

Mobile Vector Maps with Mapbox GL

Justin Miller • Mapbox • @incanus77



Introduction

- Mobile lead at Mapbox
- Live & work here in Portland
- Working on mobile tools & strategy



Mapbox

- Building open source tools for custom map design and development ()
- Cloud hosting of custom maps for apps and websites ()
- ~55 folks in DC, SF, and worldwide ()

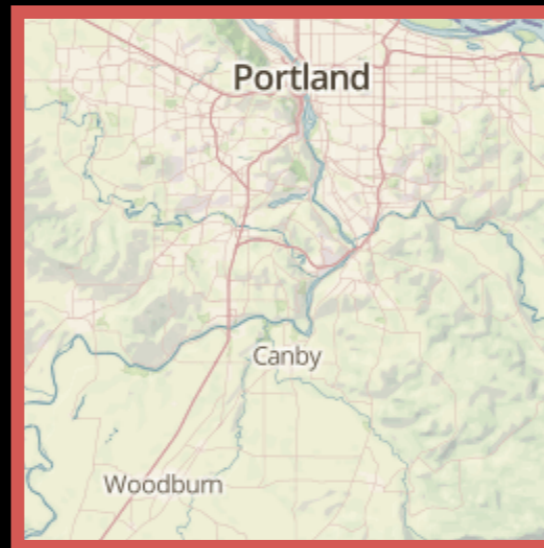
Mapbox GL

- Our name for on-device vector rendering
- As always, completely open source
- GPU accelerated (think: game tech to new ends)

