



Rijkswaterstaat
Ministry of Infrastructure
and Water Management



Haringvliet discharge sluices ajar to improve fish migration

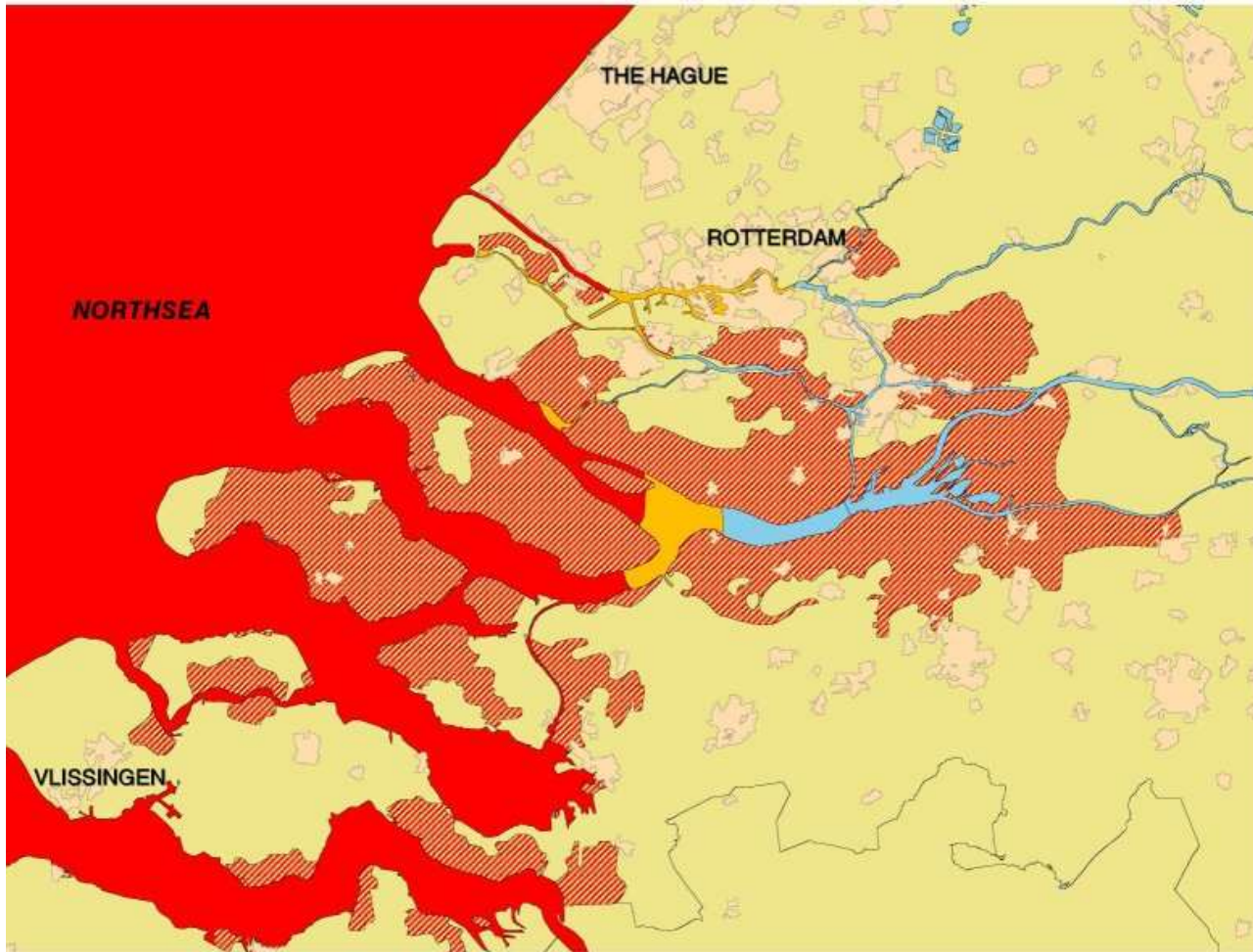
Learning by doing

Aniel Balla

Landgoed Altembrouck
1 maart 2019



Flood disaster 1953





The Dutch delta works





The Haringvliet sluices



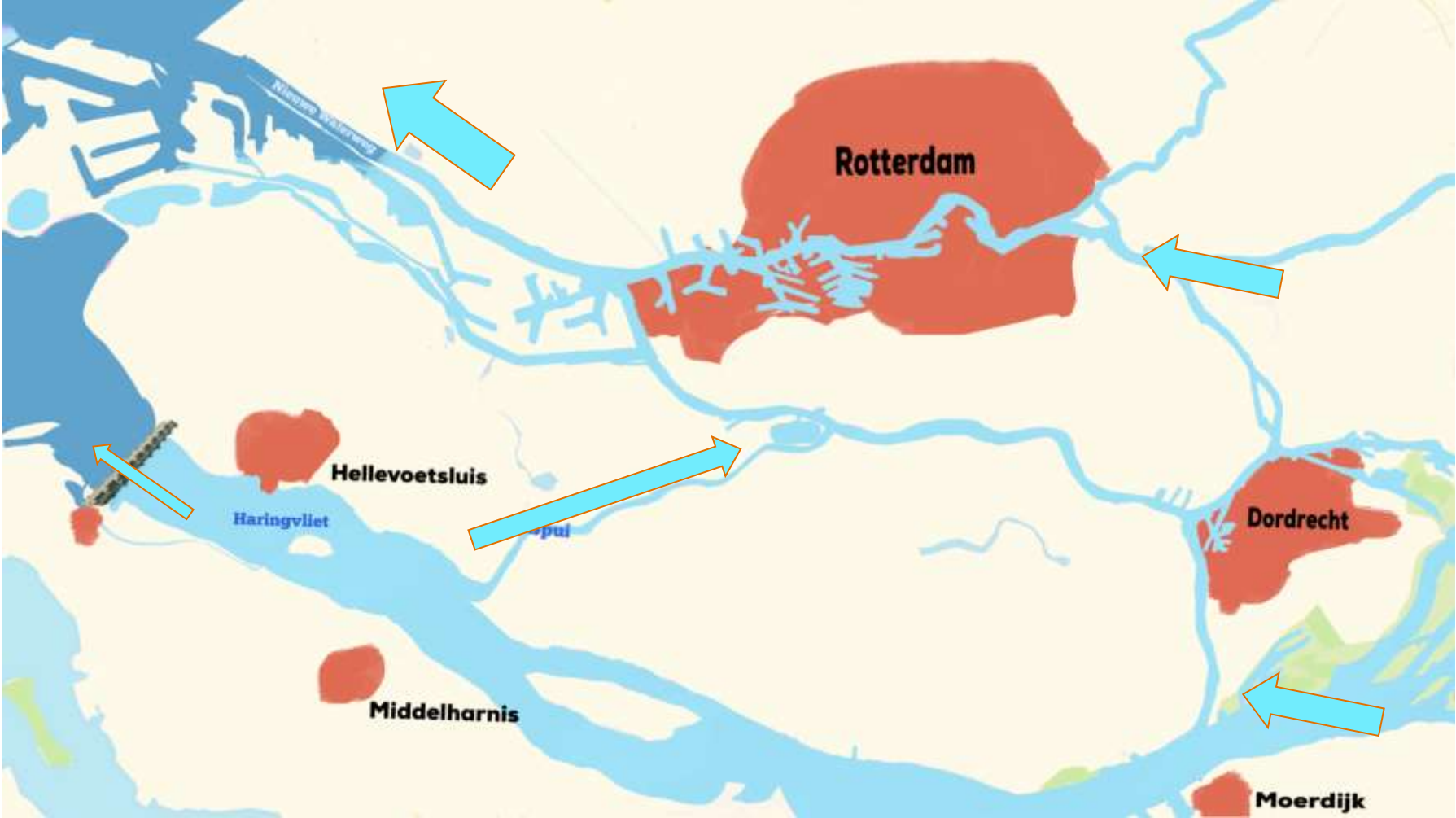


Salt water penetration into the delta of Rijn / Maas before and after the Delta works





Current situation: Water discharged during low discharge





Kierbesluit, Sluices ajar

Opening the sluices during high tide letting salt water flow into the Haringvliet

Aim:

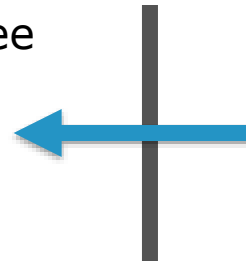
- Improving migration possibilities (in and out) for (migration) fish
- Creating a brackish transition zone
- Reduce the number of freshwater fish being washed to sea and improving possibilities to return to the Haringvliet



