HOUSTON SHIP CHANNEL EXPANSION CHANNEL IMPROVEMENT PROJECT

CONFINED AQUATIC DISPOSAL (CAD) CELLS

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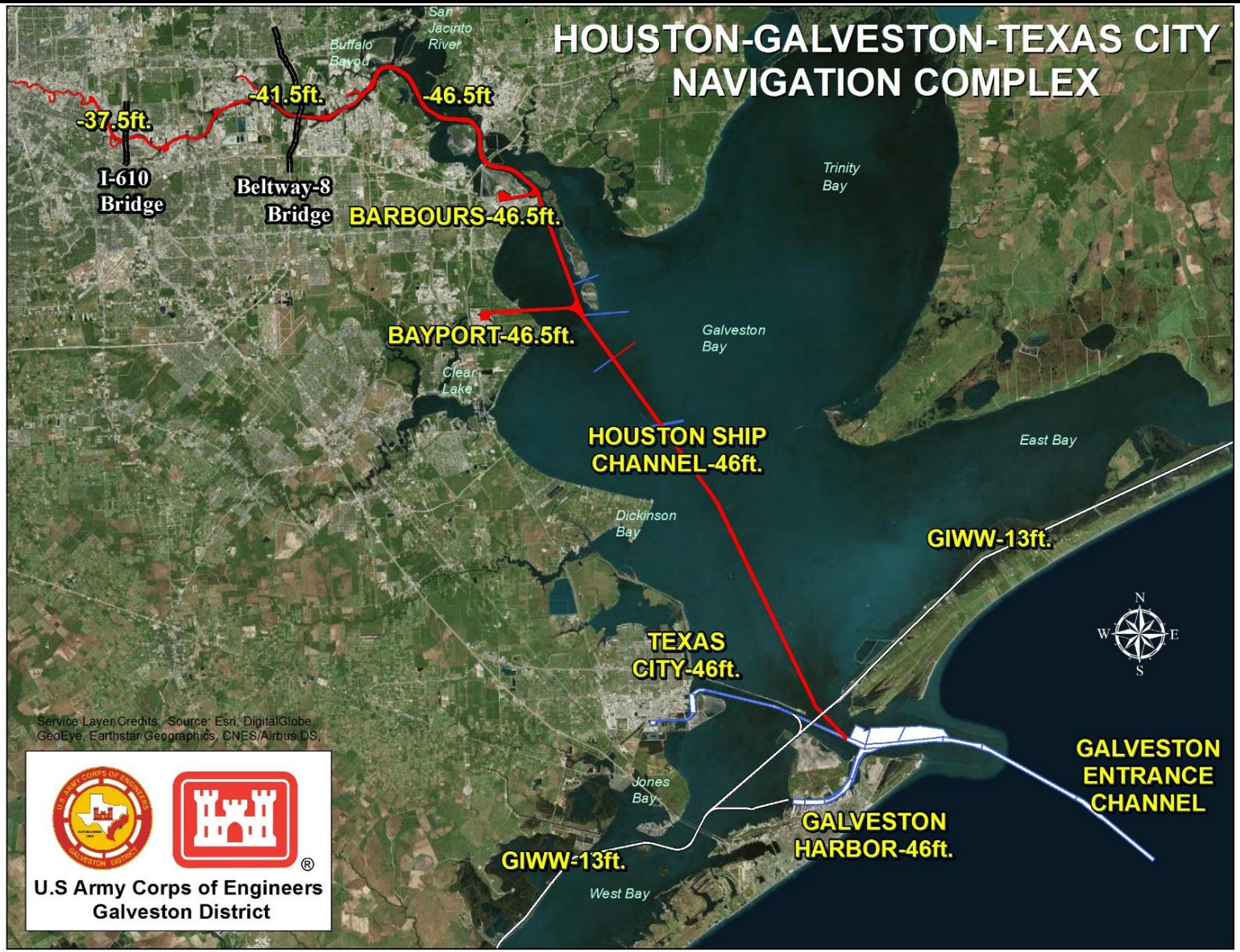
HOUSTON SHIP CHANNEL PROJECT OVERVIEW



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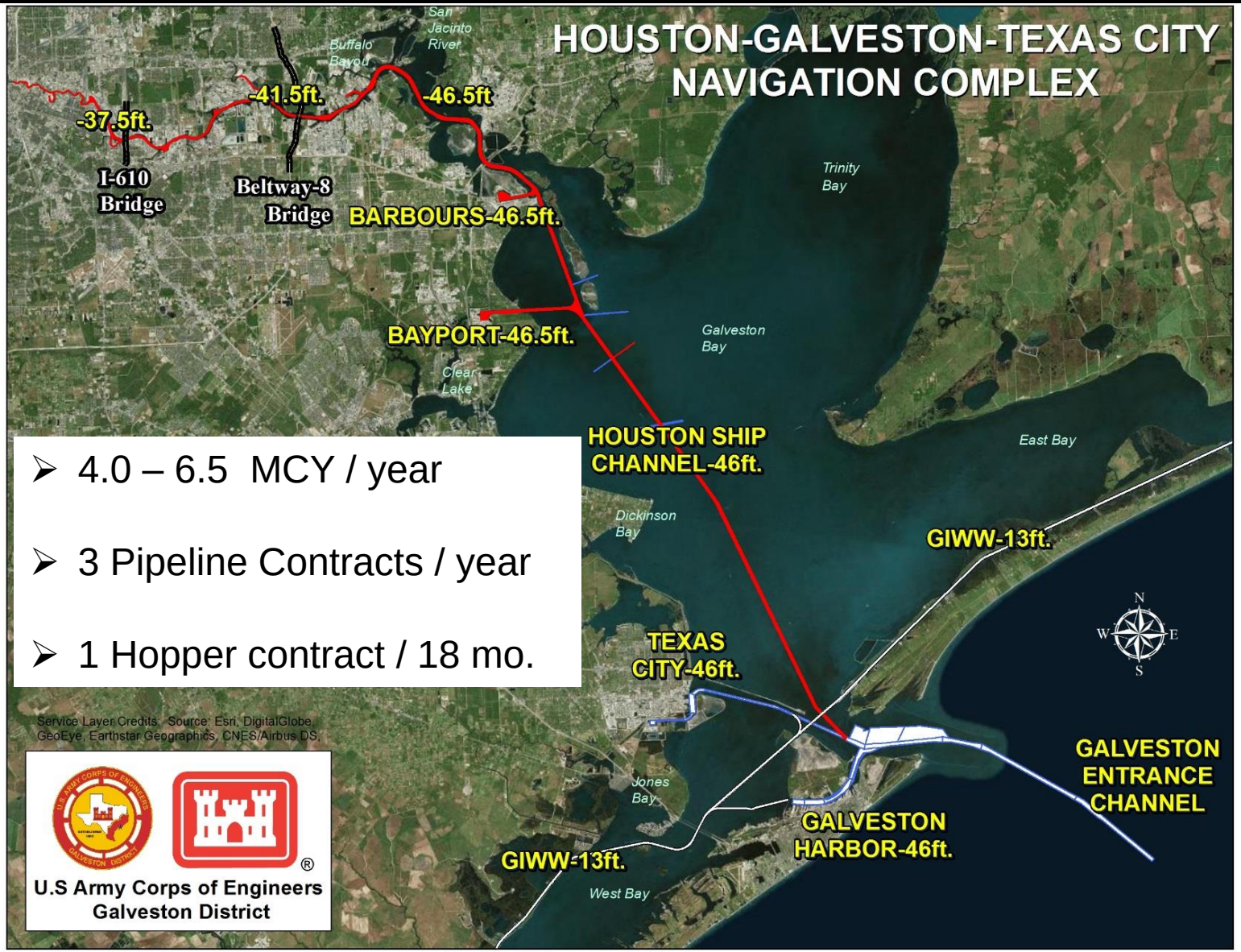

- 4.0 – 6.5 MCY / year
- 3 Pipeline Contracts / year
- 1 Hopper contract / 18 mo.

