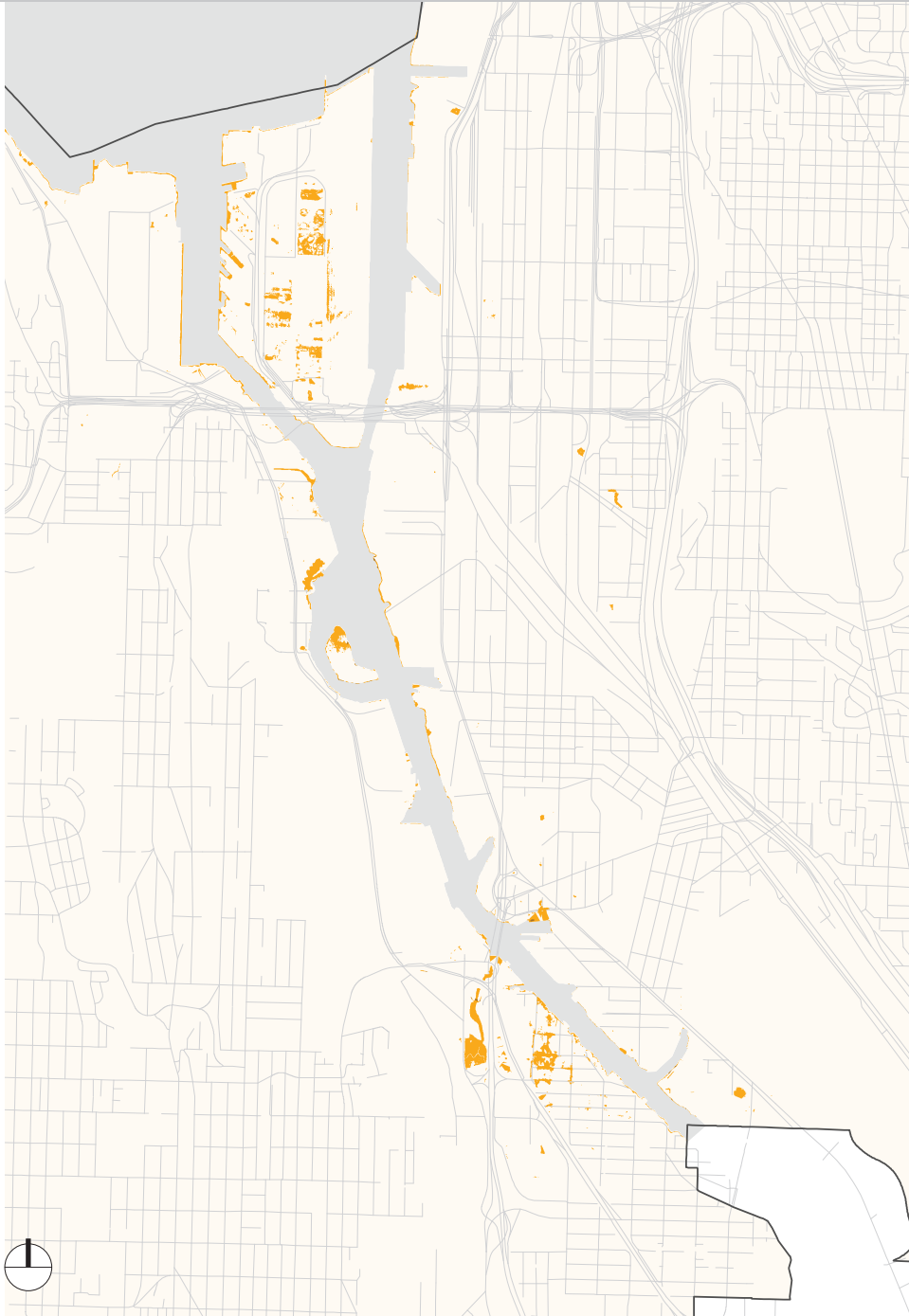
# DUWAMISH: Habitat & Parks Impacts



| Year of Occurrence: FREQUENCY<br><b>Now: ANNUALLY</b><br><b>2035: MONTHLY</b><br><b>2060: DAILY</b> |                                   | <h1>2FT</h1> <p>ABOVE MHHW</p> |
|---|-----------------------------------|--------------------------------|
| KEY   | GIS SHAPEFILE                     |                                |
| Seattle Land Area   | City_of_Seattle                   |                                |
| Seattle City Limits (Political Boundary)  | SeattleLimits                     |                                |
| Water Body & Streams  | n/a (negative of City_of_Seattle) |                                |
| Streets   | StreetNetworkDatabase             |                                |
| <b>CRITICAL AREAS</b>   |                                   |                                |
| <i>Habitat &amp; Parks</i>  |                                   |                                |
| PHS-Biodiversity Area/Corr, Eagle   |                                   |                                |
| Eagle Mngmt Area  |                                   |                                |
| PHS-Biodiversity Area/Corr  |                                   |                                |
| Parks   |                                   | SLR11_Parks_SeattleLimits      |