Operating discharge sluices

Now

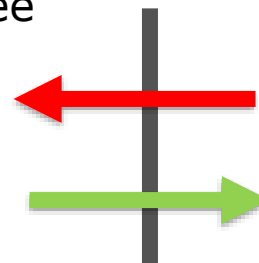
Noordzee



Haringvliet

Sluices ajar

Noordzee

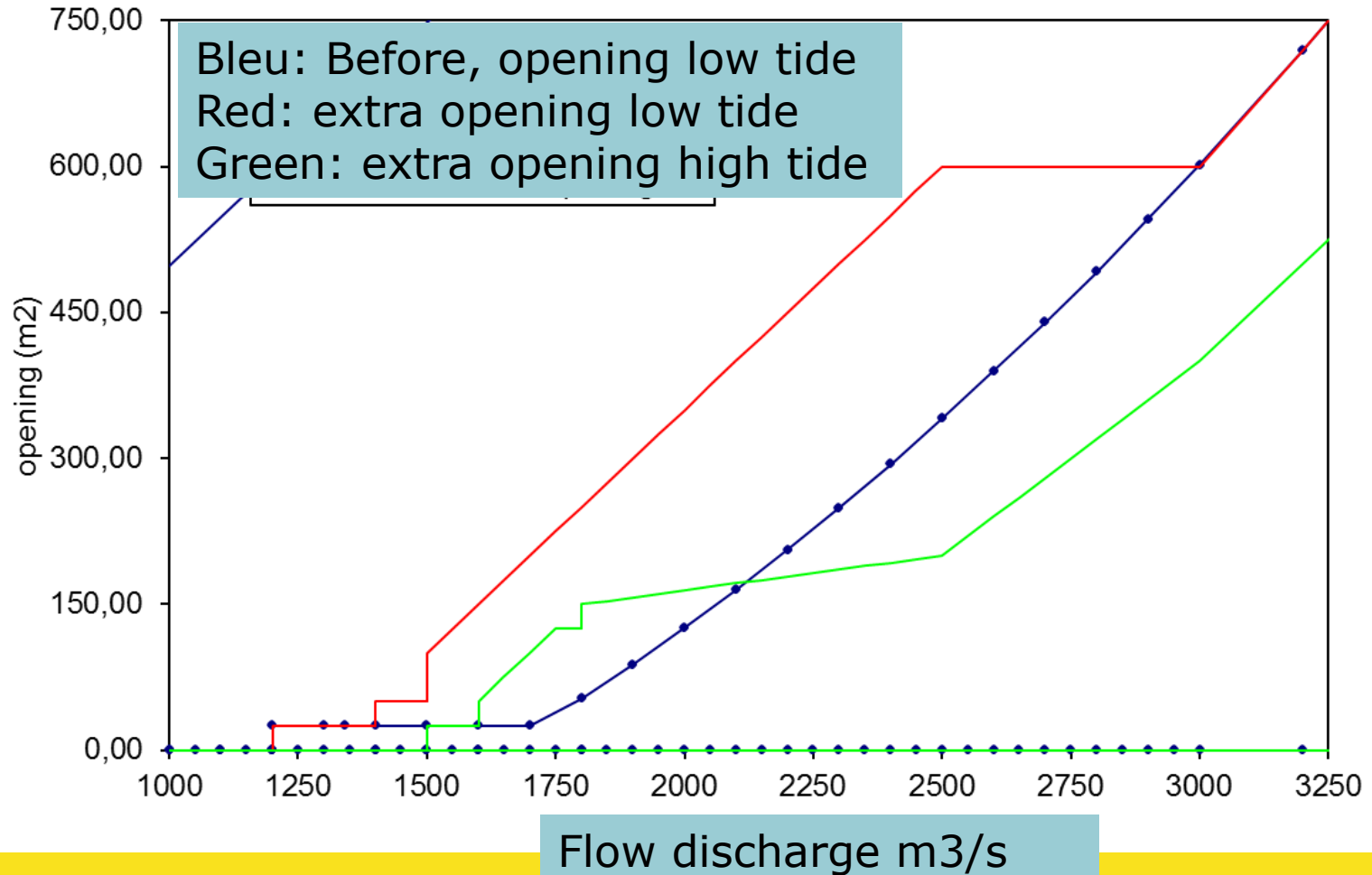


Haringvliet

Limited salt water inlet at flood,
depending on the river discharge



Operating discharge sluices





Creating a Kier (sluices ajar)