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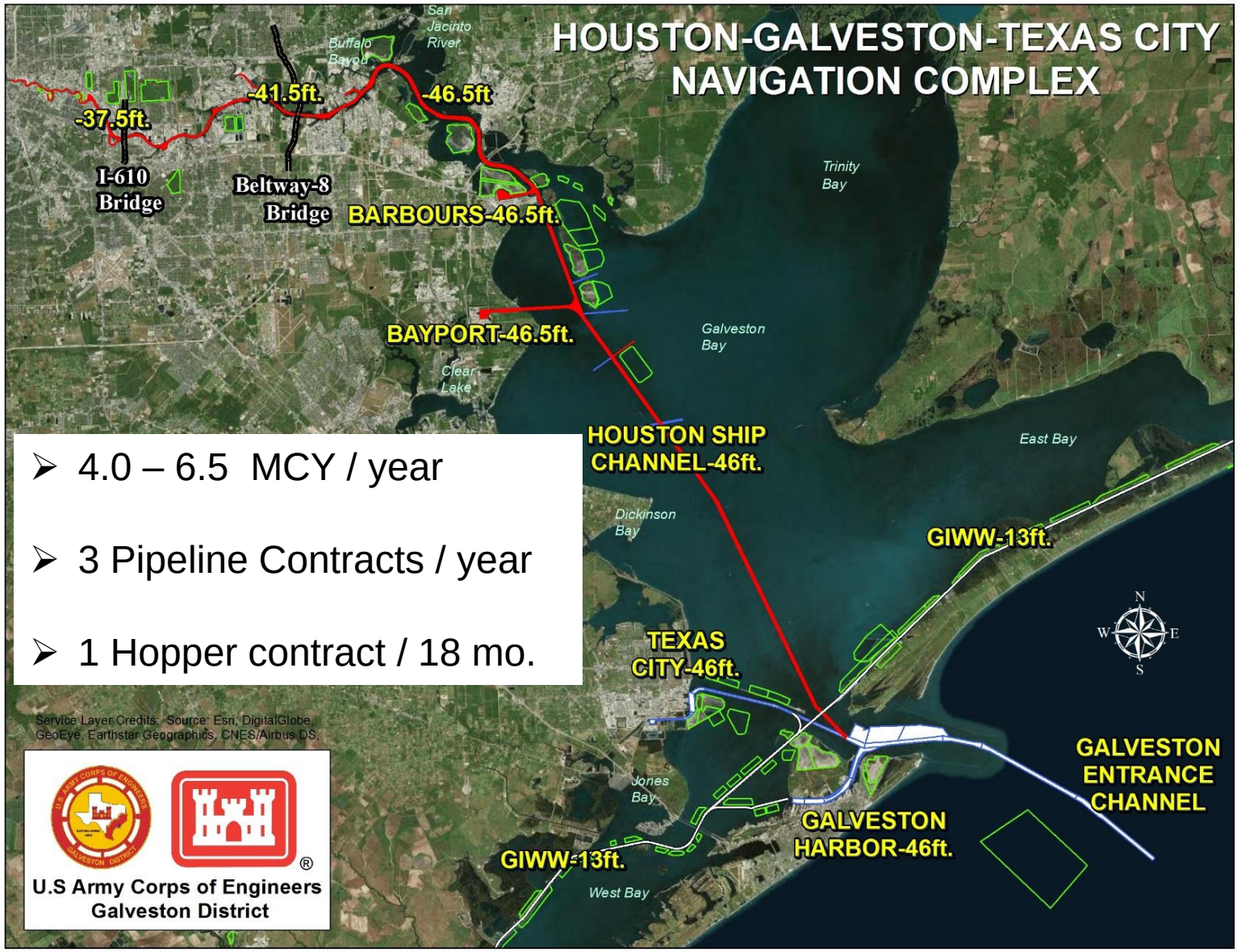

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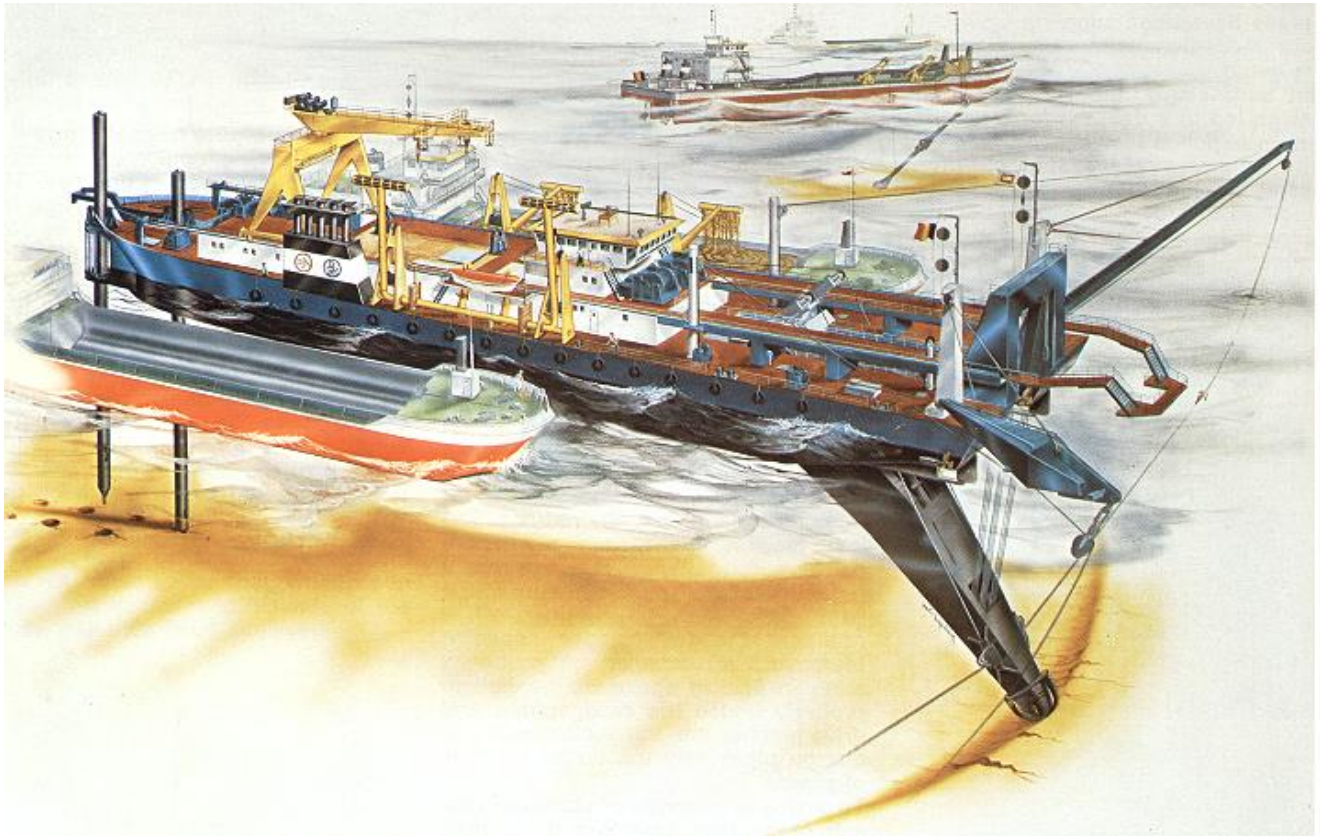
PIPELINE DREDGING