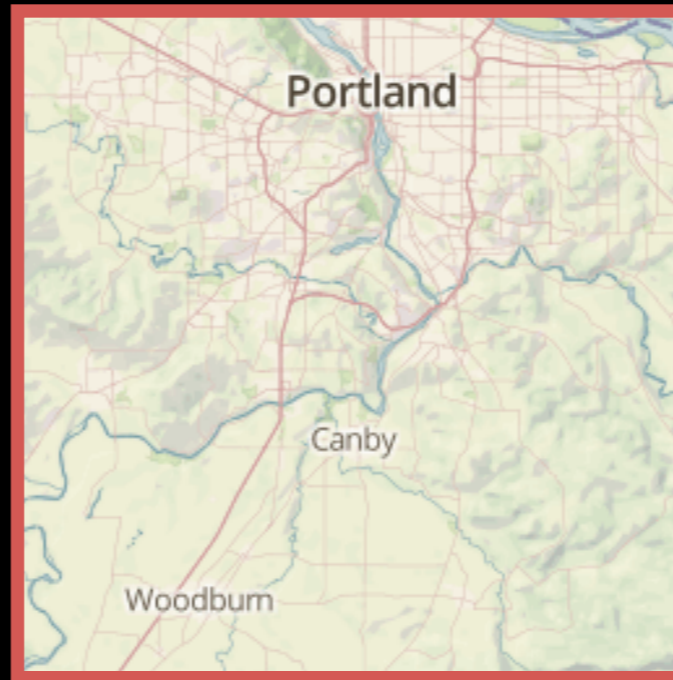


Demos

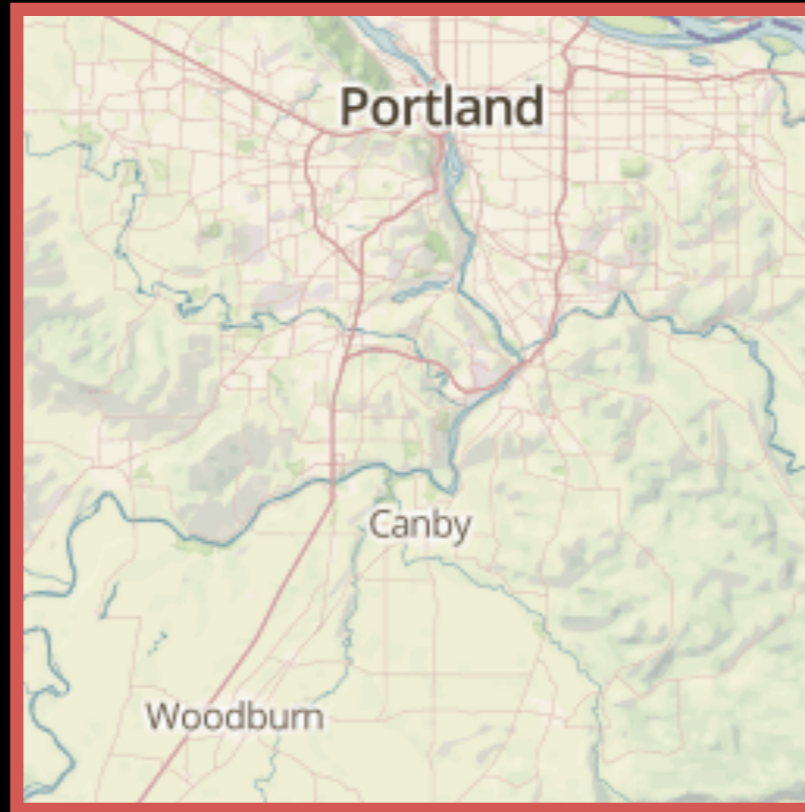
Raster Tiles: Zoom



Raster Tiles: Zoom



Raster Tiles: Zoom



Raster Tiles: Zoom



Raster Tiles: Zoom



Raster Tiles: Rotation



Raster Tiles: Rotation



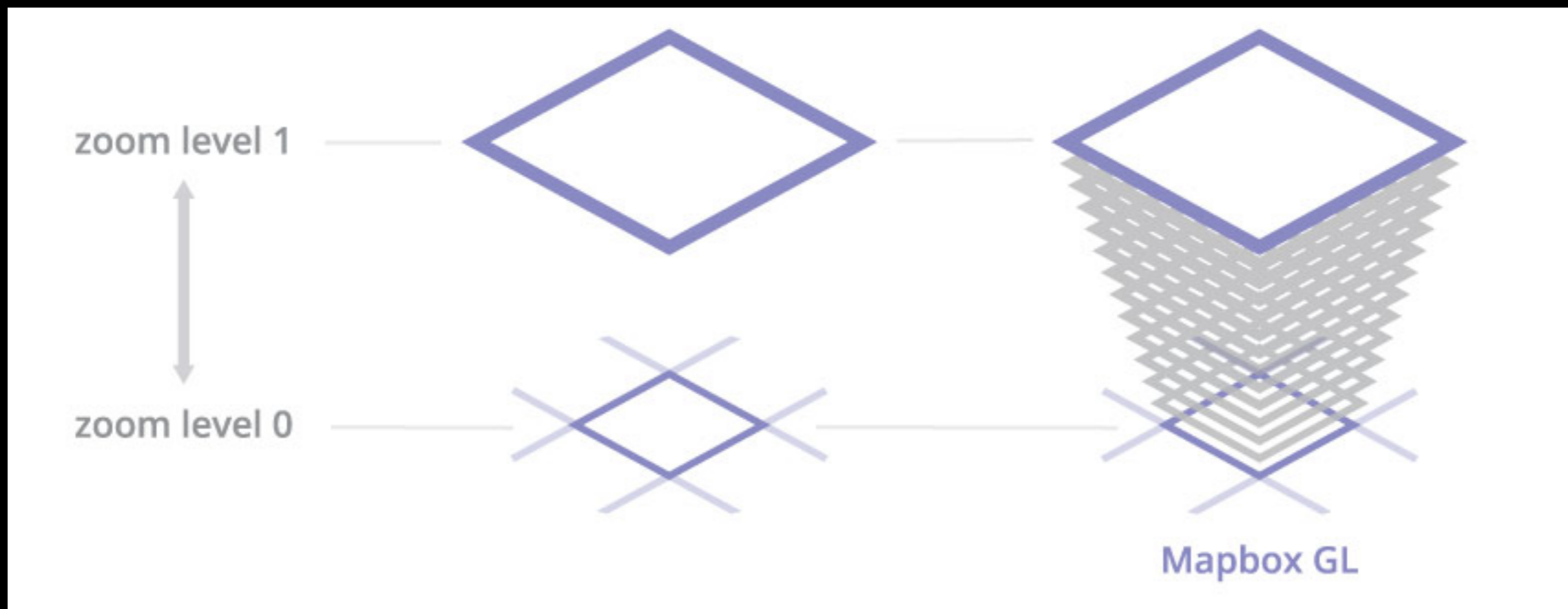
Raster Tiles: Rotation



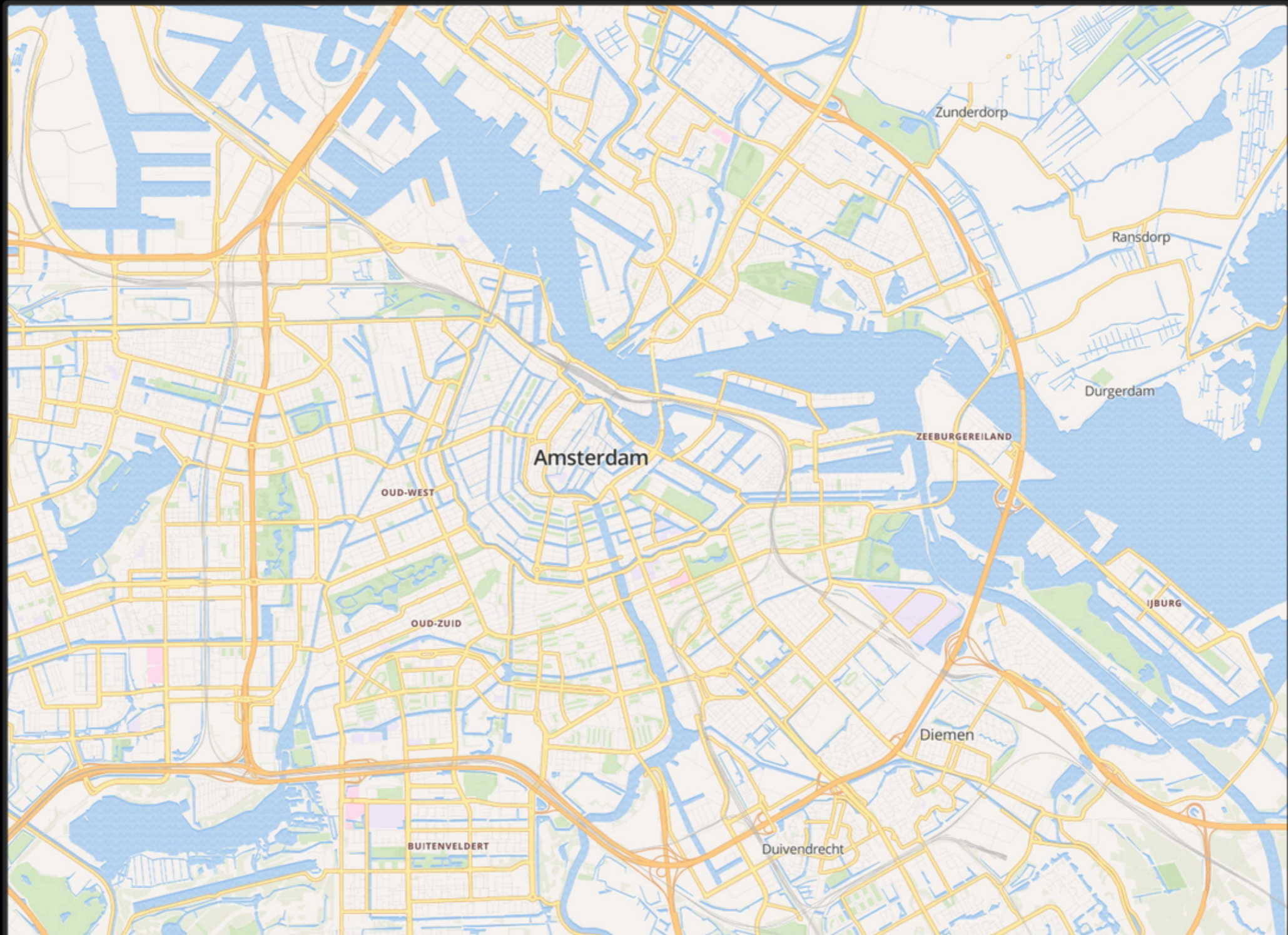
Vector Tiles

- You can't "see" vector tiles; they are just data
- But the "tile pyramid" works the same way
- Rendering continuity between zooms
 - Label placement is a great example