zeezijde

rivierzijde



opening Kier (inlaat zeewater):
40 - 250 cm



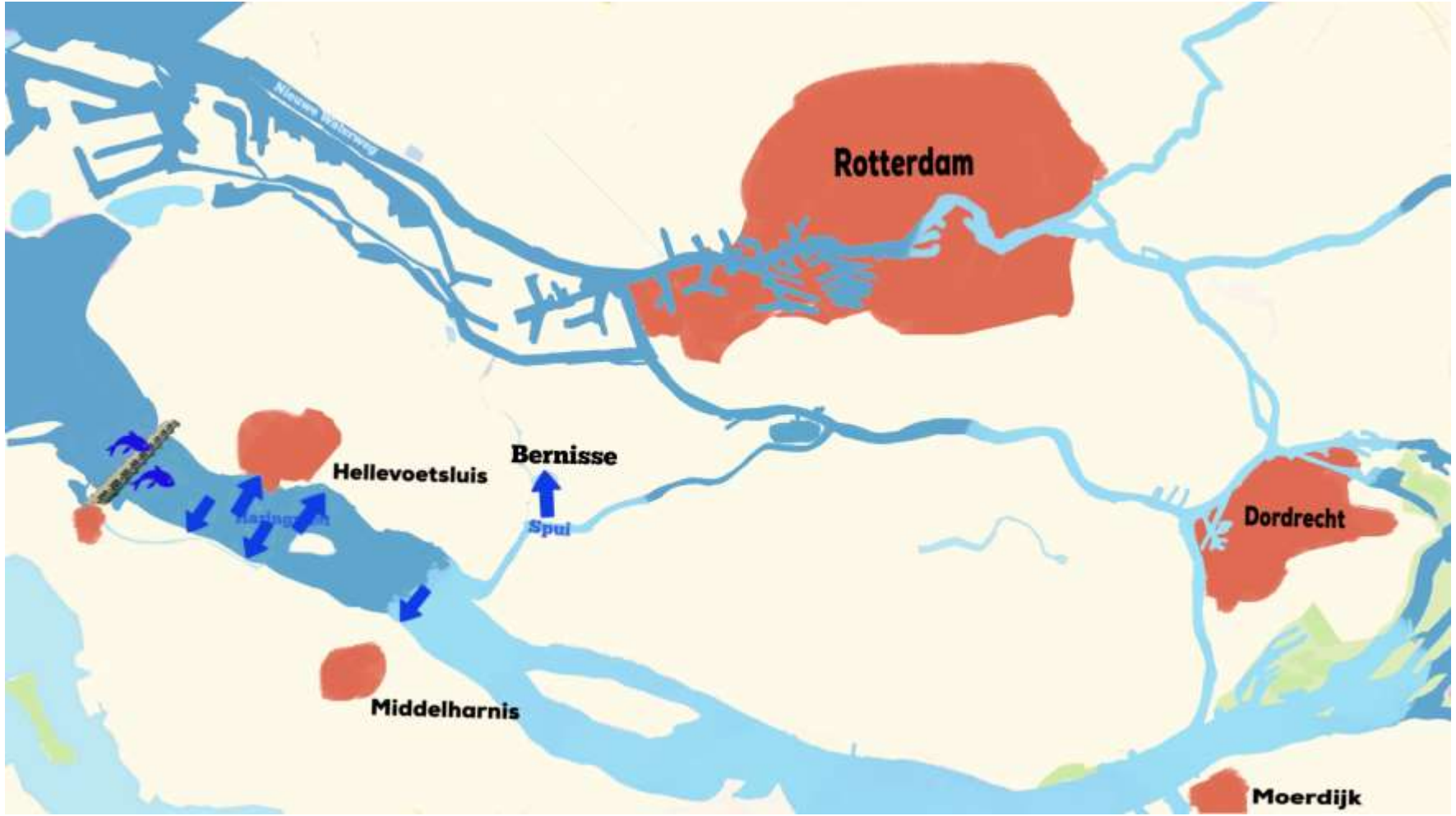
Conditions

- No adverse effect on Flood safety
- Guarantee of fresh water supply (drinking water, agricultural use and nature): Mitigative & compensatory measures
- Shipping – waterdepth