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PIPELINE DREDGING

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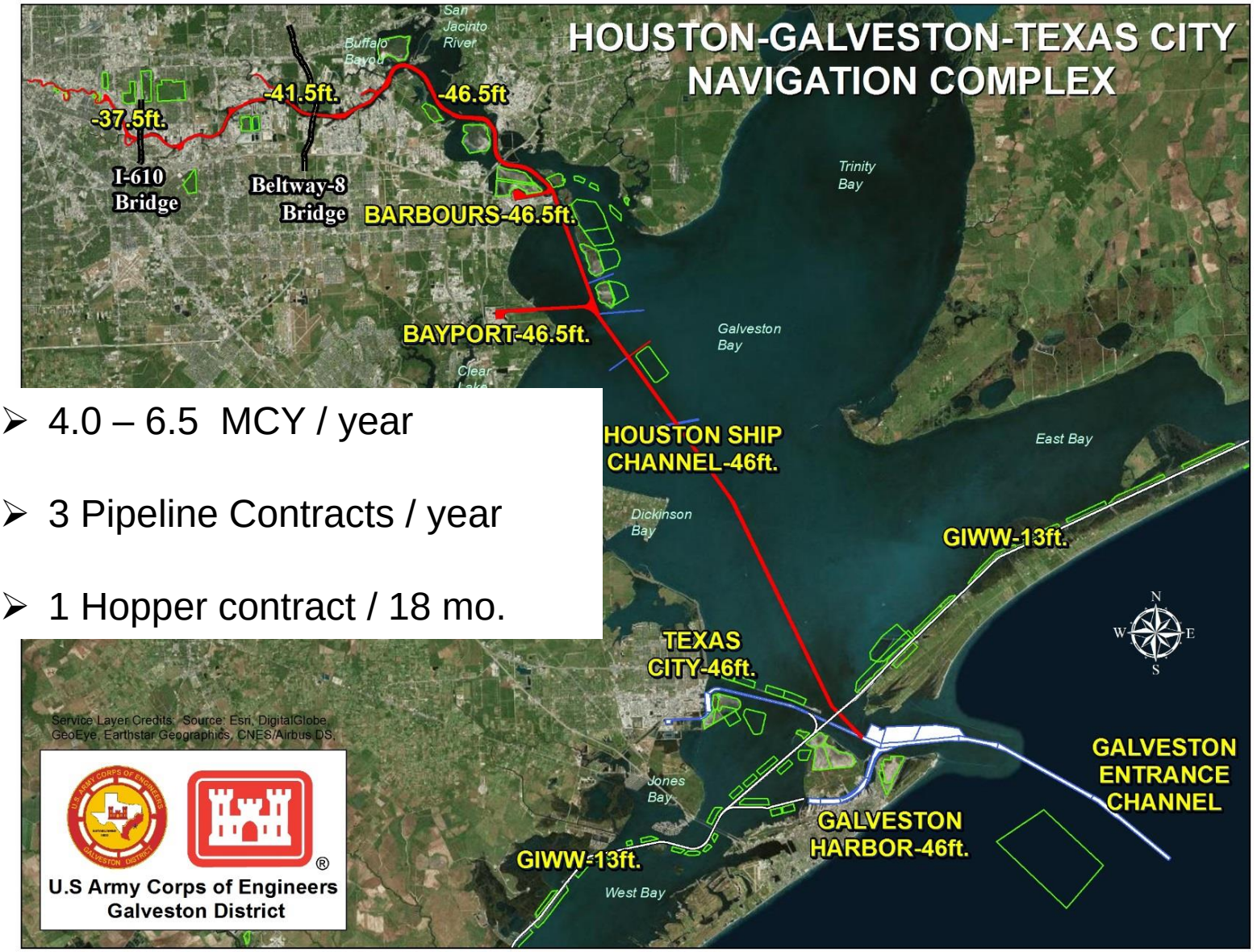

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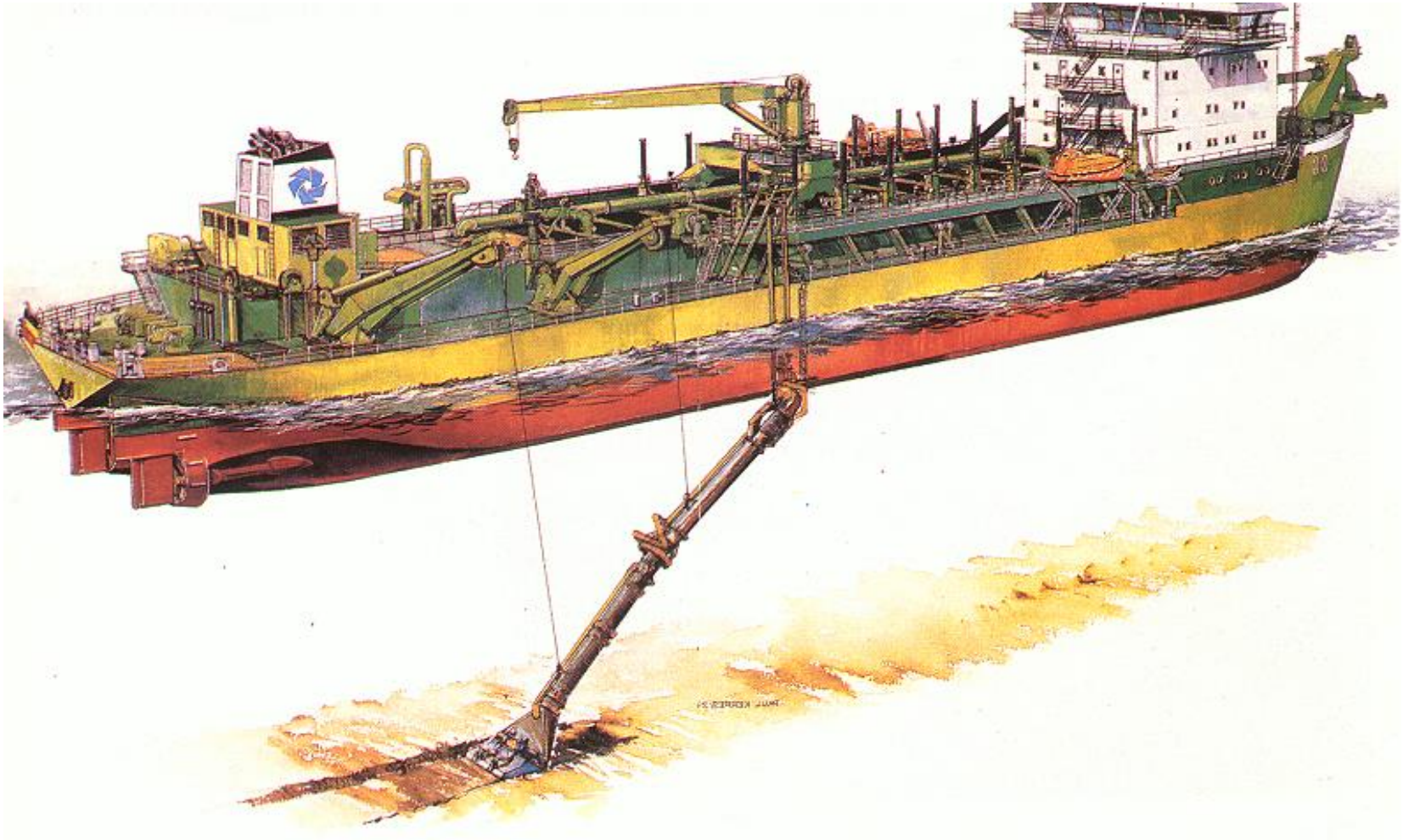
HOPPER DREDGING