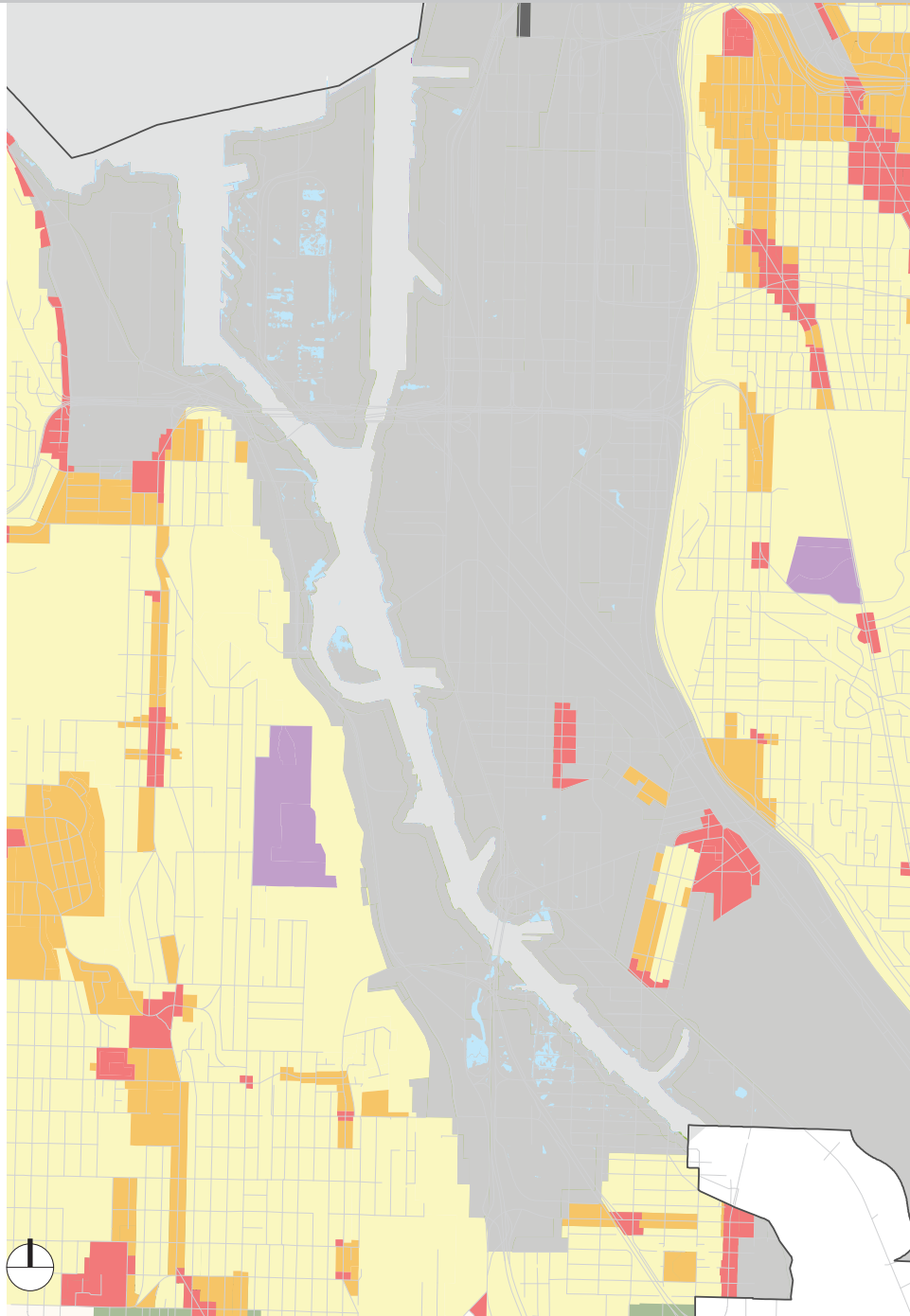
# DUWAMISH: Soils Impacts



| Year of Occurrence: FREQUENCY<br><b>Now: ANNUALLY</b><br><b>2035: MONTHLY</b><br><b>2060: DAILY</b>             |  | <h1>2FT</h1> <p>ABOVE MHW</p>     |
|---|--|-----------------------------------|
| KEY   |  | GIS SHAPEFILE                     |
|   | Seattle Land Area                        | City_of_Seattle                   |
|   | Seattle City Limits (Political Boundary) | SeattleLimits                     |
|   | Water Body & Streams                     | n/a (negative of City_of_Seattle) |
|   | Streets                                  | StreetNetworkDatabase             |
| CRITICAL AREAS  |  |                                   |
| Soils   |  |                                   |
|   | Peat Settlement Prone Areas              | SLR11_LiquefactionArea            |
|   | Liquefaction Prone Areas                 |                                   |
|   | Geologic Hazard Areas <sup>1</sup>       |                                   |
| <i>1. Geologic Hazard Areas include known slide areas, potential slide areas, and steep slope erosion areas</i> |  |                                   |



# DUWAMISH: Zoned Use Impacts



| Year of Occurrence: <b>FREQUENCY</b>     |                                   | <h1>2FT</h1> <p>ABOVE MHW</p> |
|--|-----------------------------------|-------------------------------|
| <b>Now: ANNUALLY</b>                     |                                   |                               |
| <b>2035: MONTHLY</b>                     |                                   |                               |
| <b>2060: DAILY</b>                       |                                   |                               |
| KEY                                      | GIS SHAPEFILE                     |                               |
| Seattle Land Area                        | City_of_Seattle                   |                               |
| Seattle City Limits (Political Boundary) | SeattleLimits                     |                               |
| Water Body & Streams                     | n/a (negative of City_of_Seattle) |                               |
| Streets                                  | StreetNetworkDatabase             |                               |
| Inundated Area: 2FT of Sea Level Rise    | SLR_11                            |                               |
| LAND USE                                 |                                   |                               |
| Zoned Use                                |                                   |                               |
| Single Family                            | Zoning_Land                       |                               |
| Multi-Family                             | Zoning_Land                       |                               |
| Neighborhood/Res. Commercial             | Zoning_Land                       |                               |
| Downtown                                 | Zoning_Land                       |                               |
| Industrial Areas                         | Zoning_Land                       |                               |
| Master Planned Community                 | Zoning_Land                       |                               |
| Major Institutions                       | Zoning_Land                       |                               |