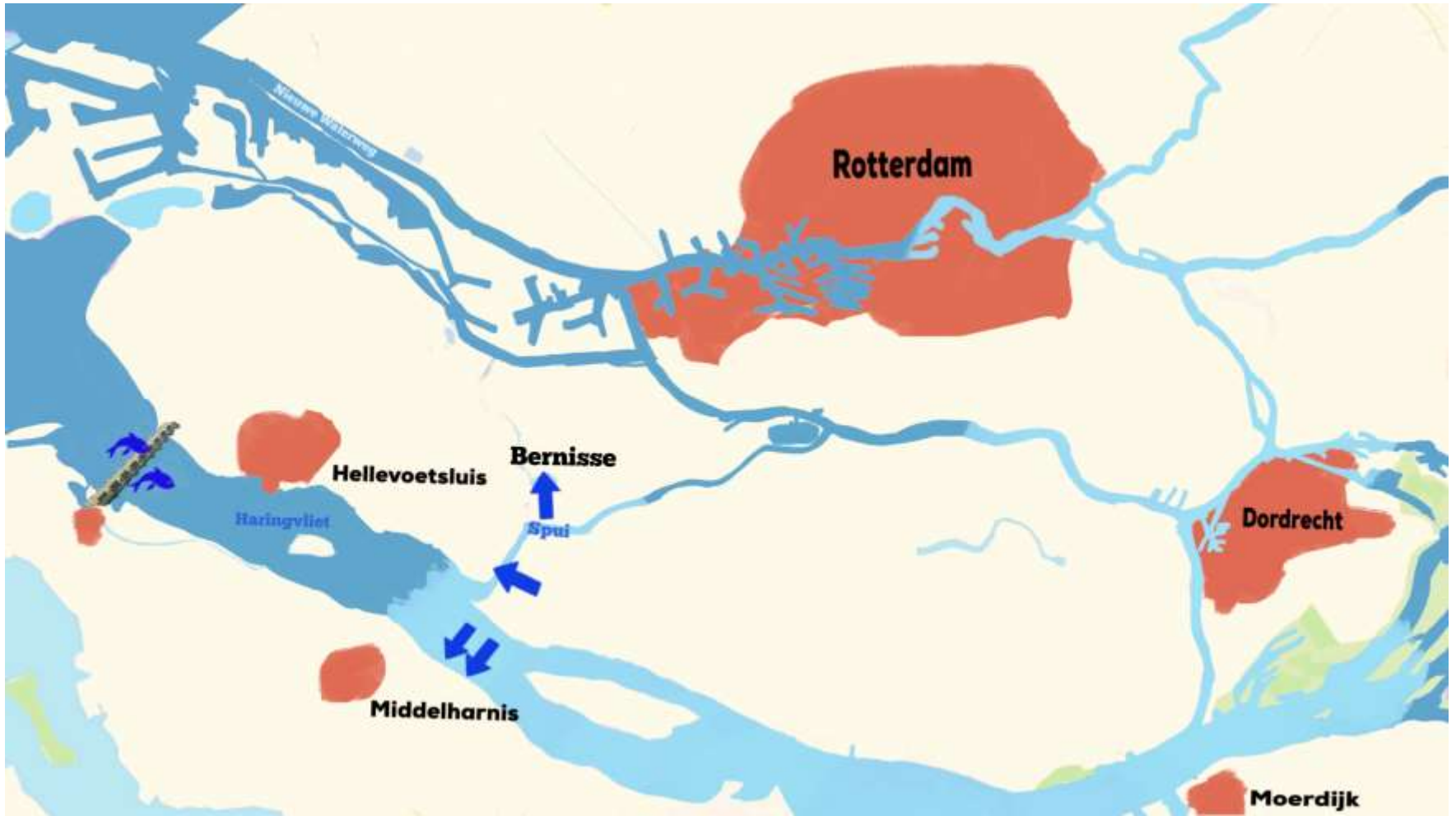


Construction of compensation measures; situation < 2014





Construction of compensation measures; situation > 2018





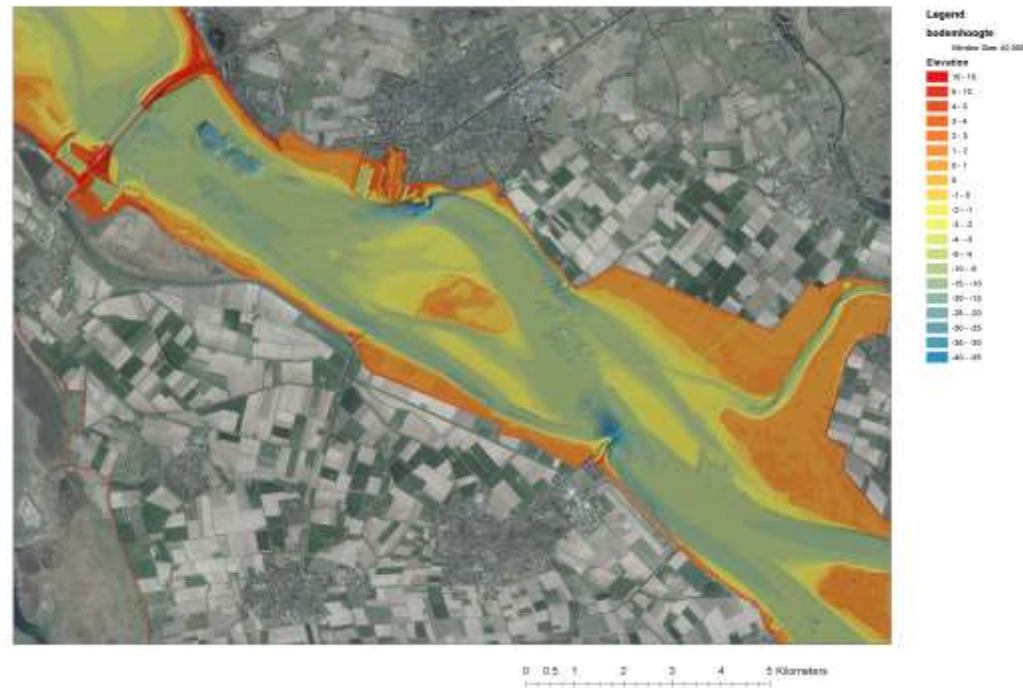
15 nov 2018: starting the phase Learning by doing

- Operating the sluices to create a balanced system *requires knowledge* on the systems dynamics.
- Duration 7 – 10 years (approx)