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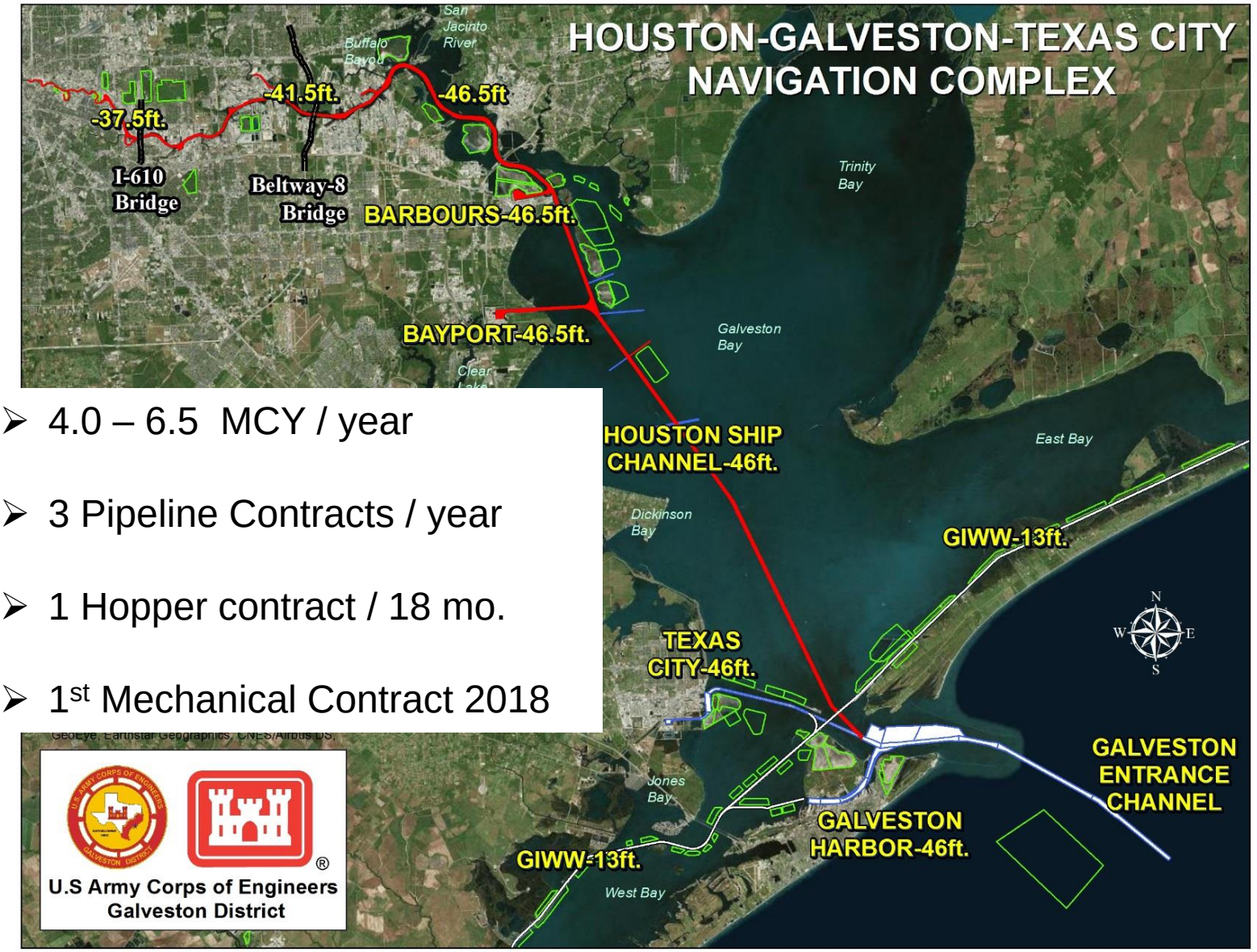

- 4.0 – 6.5 MCY / year
- 3 Pipeline Contracts / year
- 1 Hopper contract / 18 mo.
- 1st Mechanical Contract 2018

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MECHANICAL DREDGING

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MECHANICAL DREDGING

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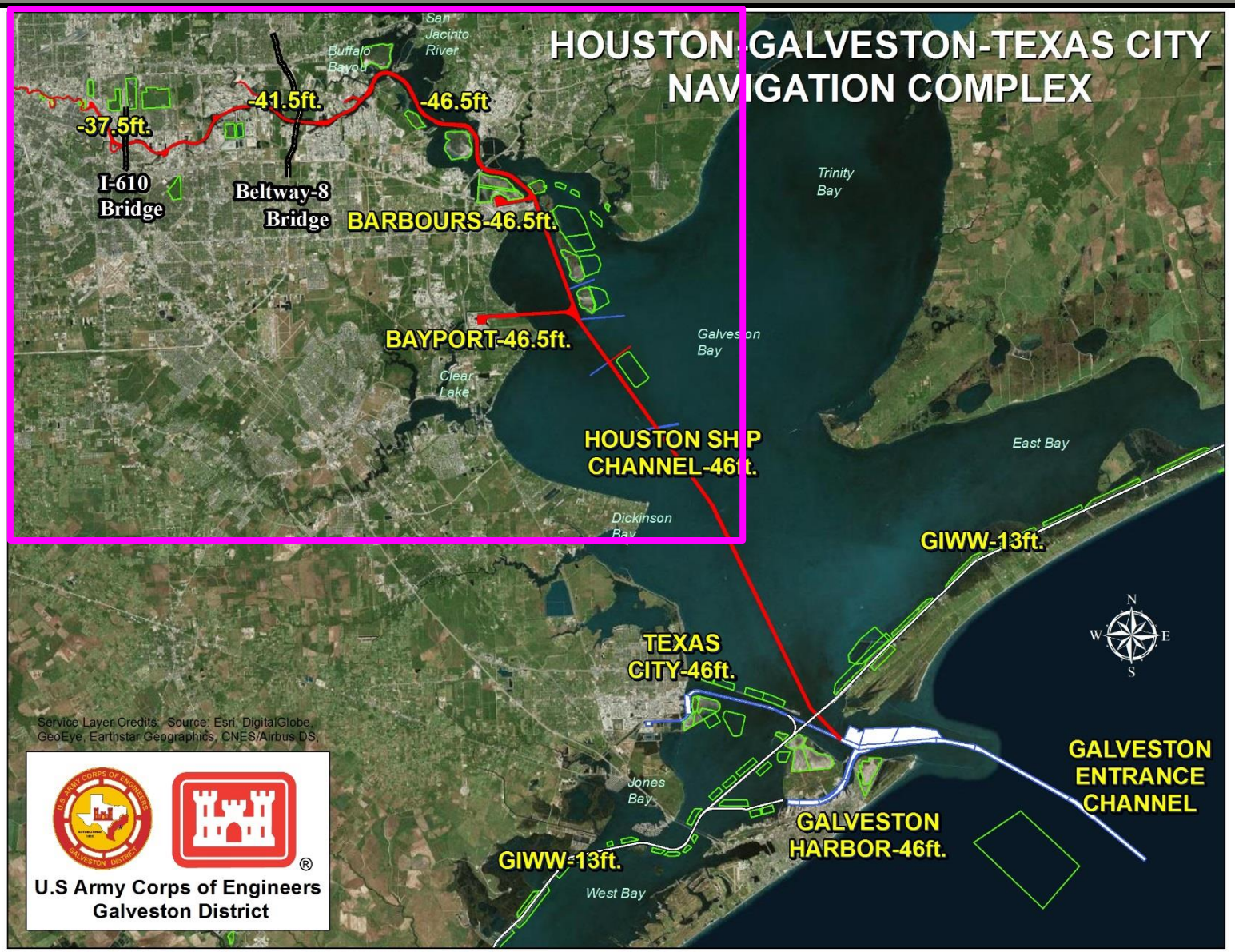