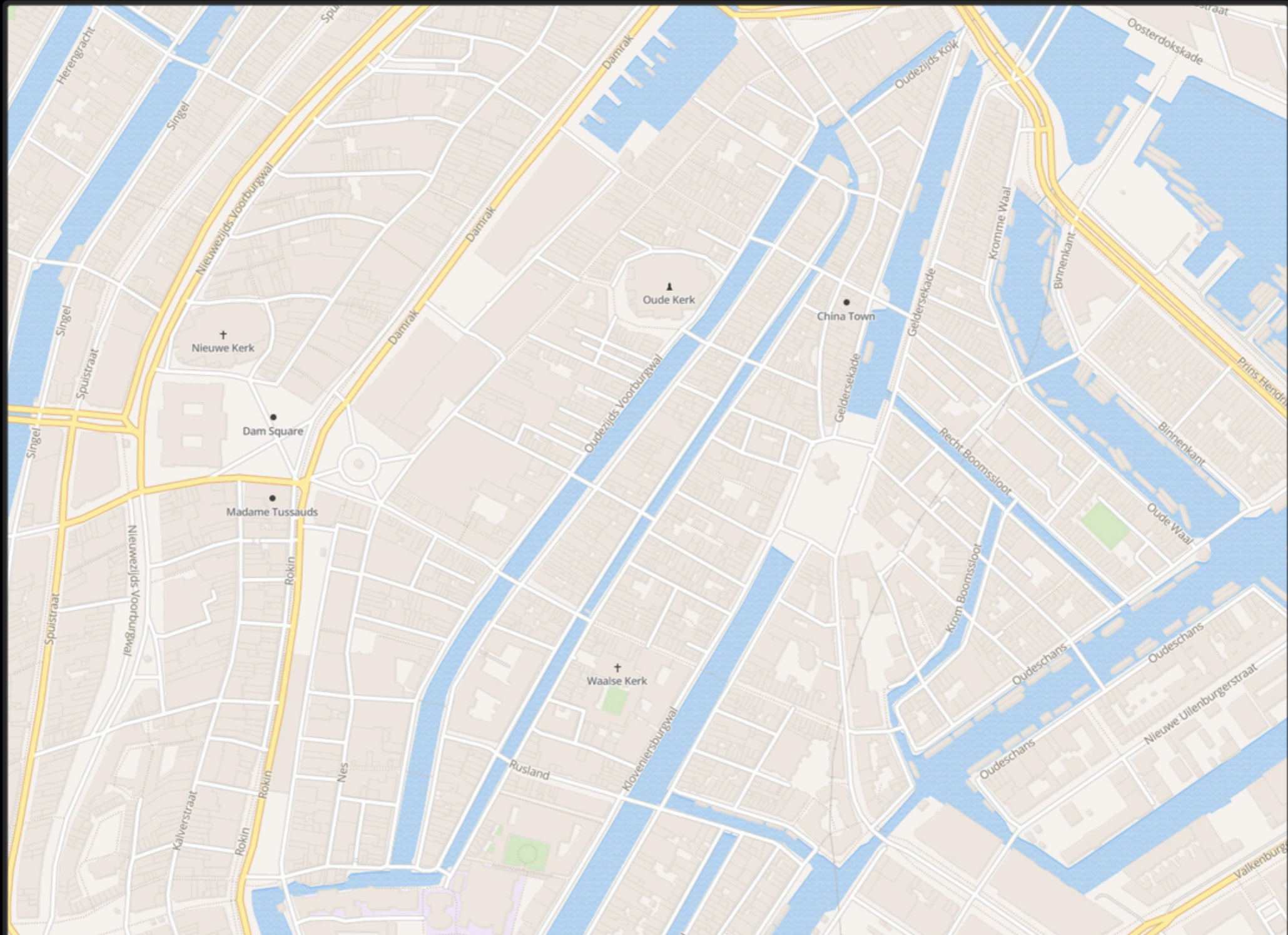
Incremental Zoom



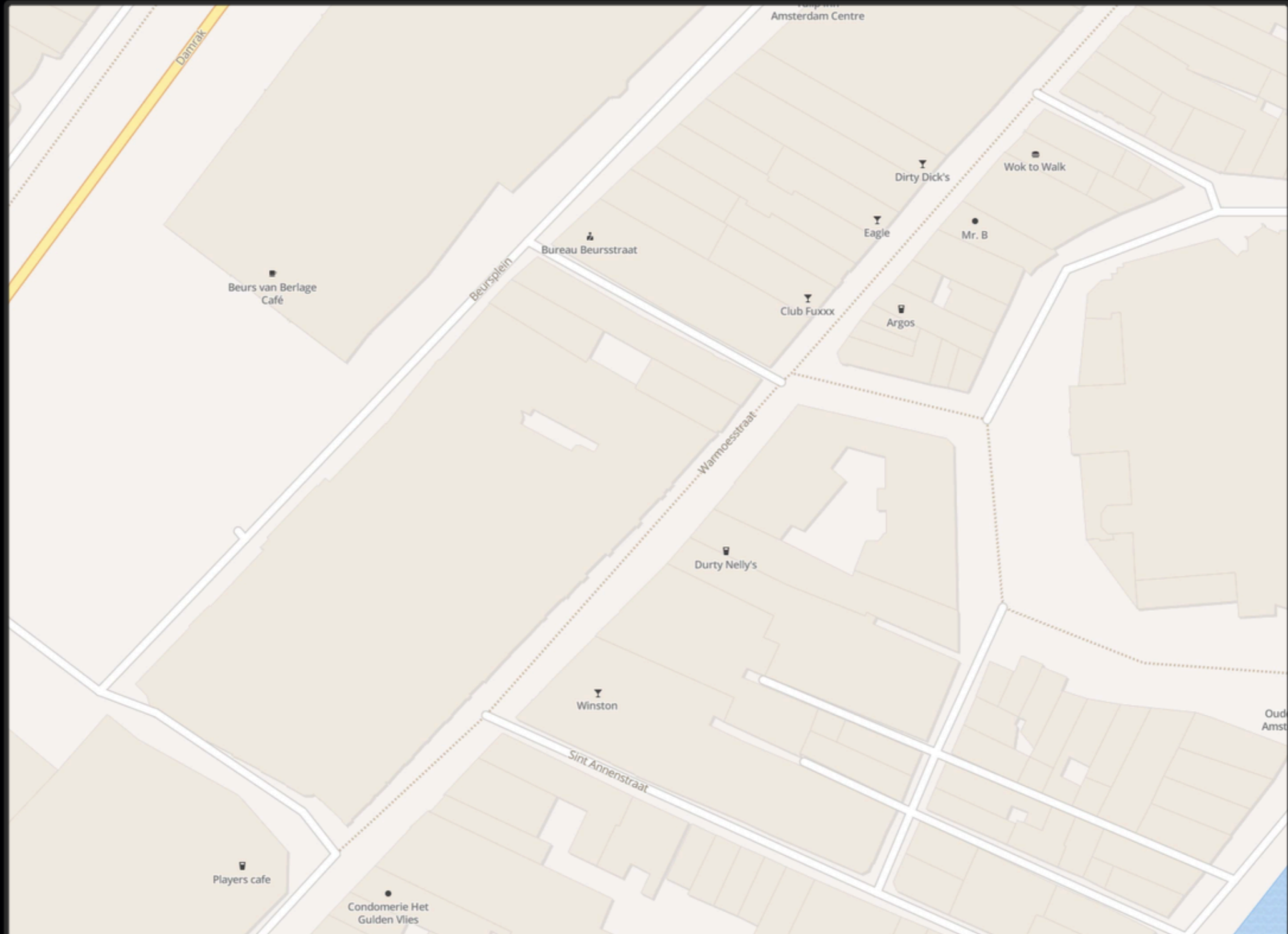
Zoom-Dependent Styling



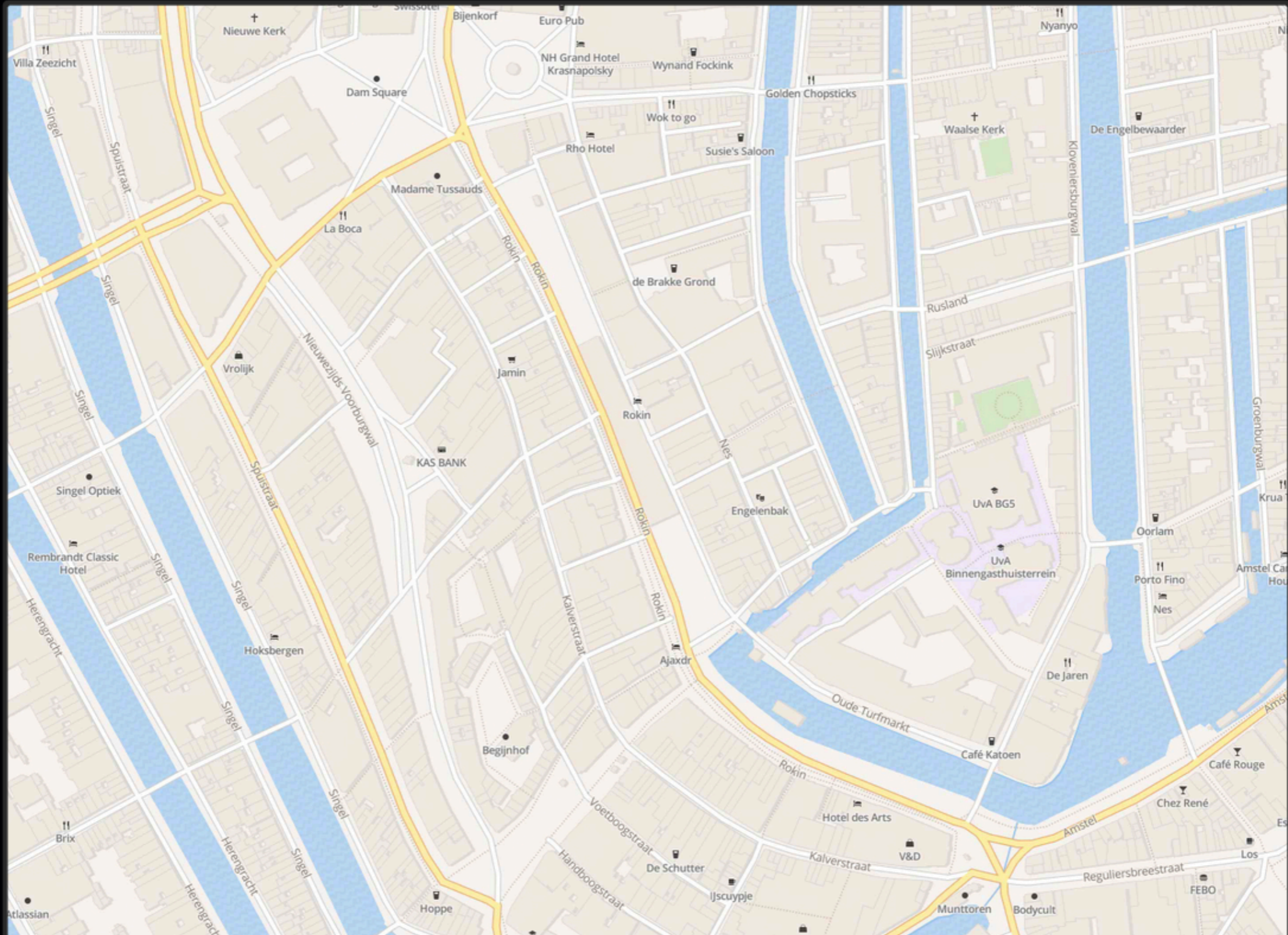
Zoom-Dependent Styling



Zoom-Dependent Styling



Zoom-Dependent Styling