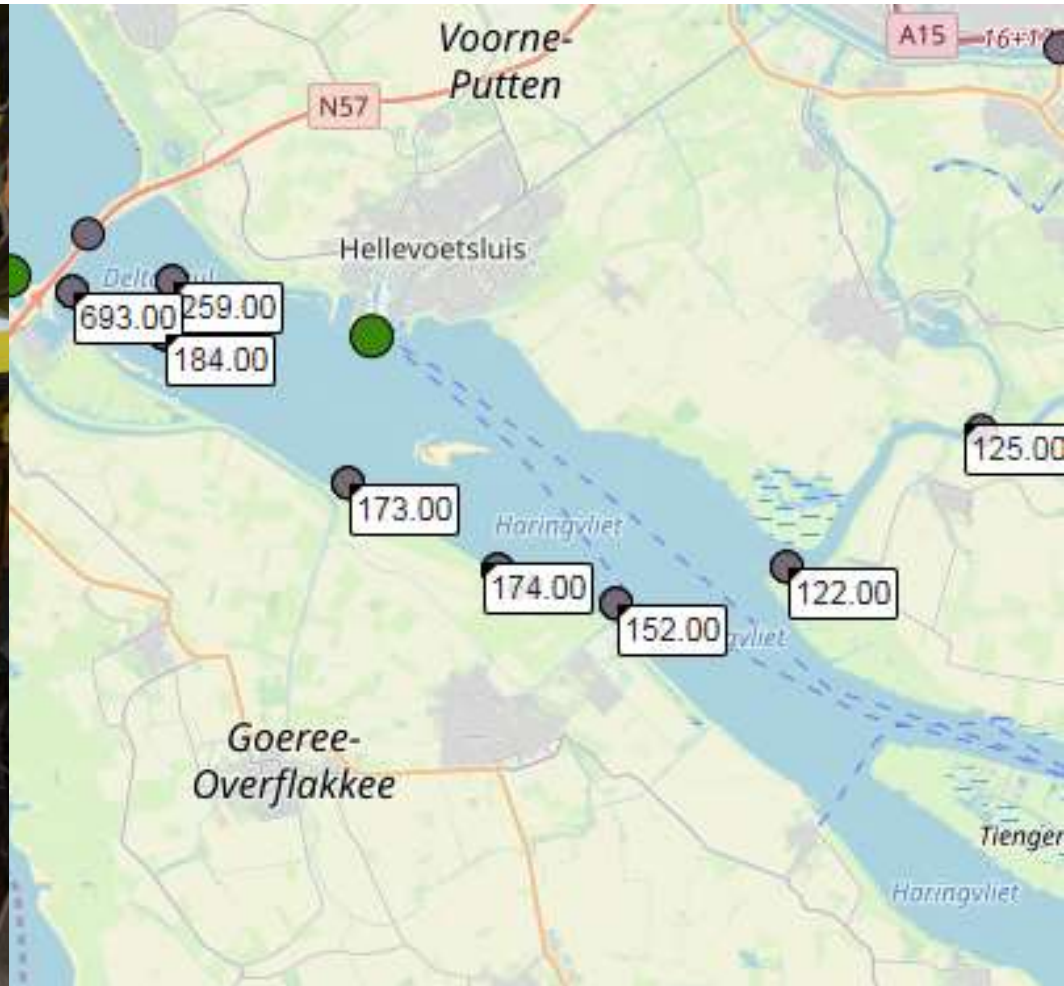
Research

- Effectiveness of sluice management on fish migration
- Effectiveness of flushing as a measure to prevent salt intrusion east of line Spui-Middelharnis
- Spreading of salt water from pits and underwater gullies
- Reaching an equilibrium state