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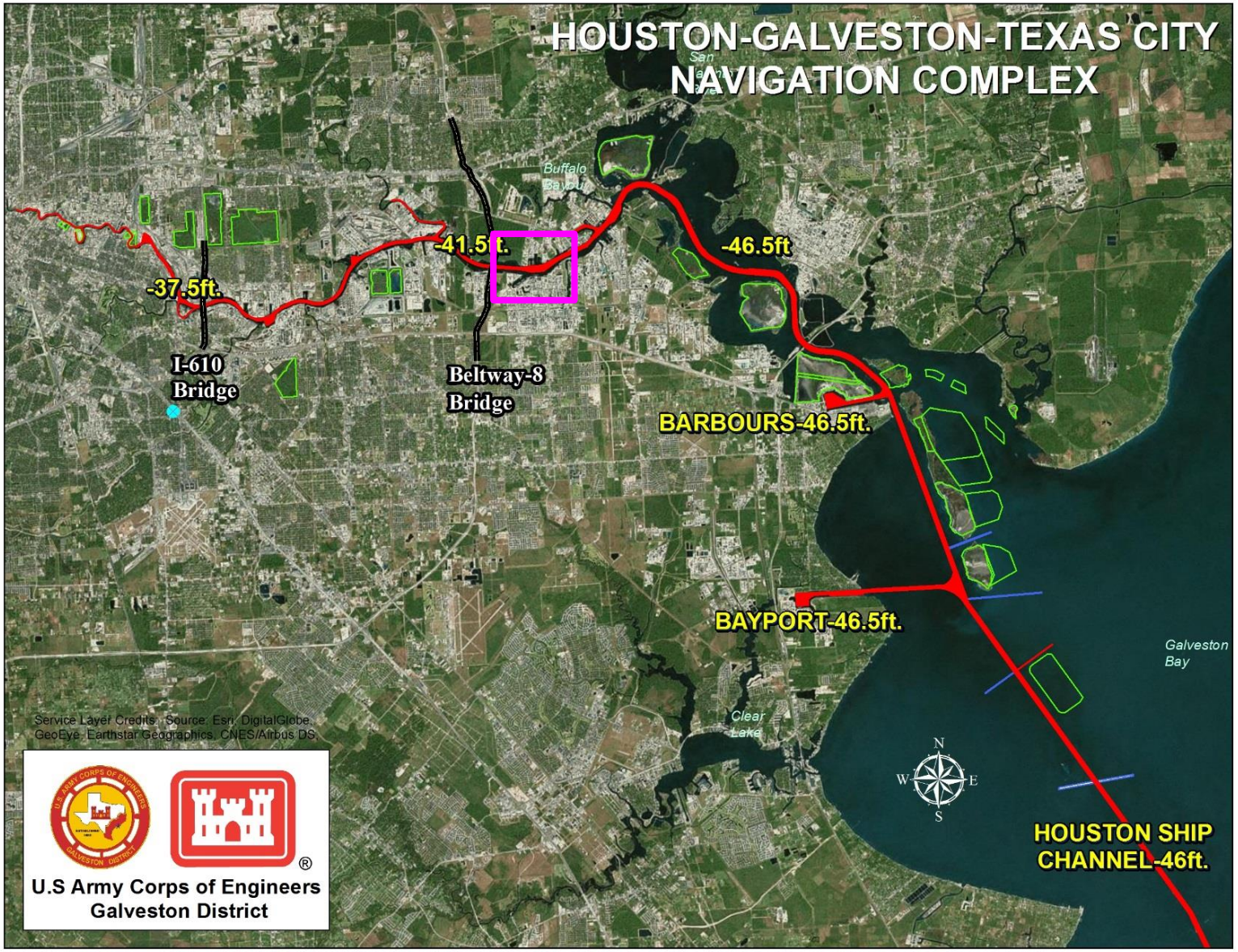

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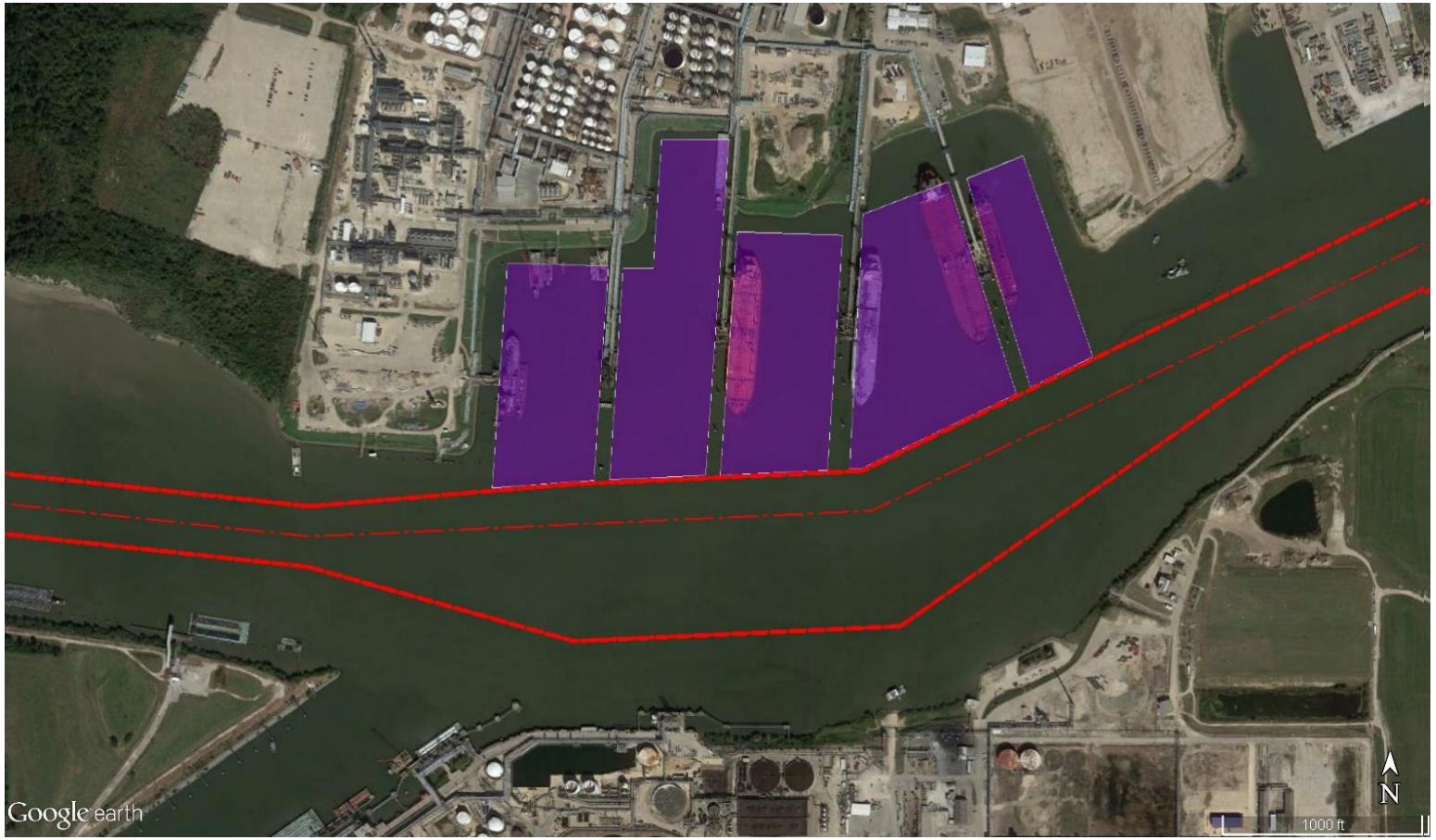

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Disposal Capacity of HSC Project

ULTIMATE CAPACITY OF EXISTING CDFs: ~180 MCY

Before Expansion (Current Needs)

- O&M Requirements: ~6.5 MCY / year

~27 years of capacity

After Expansion

- O&M Requirements: ~7.5 MCY / years

~24***** years of capacity

* This assumes that CDF capacity is preserved for Maintenance

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CRITICAL NEED TO PRESERVE CDF CAPACITY FOR FEDERAL & NON-FEDERAL MAINTENANCE

CURRENT OPERATIONS

COST

3 Pipeline Maintenance contracts / year
Medium-sized Pipeline Dredges
3 – 5 miles of pipeline
No Booster Pumps
(~$10 / CY)

OPERATIONAL FEASIBILITY

Ship traffic able to flow with minimal disruptions during dredging operations

FUTURE OPERATIONS w/out CDF Capacity

COST

3 Pipeline Maintenance contracts / year
Large-sized Pipeline Dredges
10+ miles of pipeline
1-4 Booster Pumps
(~$30 / CY)

OPERATIONAL FEASIBILITY

Ship traffic will be significantly inhibited from excess pipeline and dredging equipment

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CHANNEL EXPANSION PROJECT

Houston Ship Channel Feasibility Study

- Reducing transportation costs while providing safe, reliable navigation on the Houston Ship Channel

Identify disposal alternatives for:

- 50+ MCY of new work material from Federal Channel and non-Federal Berthing Areas.