Zoom-Dependent Styling

ZOOM 14

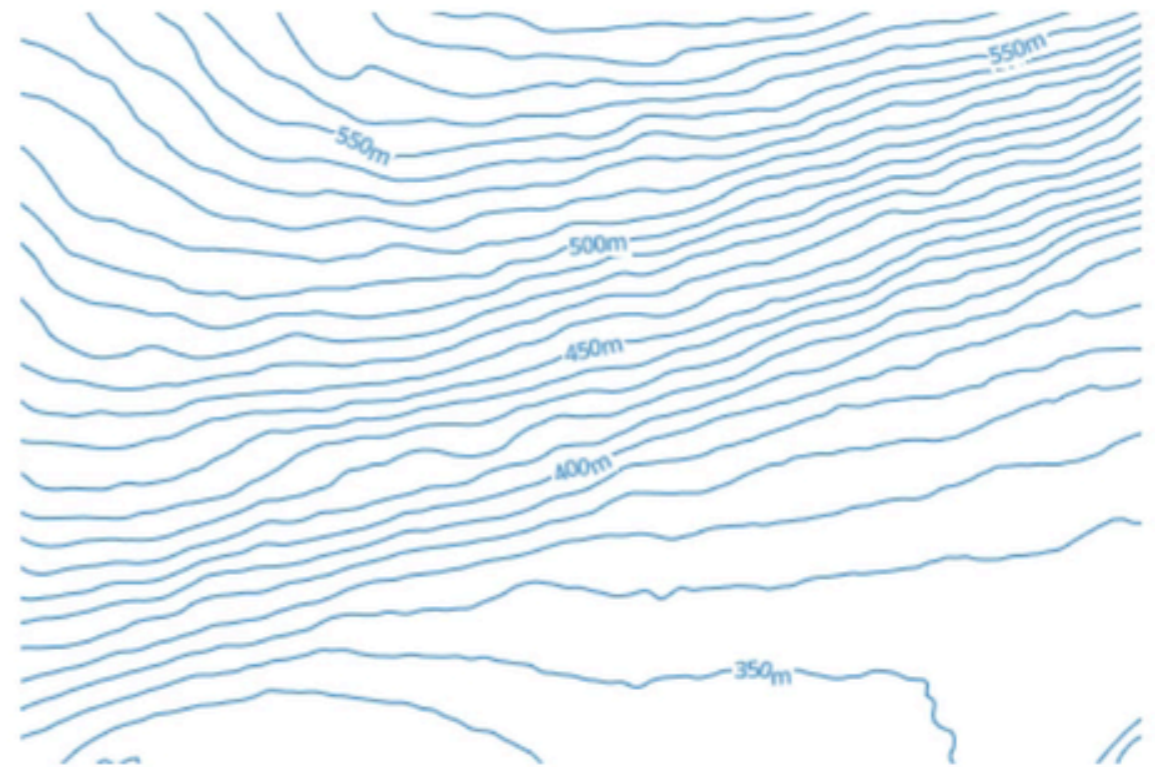
VALUE: 0.1

ZOOM 16



```
...  
"style": {  
  "line-width": {  
    "stops": [[14, 1], [15, 3], [16, 4]]  
  }  
}
```

Functions are specified in `[zoom, value]` pairs.