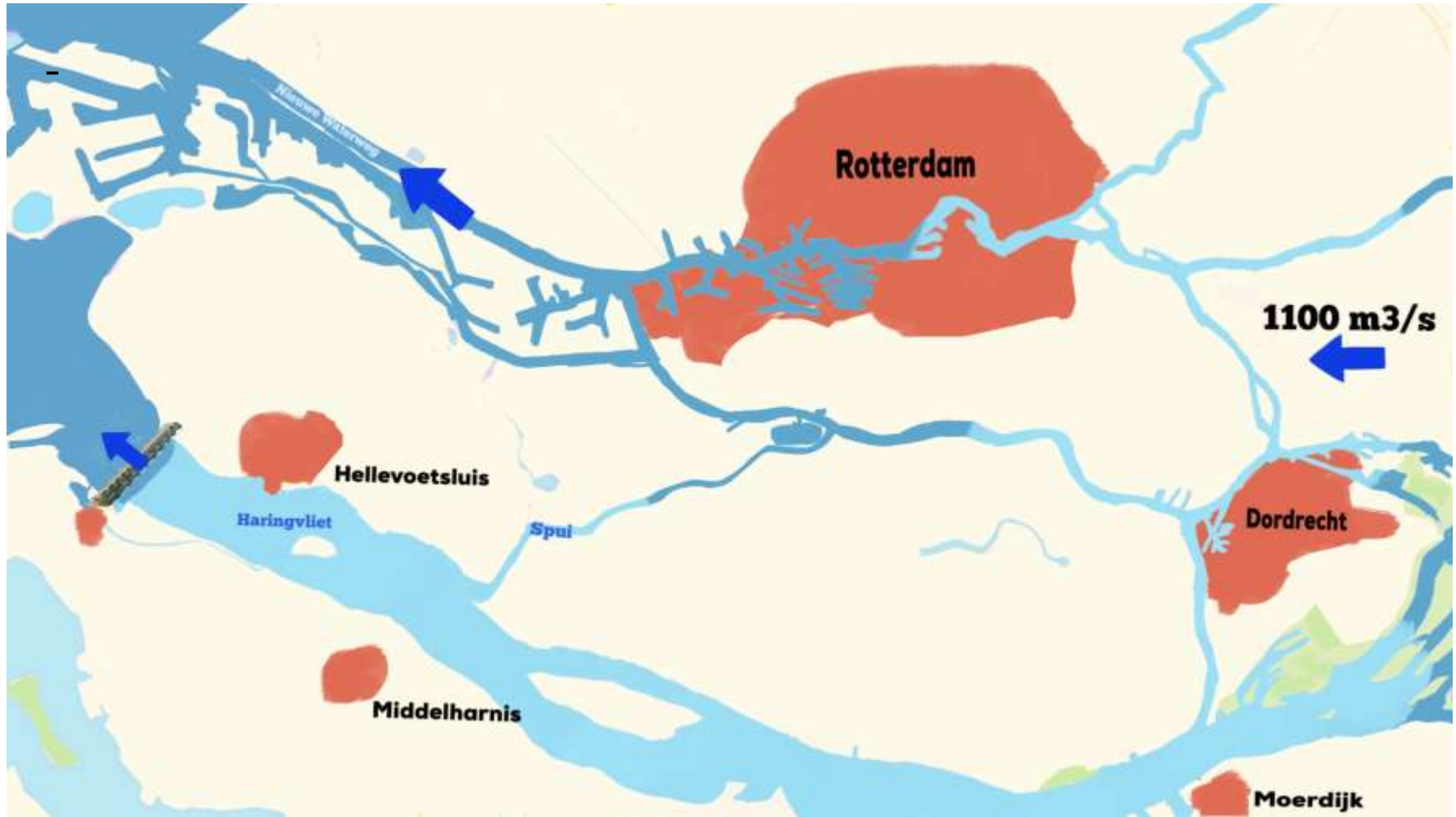


Monitoring salinity



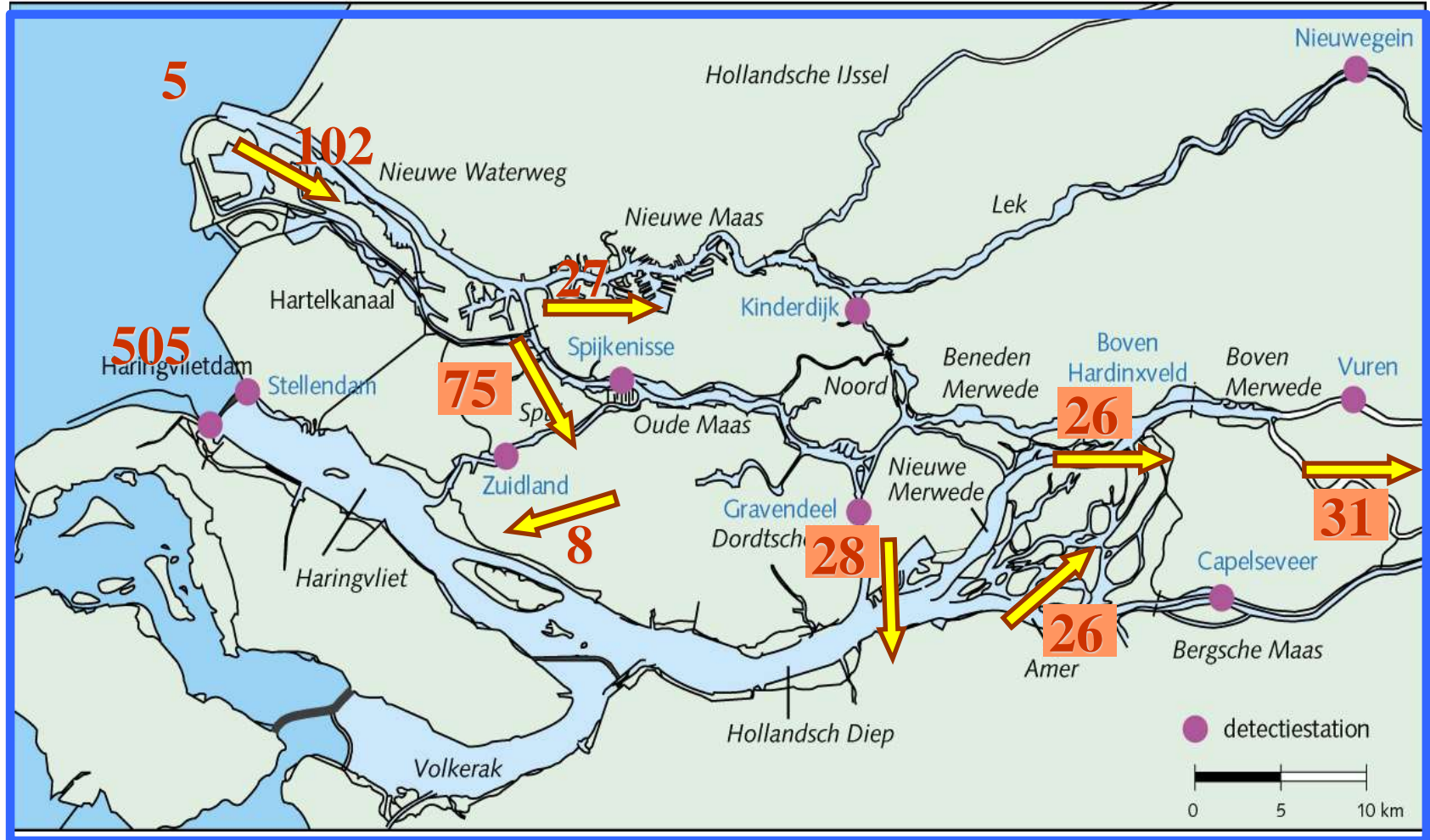


Low discharges: managing the sluices “fish friendly”