- 350 MCY of maintenance material from Federal Channel and non-Federal Berthing Areas.

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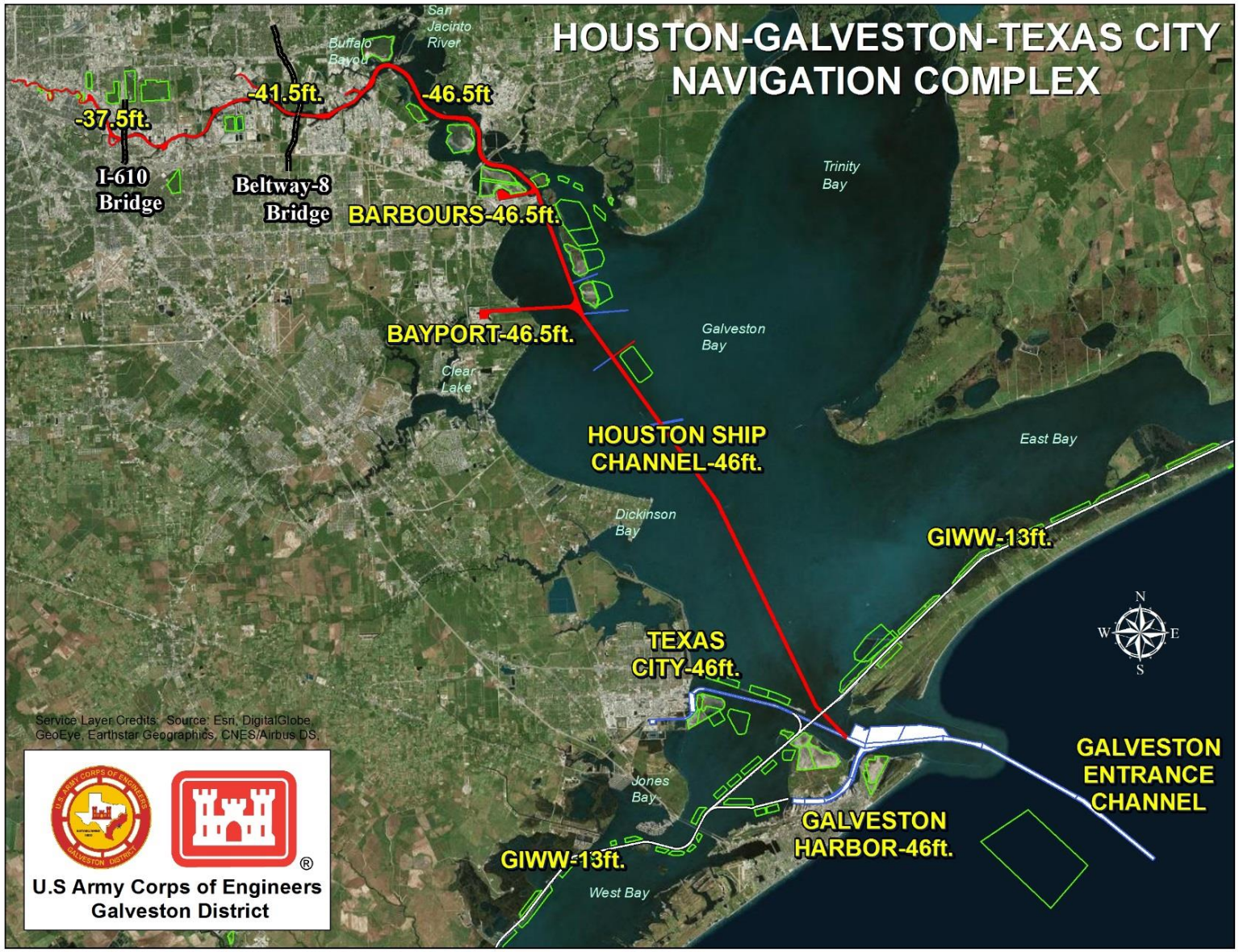

CHANNEL EXPANSION PROJECT

Long Distance Conveyance of Dredged Material

- Pipeline Dredging:
  - Large Dredges
  - Long Pipelines
  - Limited to 10 miles +-
  - Not operationally feasible

- Hopper Dredging
  - Cannot dredge berthing areas
  - Not dredging when it's sailing
  - Not operationally nor economically feasible
    North of Morgans Point
  - Unable to maneuver in tight areas

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MECHANICAL DREDGING

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CHANNEL EXPANSION PROJECT

Long Distance Conveyance of Dredged Material (cont…)

- Mechanical Dredging:
  - Great for berthing area dredging
  - Works well in tight areas
  - Preferred dredging method for new work
  - Able to continuously dredge with multiple scows
  - Scows draw ~15 ft of water

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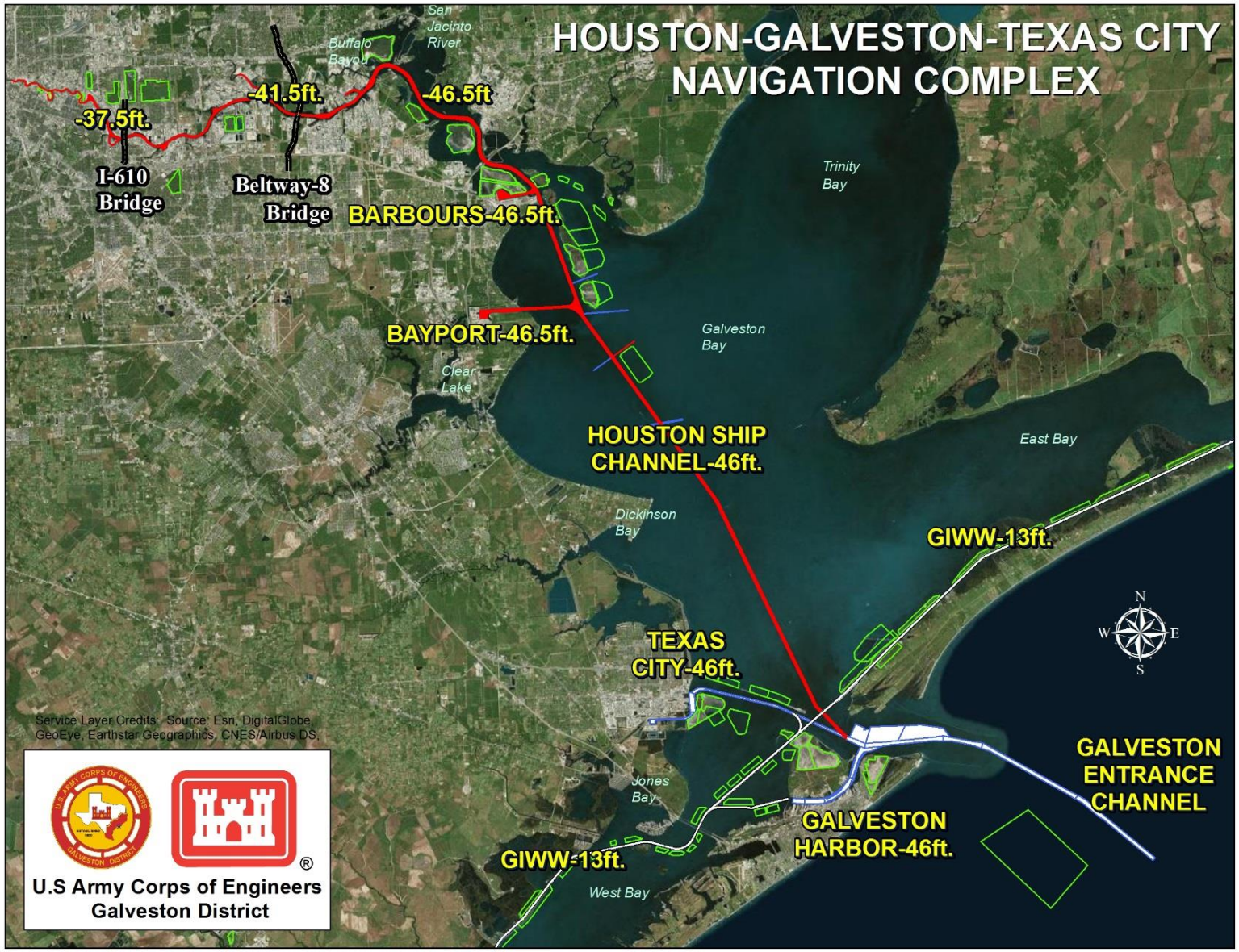