Zoom-Dependent Styling

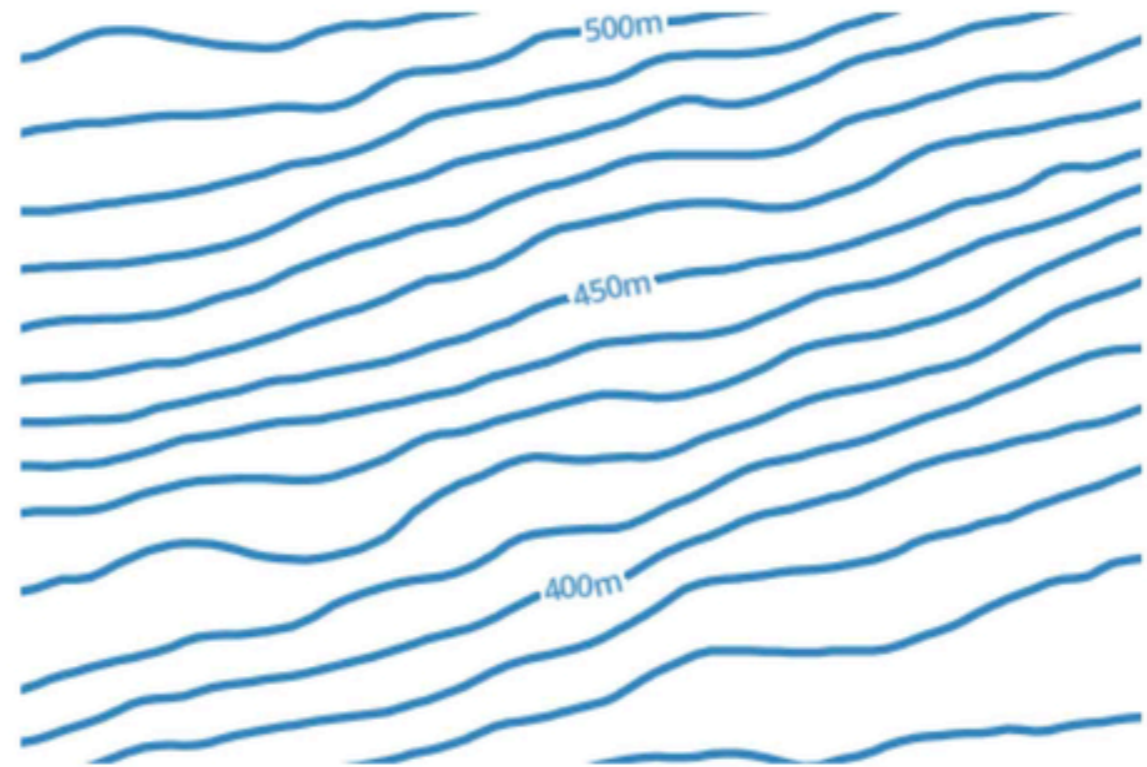
ZOOM 14

VALUE: 3.32

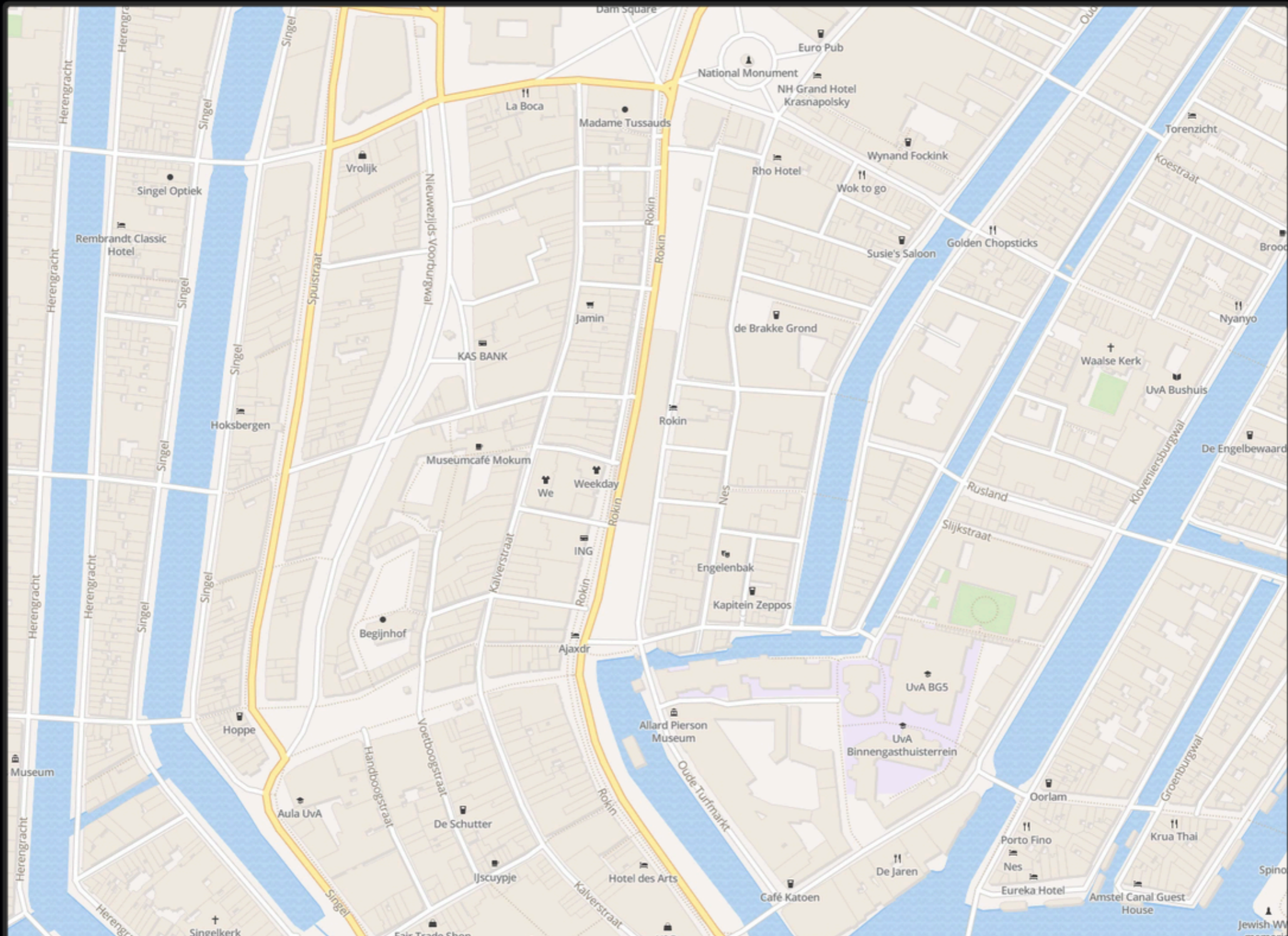
ZOOM 16

```
...  
"style": {  
  "line-width": {  
    "stops": [[14, 1], [15, 3], [16, 4]]  
  }  
}
```