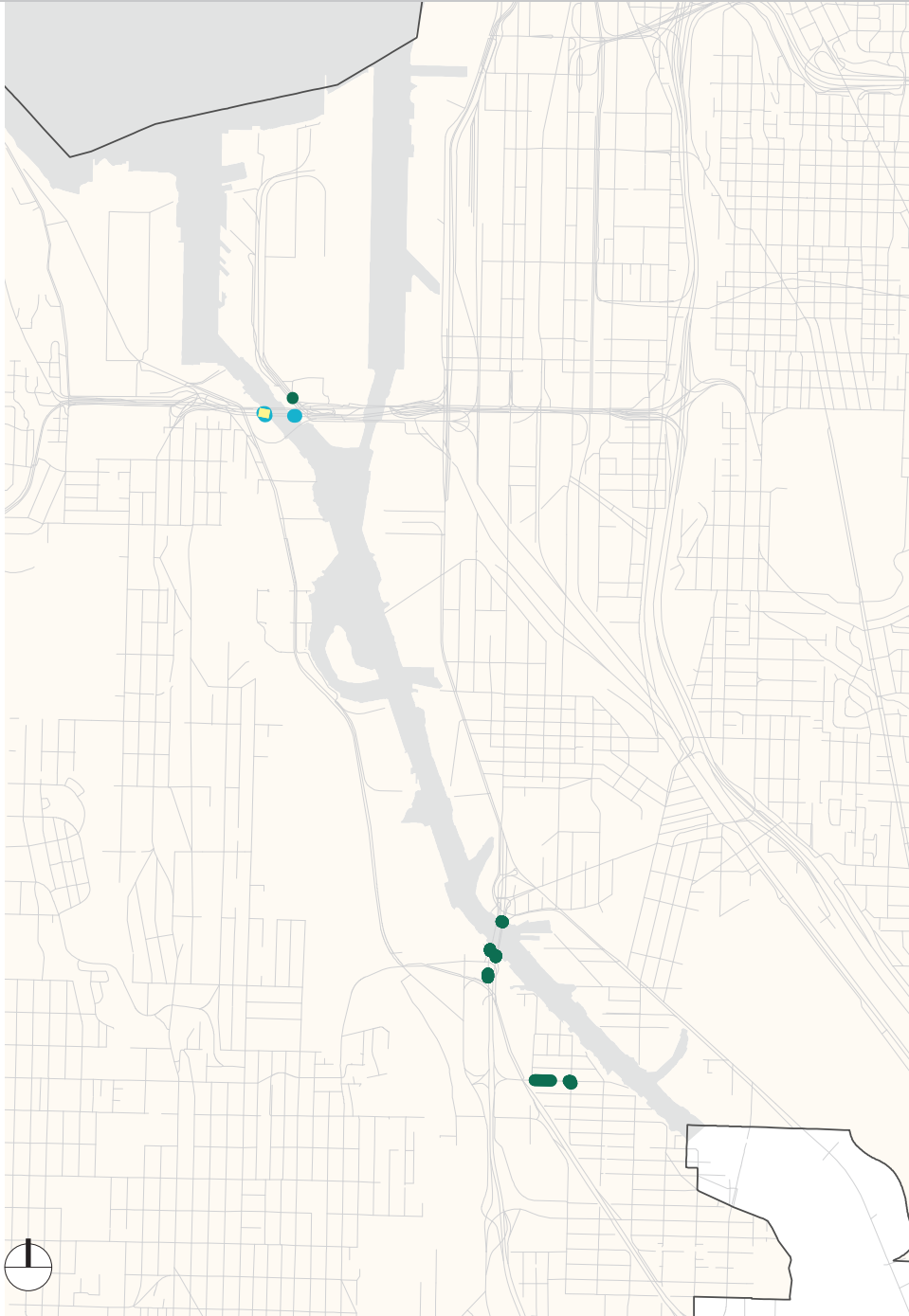


# DUWAMISH: Planning Areas Impacts



| <i>Year of Occurrence:</i> <b>FREQUENCY</b>   |  | <h1>2FT</h1> <p>ABOVE MHW</p>            |
|---|--|--|
| <b>Now: ANNUALLY</b>  |  |  |
| <b>2035: MONTHLY</b>  |  |  |
| <b>2060: DAILY</b>  |  |  |
| KEY   |  | GIS SHAPEFILE                            |
|   | Seattle Land Area                        | <i>City_of_Seattle</i>                   |
|   | Seattle City Limits (Political Boundary) | <i>SeattleLimits</i>                     |
|   | Water Body & Streams                     | <i>n/a (negative of City_of_Seattle)</i> |
|   | Streets                                  | <i>StreetNetworkDatabase</i>             |
|   | Inundated Area: 2FT of Sea Level Rise    | <i>SLR_11</i>                            |
| LAND USE  |  |  |
| Planning Areas  |  |  |
|   | GREATER DUWAMISH                         | <i>UrbanVillages_Land</i>                |
|   | PIONEER SQUARE                           | <i>UrbanVillages_Land</i>                |
|   | SOUTH PARK                               | <i>UrbanVillages_Land</i>                |
|   | Other Planning Areas (Unimpacted)        | <i>UrbanVillages_Land</i>                |
| <i>Planning Areas include urban centers, villages, manufacturing and industrial centers</i> |  |  |