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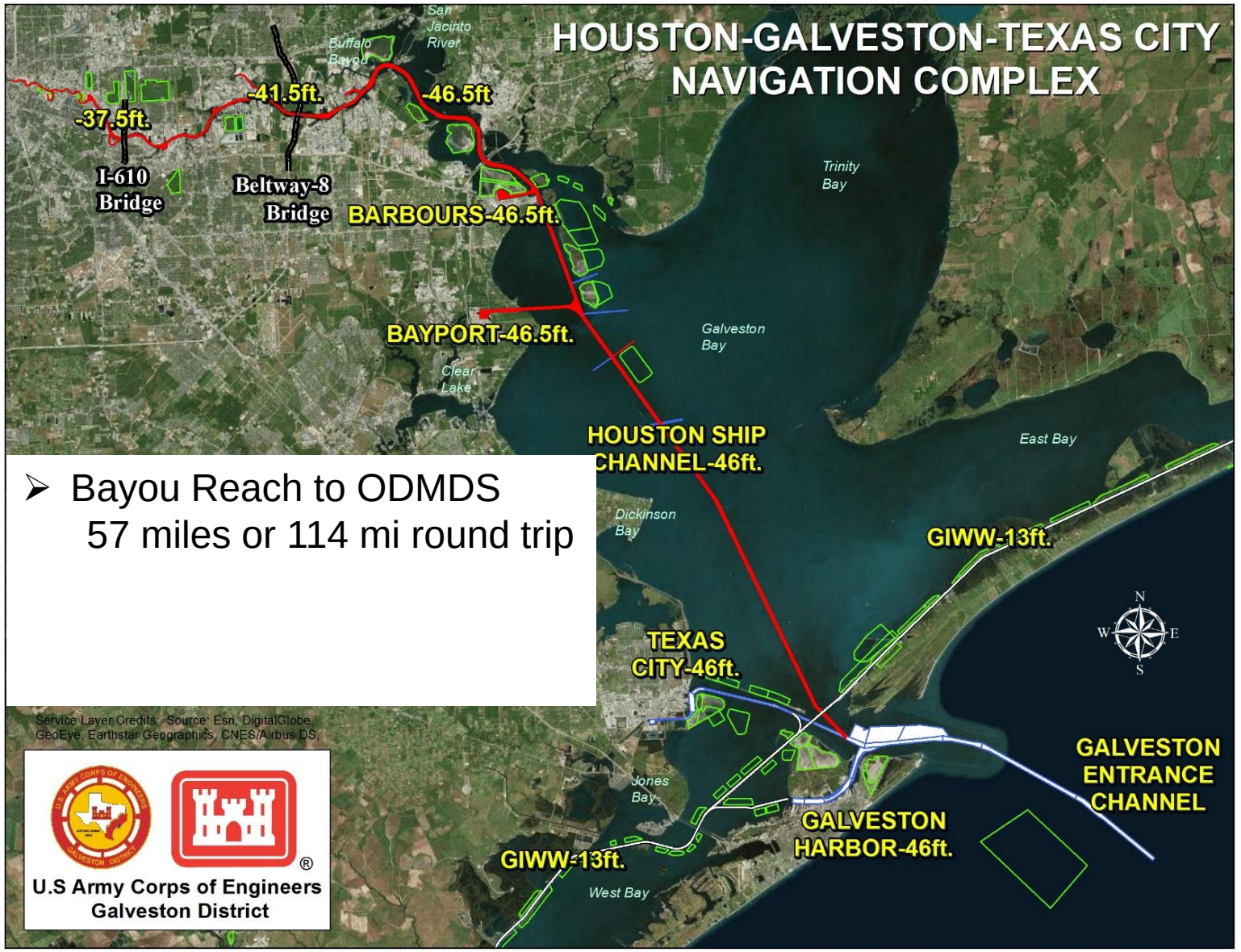

- Bayou Reach to ODMDS
  57 miles or 114 mi round trip

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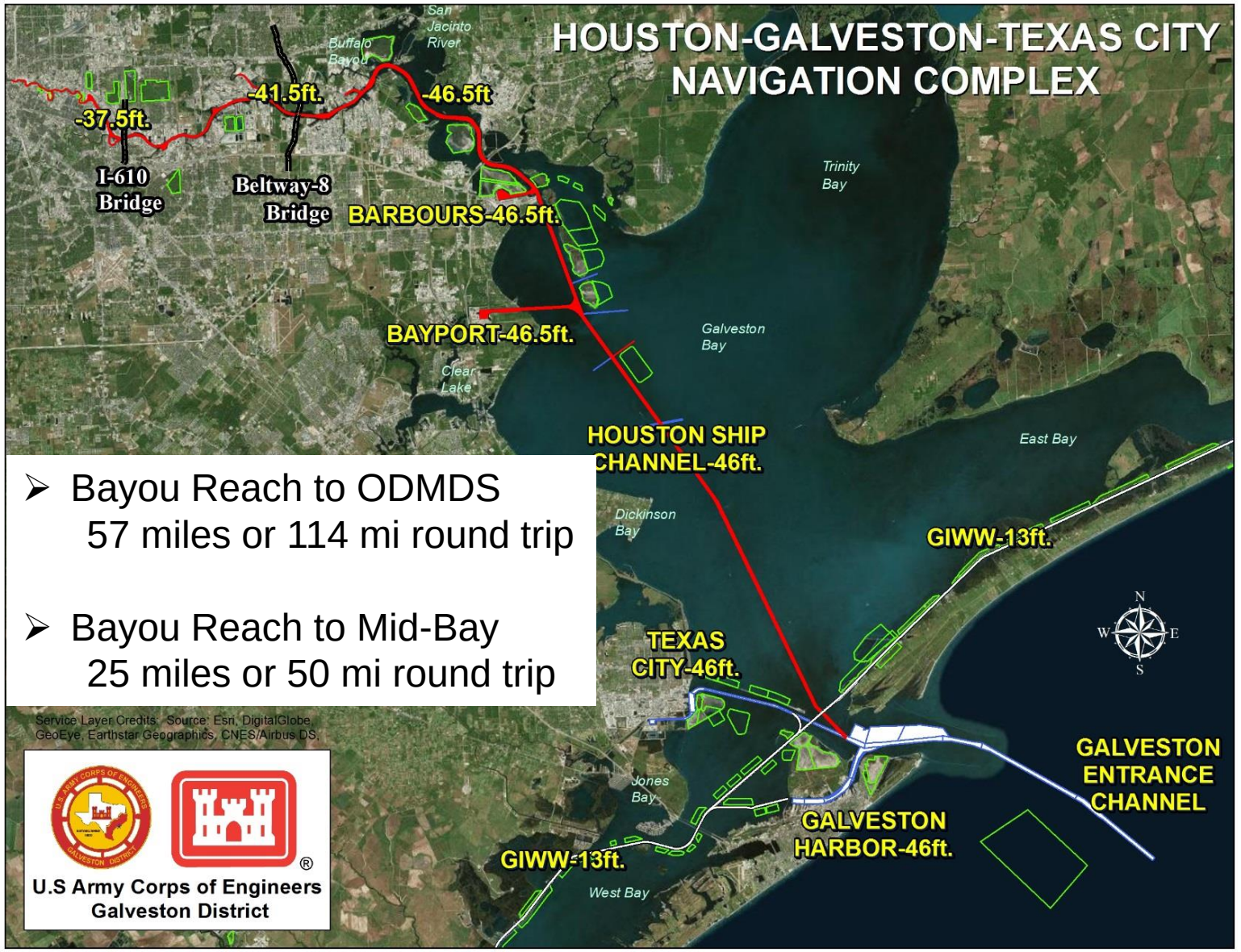