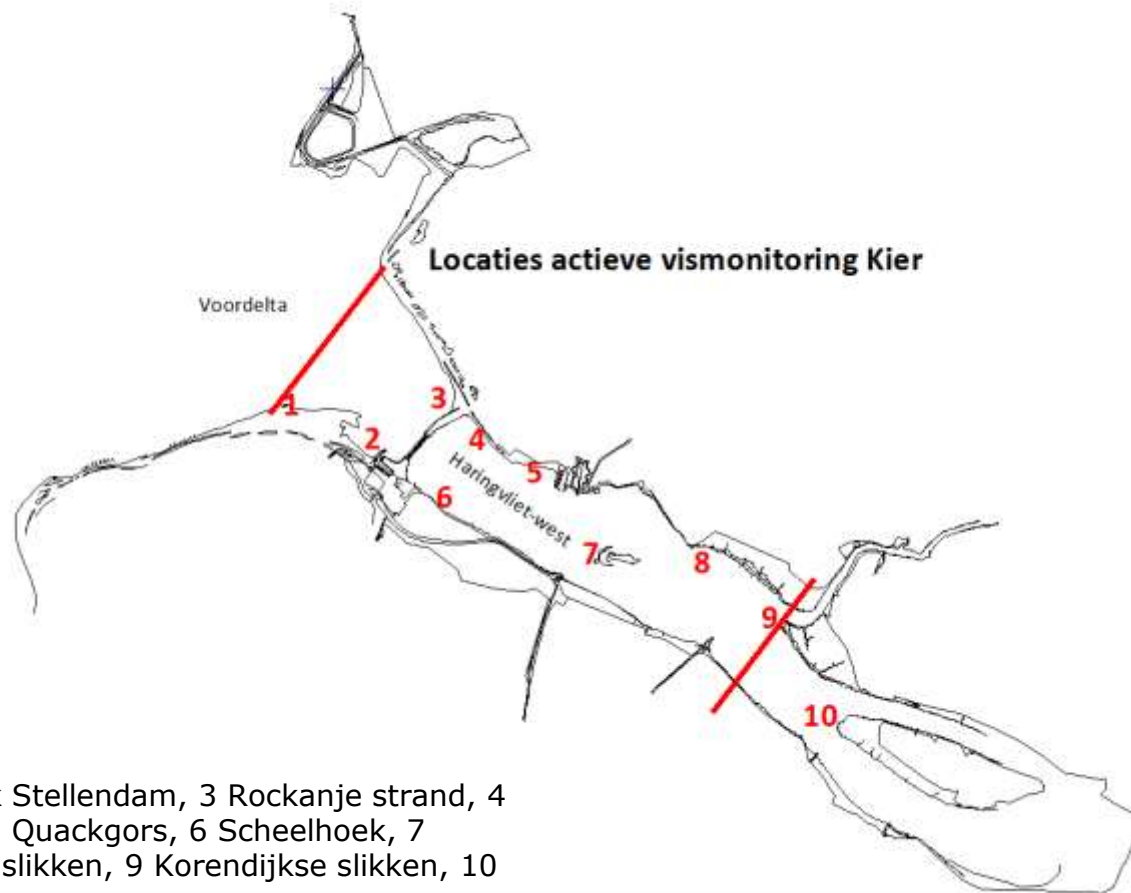


Example telemetry: migration through NWW





Locations active fish monitoring



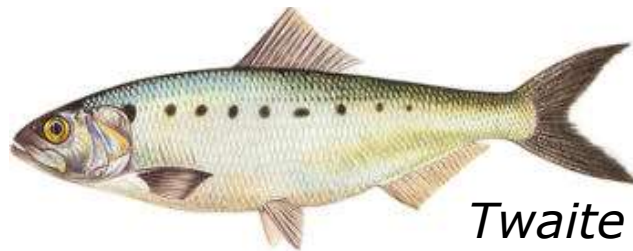
- 1 Kwade Hoek, 2 Kreek Stellendam, 3 Rockanje strand, 4 Hellevoetsluis strand, 5 Quackgors, 6 Scheelhoek, 7 Slijkplaat, 8 Benninger slikken, 9 Korendijkse slikken, 10 Tiengemeten



Target species



Salmon



Twaite shad



Eel



River lamprey



Sea lamprey