# DUWAMISH: Transit Impacts

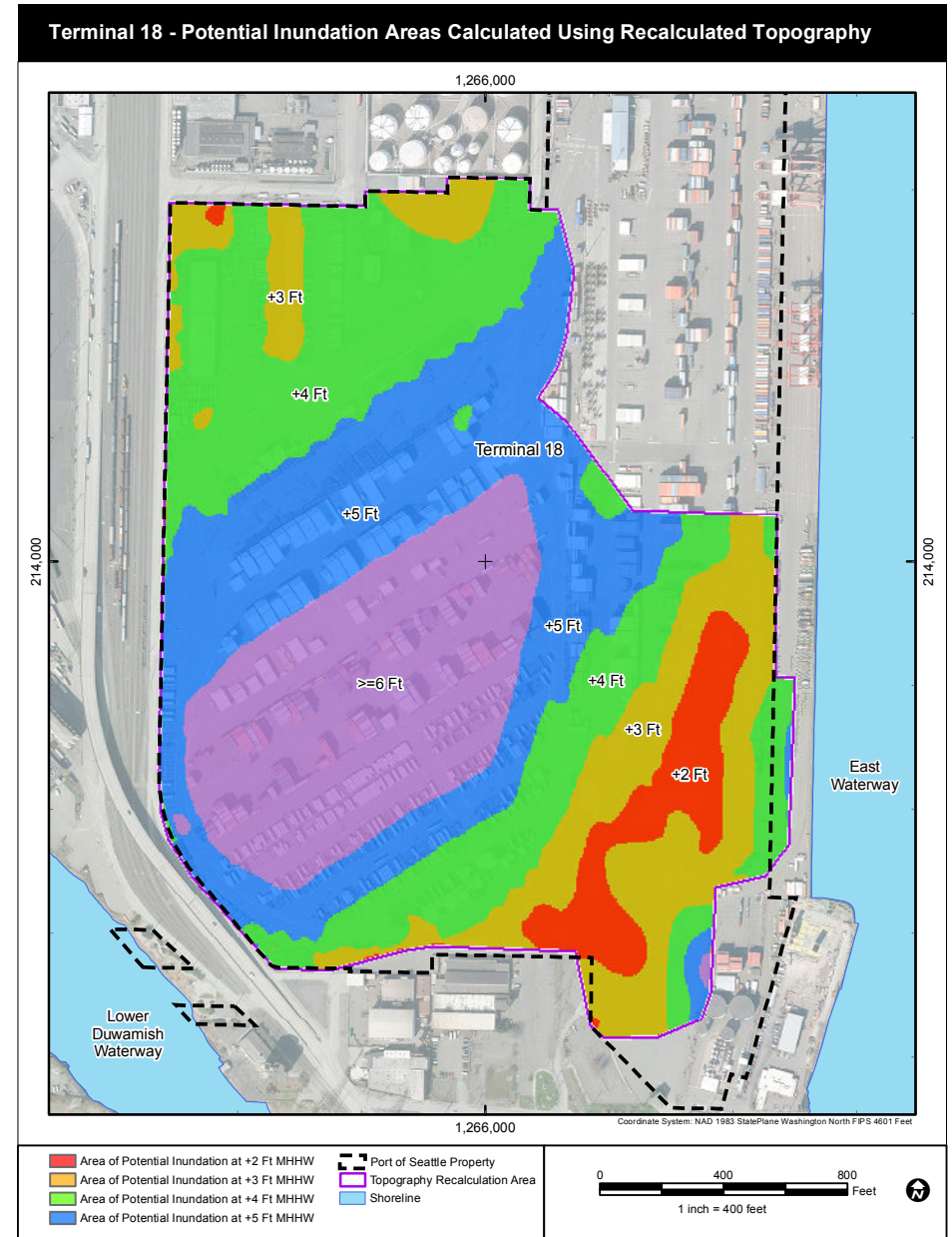


|   |  |                                   |
|---|--|-----------------------------------|
| Year of Occurrence: FREQUENCY<br><b>Now: ANNUALLY</b><br><b>2035: MONTHLY</b><br><b>2060: DAILY</b> |  | <h1>2FT</h1><br>ABOVE MHHW        |
| <b>KEY</b>  |  |                                   |
|   | Seattle Land Area                        | City_of_Seattle                   |
|   | Seattle City Limits (Political Boundary) | SeattleLimits                     |
|   | Water Body & Streams                     | n/a (negative of City_of_Seattle) |
|   | Streets                                  | StreetNetworkDatabase             |
| <b>TRANSPORTATION</b>   |  |                                   |
| <i>Transit</i>  |  |                                   |
|   | Bus Stops                                | SLR11_Bus Stops                   |
|   | Bus Routes                               | SLR11_Bus Routes                  |
|   | TMP Priority Corridor                    | SLR11_TMPPC                       |
|   | Frequent Transit Corridor (LF)           | SLR11_Freq Transit                |