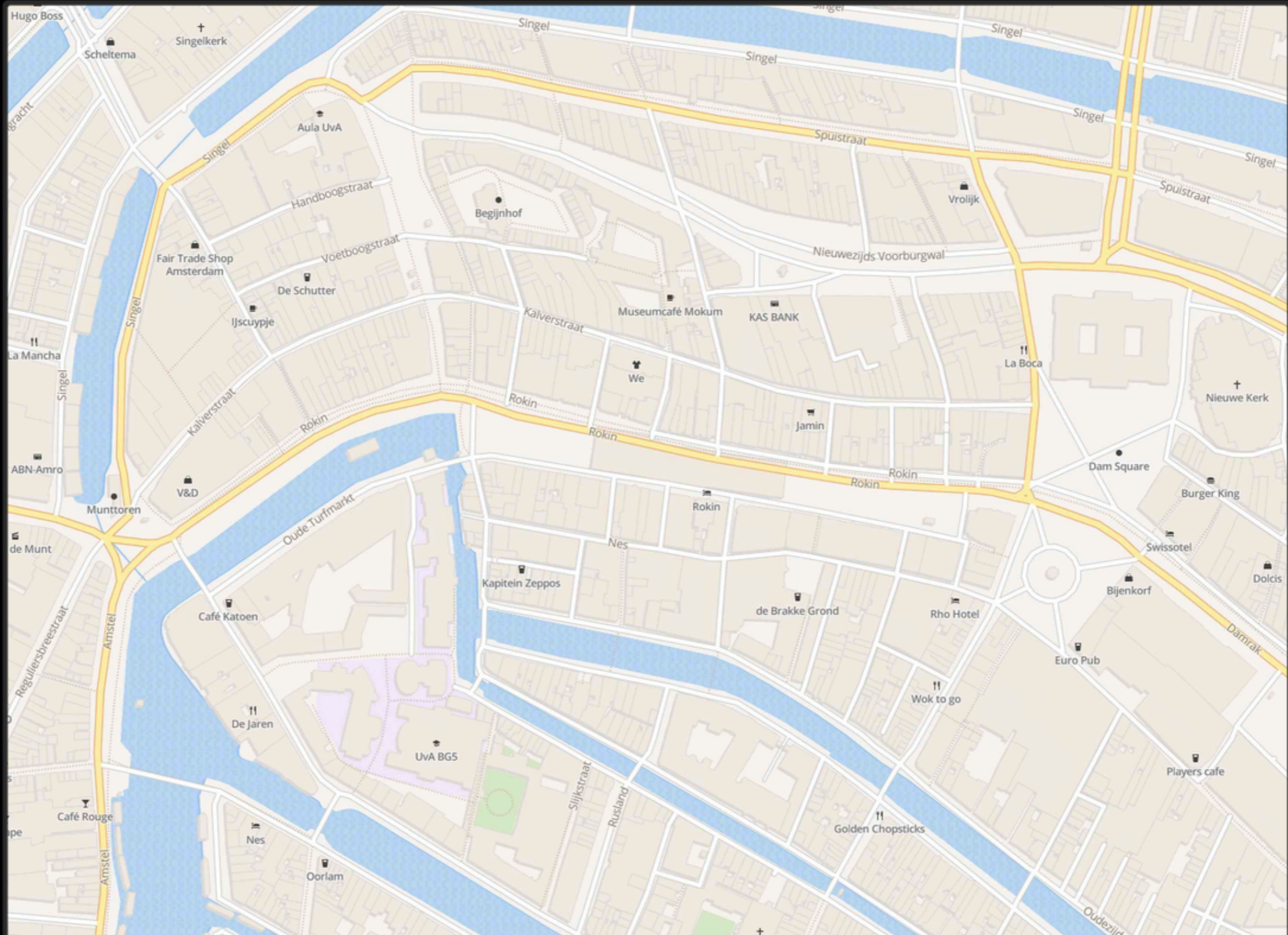
Functions are specified in `[zoom, value]` pairs.



Rotation Response



Rotation Response



Vector/Raster Combos

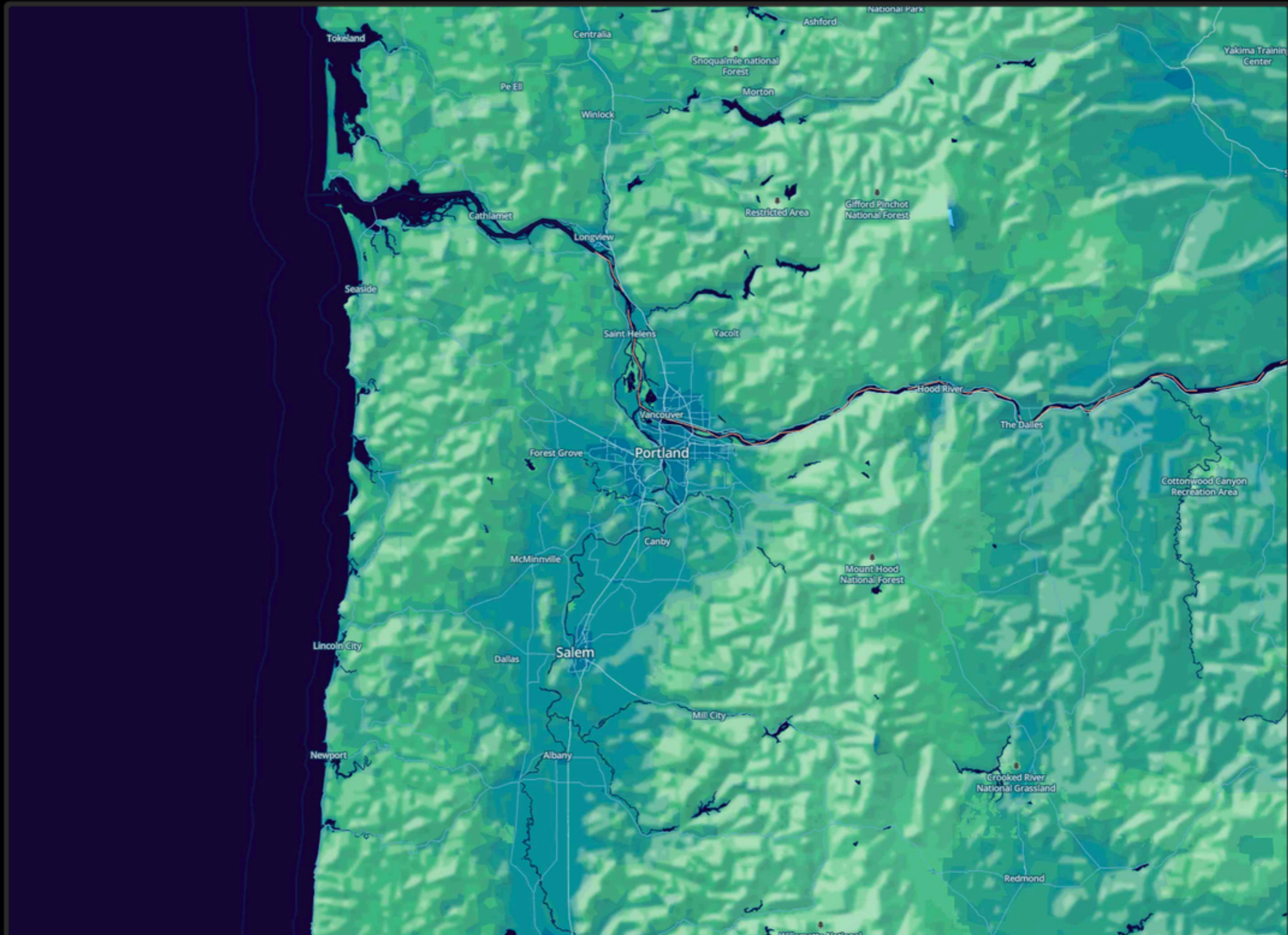
- Rasters aren't going away
- All satellite imagery is rasters
- Can combine raster base & vector features & labels



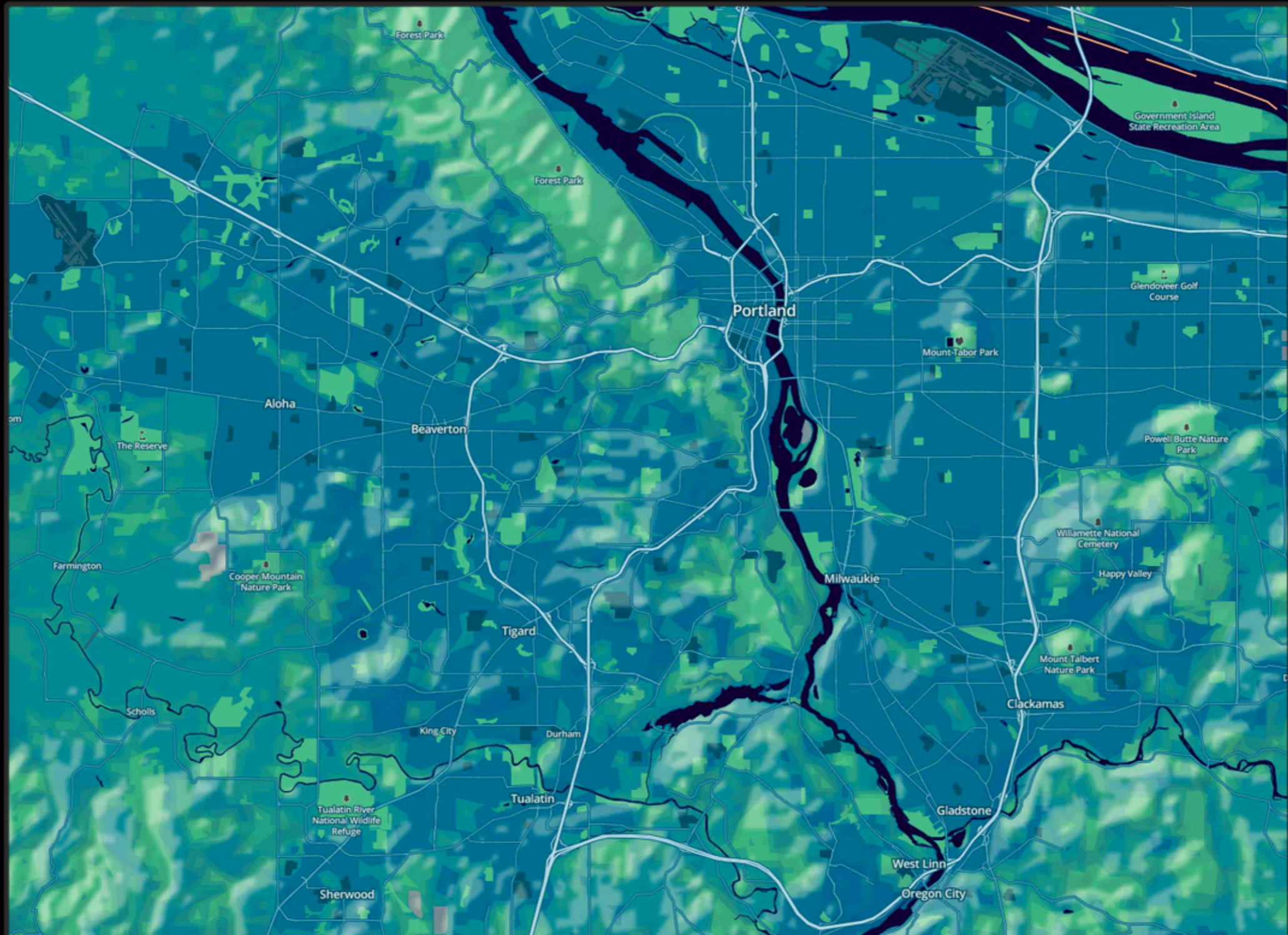
Style Transitions



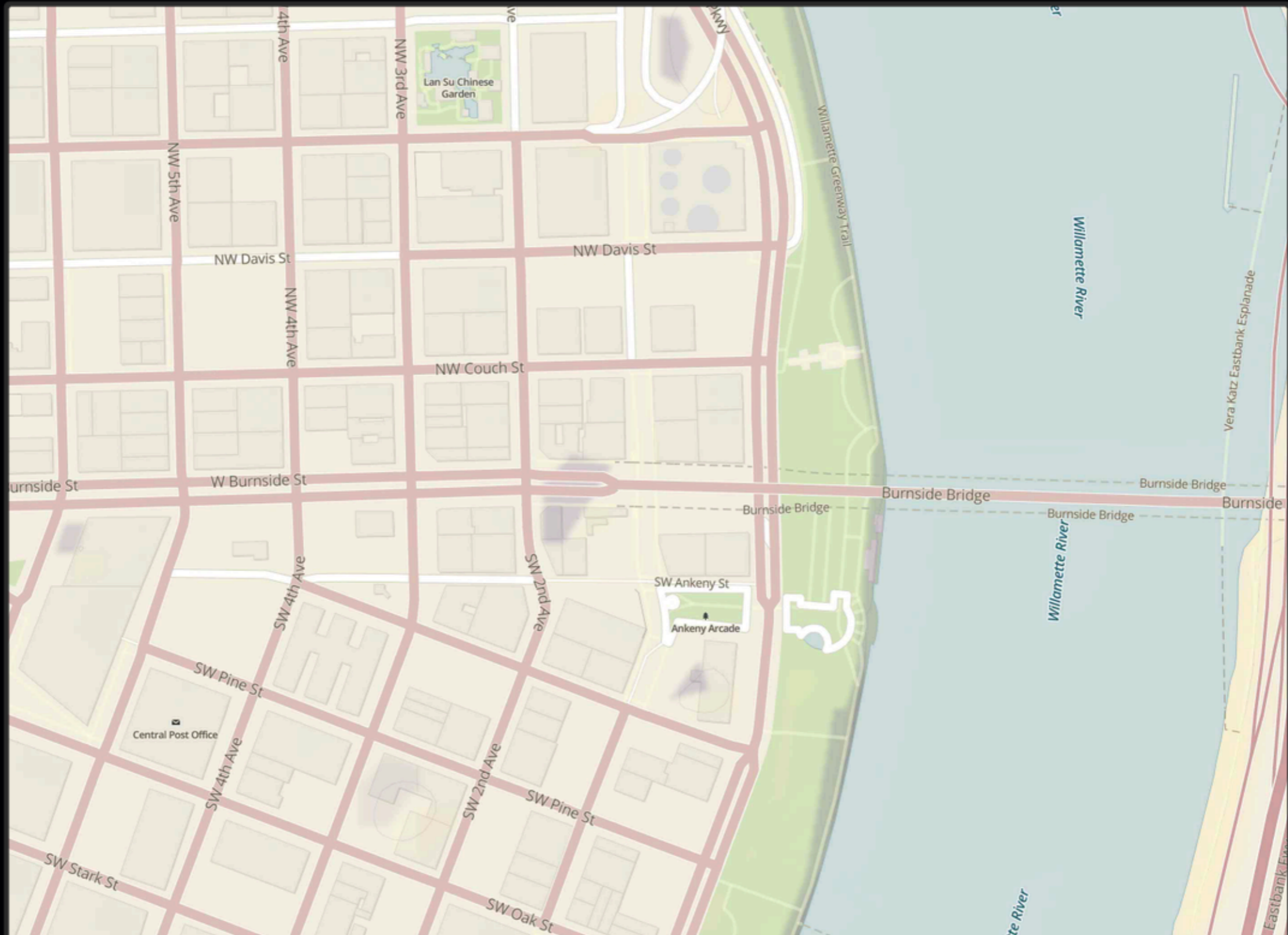
Style Transitions



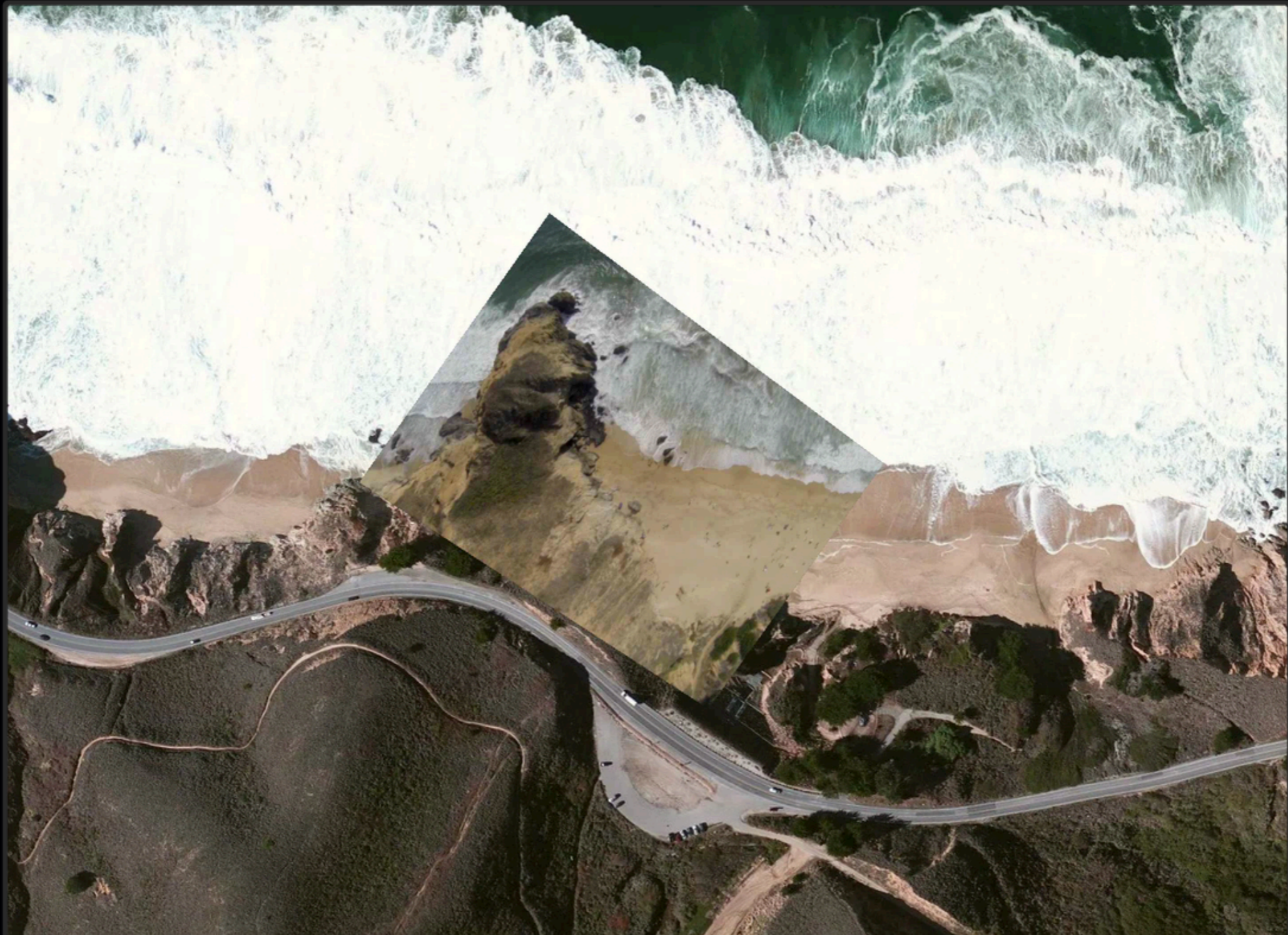
Style Transitions



Style Transitions



Superimposed Video



Superimposed Video



Mapbox GL Stack

- Dual-stack approach (native devices + JS)
- JS variant is not designed for mobile
- Native is written in C++11

Mapbox GL Stack

- Atop native we have per-platform bindings
 - Cocoa/ObjC/Swift for iOS, Java for Android
- All open source on GitHub
- Aims to support non-Mapbox
 - Regular ol' slippy map tile URLs, etc.

High-level Goals

FULL DESIGN CONTROL

High-level Goals

- Run on mobile & web using best frameworks
- Easy to get up and running in apps & websites
- Fun to design & iterate with
- Built on open standards (created, if necessary)

Vector Tiles

- Deep dive: Dane's talk today at 3:30pm (S3:T4)
- Basic tenet: eliminating the database, particularly for global maps
- Instead of indexing DBs, we pre-tile $X+Y$ by Z
- Pre-optimize with polygon simplification
- Tile format spec is open on GitHub

Mobile Considerations

- With Mapbox, you can composite on the server
 - `mapbox://mapbox.mapbox-streets-v5,justin.1bcee271`
- Tiles are smaller & less numerous
 - ~10-25% the size, none needed beyond **z14**
- Thus, tiles can more easily go offline

Size & Count

- Tile z9, x81, y183
- Raster z9-z17