# PORT OF SEATTLE TERMINAL-18: Adjusted Inundation



See page 1 Assessment as Screening Tool | Case Study: Port of Seattle

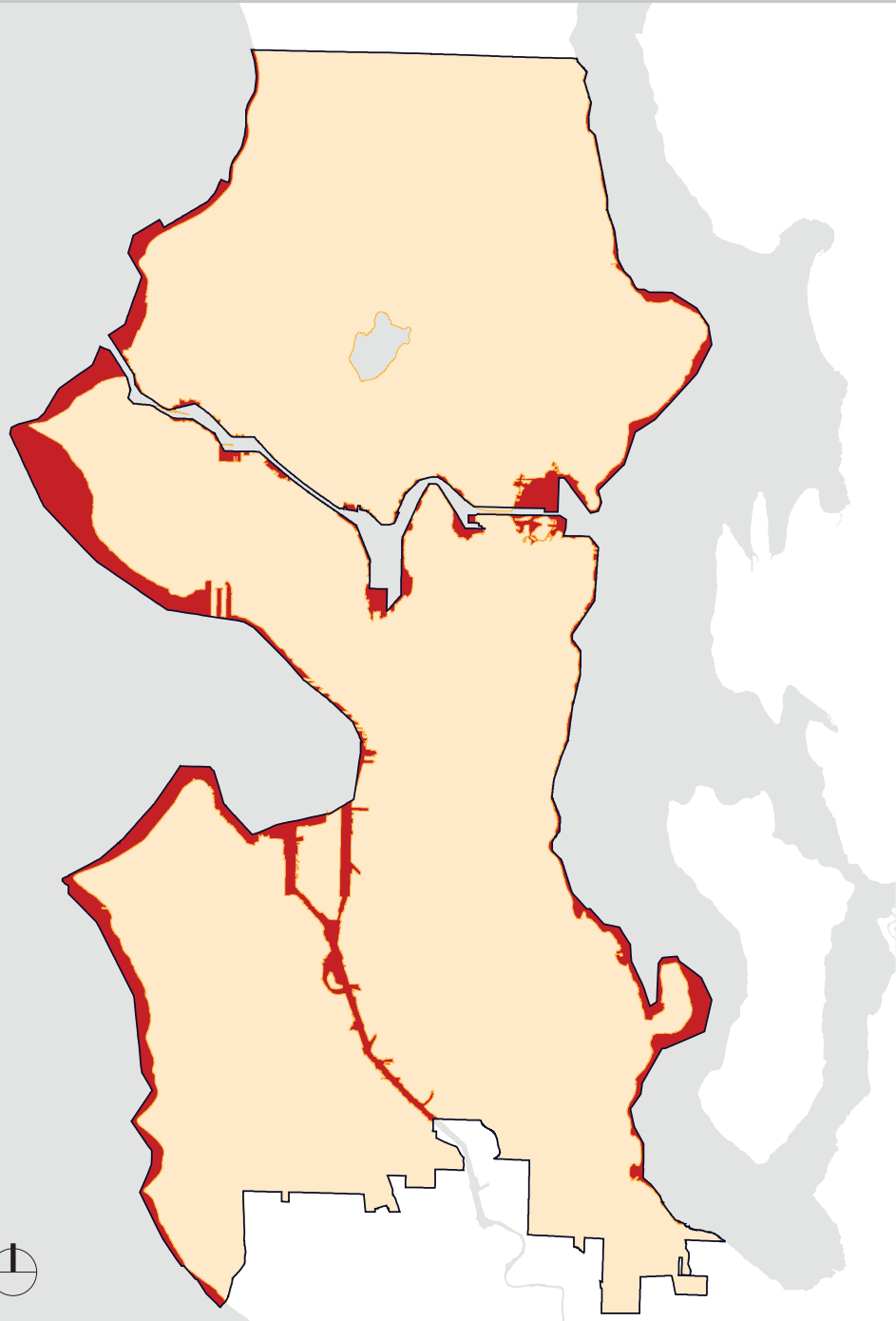
# METHODOLOGY

The following pages detail the mapping inventory methodology.





# METHODOLOGY: Project Boundary



## PROJECT BOUNDARY & EXCLUDED AREA CLIP

An important part of the overall methodology has been to identify the correct project boundary from which to measure affected areas and set a consistent baseline. The "City\_of\_Seattle" GIS data layer was selected as the project boundary, with the assumption that its edges represent the current day *shoreline* and approximately correlate to the City's official vertical datum of NAVD88. All analyzed data were clipped to this boundary prior to overlaying sea level rise inundation areas.

This was important to do, since some City GIS data layers extend across the shoreline into Puget Sound and other water bodies, with many extending to the political boundary of the "City Limits" (and a few even beyond that line). To prevent calculating sea level rise impacts to those areas that are already in the water, or submerged, they were removed from each study category area's total area from the start.<sup>1</sup>

For example, before clipping to the set project boundary, the total acres found for urban center villages in the "DPD\_uvmfg\_polygon" GIS layer is 16,574 acres; afterwards it is 15,307 acres, which is the baseline area for this land use category.<sup>2</sup> While this "submerged" versus "shoreline" issue is not readily visible on a citywide map (shown on the left of this page), GIS has the capacity to zoom in on target areas to easily identify the issue.