 - ~87k tiles
- Vector z9-z14
 - ~1,300 (smaller) tiles



Mobile Potential

- Mobile doesn't just mean phone
- Mobile means **personal & hyper-local**
- Pocket computers with an ever-increasing number of sensors
- This space will grow (wearables, anyone?)

Ambient Light

- Dark room: lower contrast map & night mode
- Bright outdoors: high contrast map & day mode



Pedometers

- Change map info density & scale
- Based on walk/run/bike/drive/fly activity
- Walk/run: show dog parks, water fountains
- Drive (or run): show highways (or not)
- Fly: show state & park borders, major cities

Onboard Auto Sensors



Onboard Auto Sensors

- Style your own personal auto map
- Could colorize zones where you tend to speed
- Or integrate other smart behaviors into your directions (gas mileage, hard braking)

iOS “Interesting Visits”

- API to record comings & goings
- If given access in apps, they could style the map
- Imagine a map that shades buildings based on visit frequency
- Explore new parts of your city or neighborhood

Heart Rate



What's Next?

- Better high-level APIs for easier integration
- Android buildout
- Your apps!



In Closing

- Vector tiles + on-device rendering are here today
- Lots of app potential & we are building the ball bearings
- Hackers welcome!

Thanks & Questions

- mapbox.com/mapbox-gl
- github.com/mapbox
- mapbox.com/blog
- justin@mapbox.com