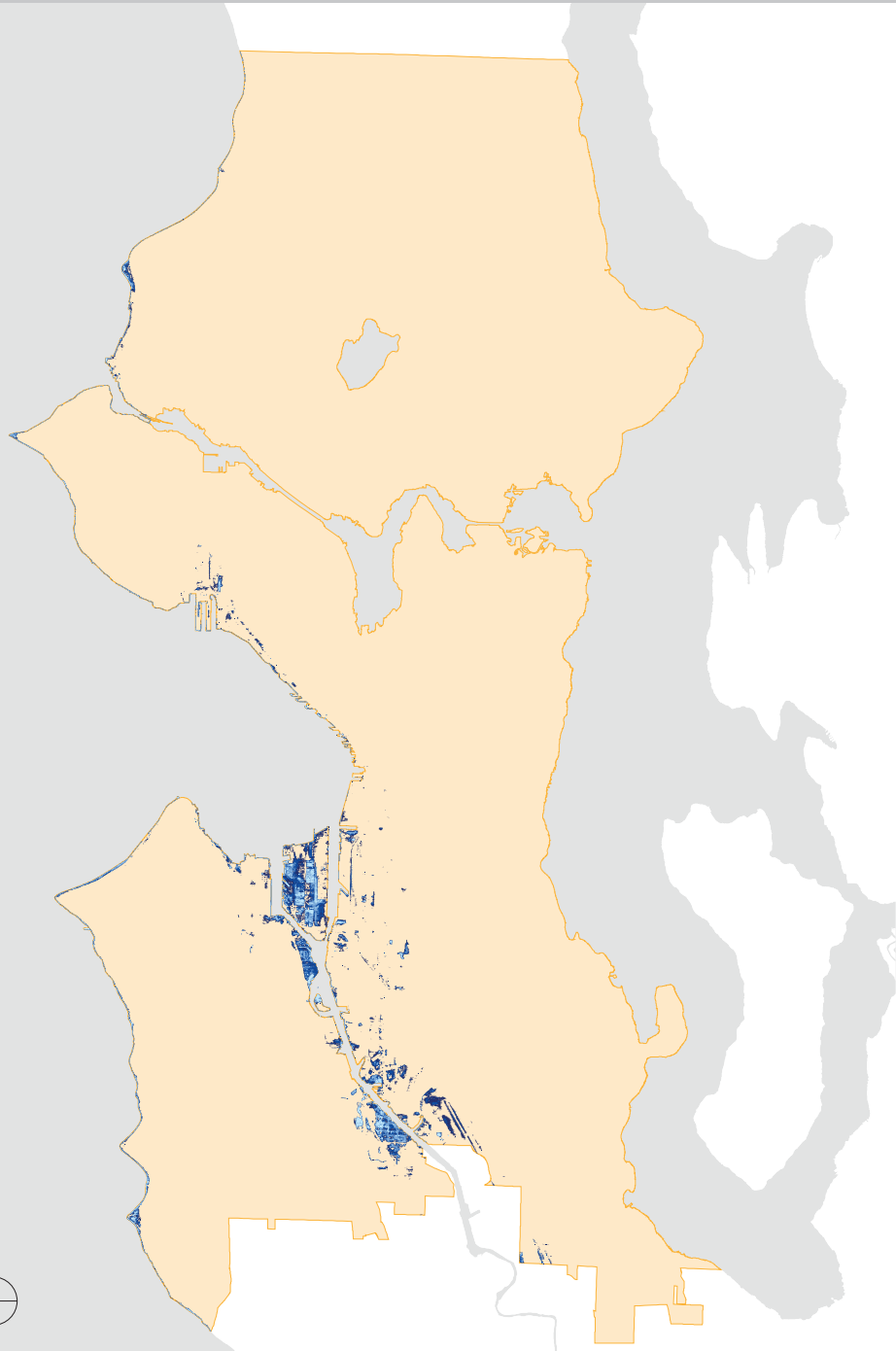
<sup>1</sup> For record keeping, these excluded areas were tracked and accounted for under a separate "Submerged" category of the City\_of\_Seattle.shp layer.

<sup>2</sup> See land use and other categories in the Table of Contents pg iii.

| KEY                                      | GIS Shapefile                |
|--|------------------------------|
| Seattle Land Area                        | City_of_Seattle              |
| Seattle City Limits (Political Boundary) | SeattleLimits                |
| Other Land outside City                  | OtherLand                    |
| Water Body & Streams                     | n/a                          |
| Excluded Area (aka "Submerged")          | n/a (Area b/w Land & Limits) |



# METHODOLOGY: Quantifying Impact Areas



## QUANTIFYING IMPACT BY AREA

Sea Level Rise projections were provided by Seattle Public Utilities (GIS shapefiles SLR\_11, SLR\_12, SLR\_13, SLR\_14).

To determine the impacts of sea level rise on Seattle Land Use, the areas of projected inundation are overlaid over the City's land area, which produces a quantifiable area-of-impact to known critical areas and land use areas such as wetlands, shoreline habitat, multifamily zones, planning areas and arterials.

Uncertainties present in GIS data, software, and climate projections should be considered when evaluating the accuracy of the results. The City and its consultants assume no liability in the use of this information.

| KEY   | GIS Shapefile   |
|---|-----------------|
| Seattle Land Area                           | City_of_Seattle |
| Other Land outside City                     | OtherLand       |
| Water Body & Streams                        | n/a             |
| Impacted Area: 2FT ABOVE MHHW (11FT NAVD88) | SLR_11          |
| Impacted Area: 3FT ABOVE MHHW (12FT NAVD88) | SLR_12          |
| Impacted Area: 4FT ABOVE MHHW (13FT NAVD88) | SLR_13          |
| Impacted Area: 5FT ABOVE MHHW (14FT NAVD88) | SLR_14          |