- Bayou Reach to ODMDS
  57 miles or 114 mi round trip
- Bayou Reach to Mid-Bay
  25 miles or 50 mi round trip

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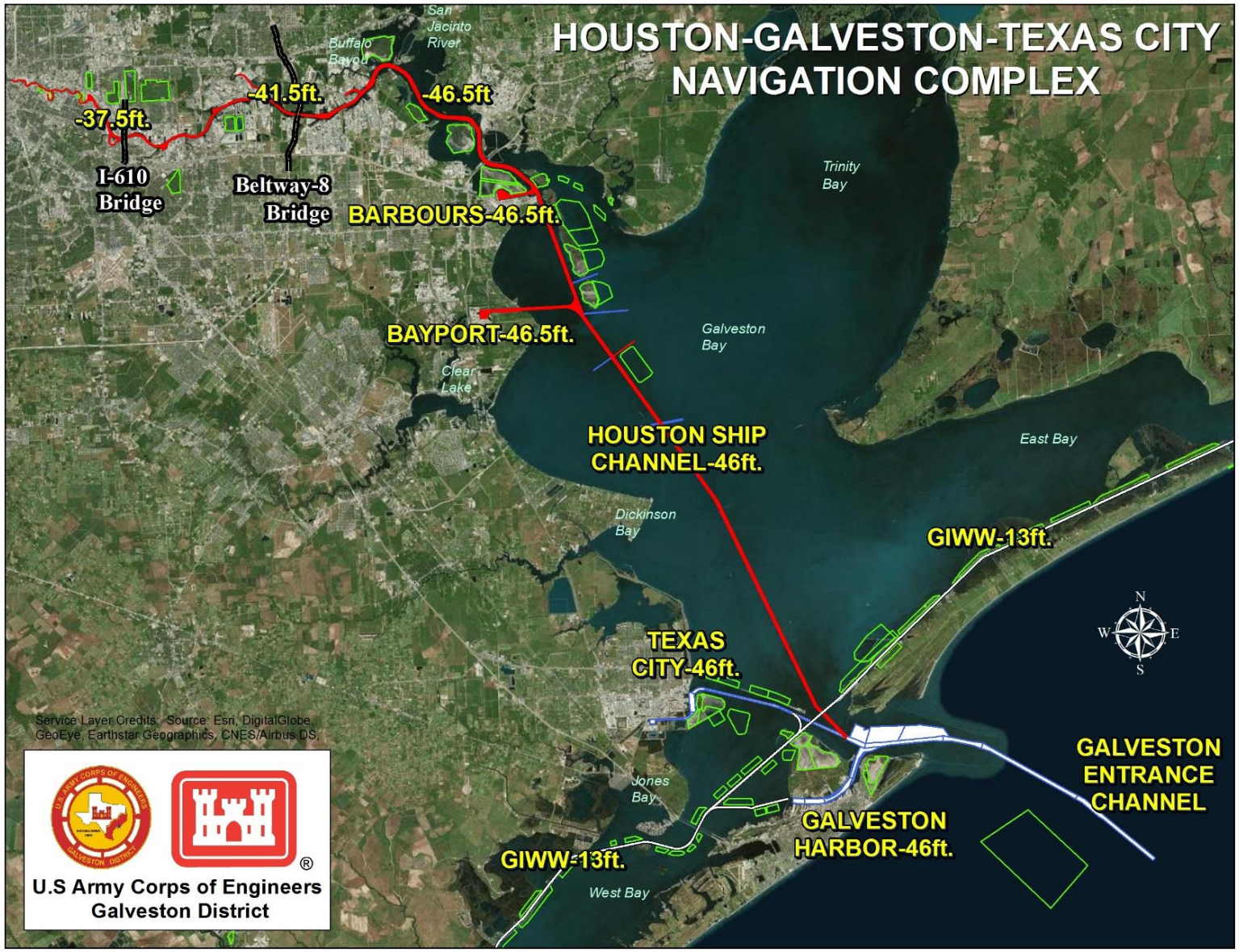

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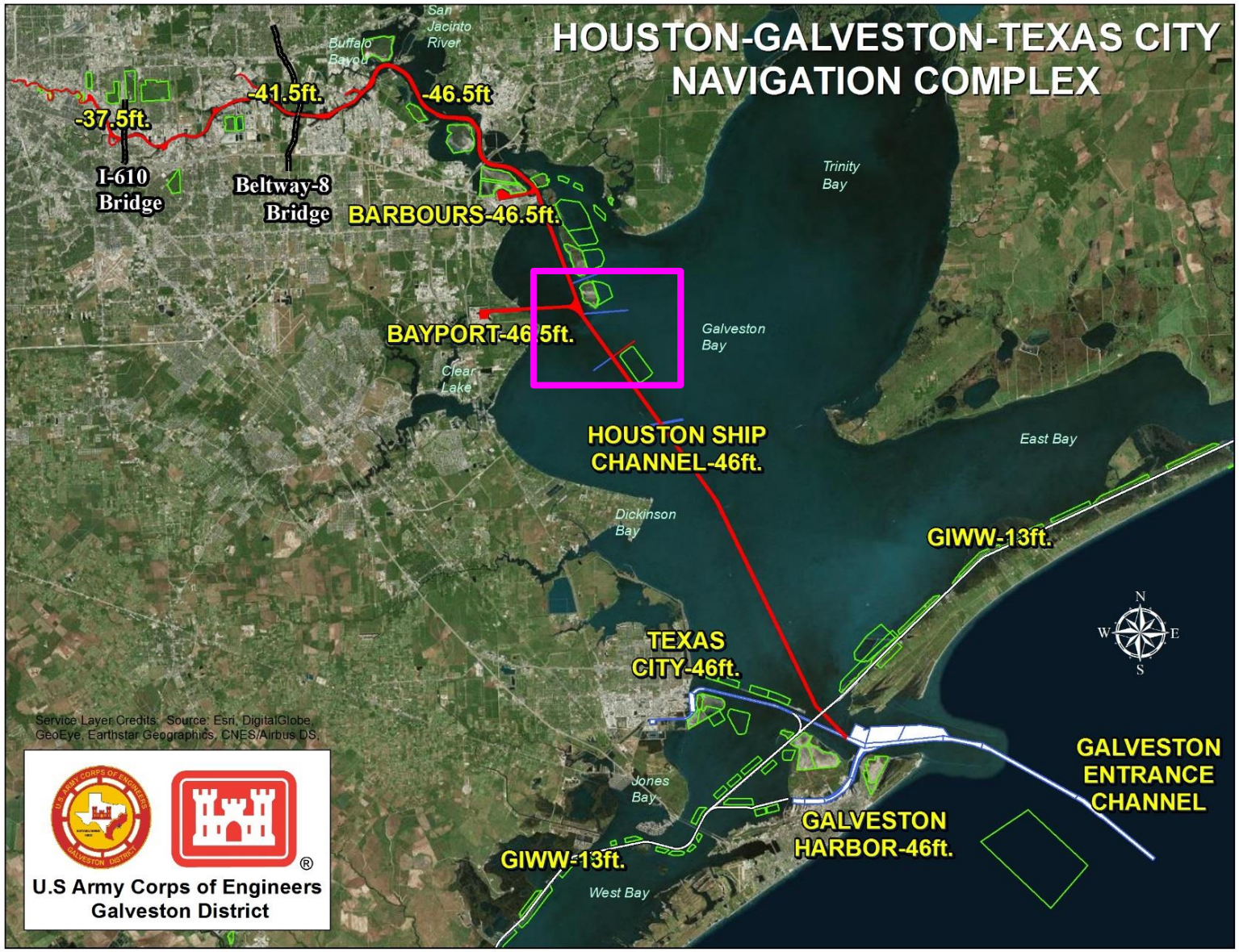

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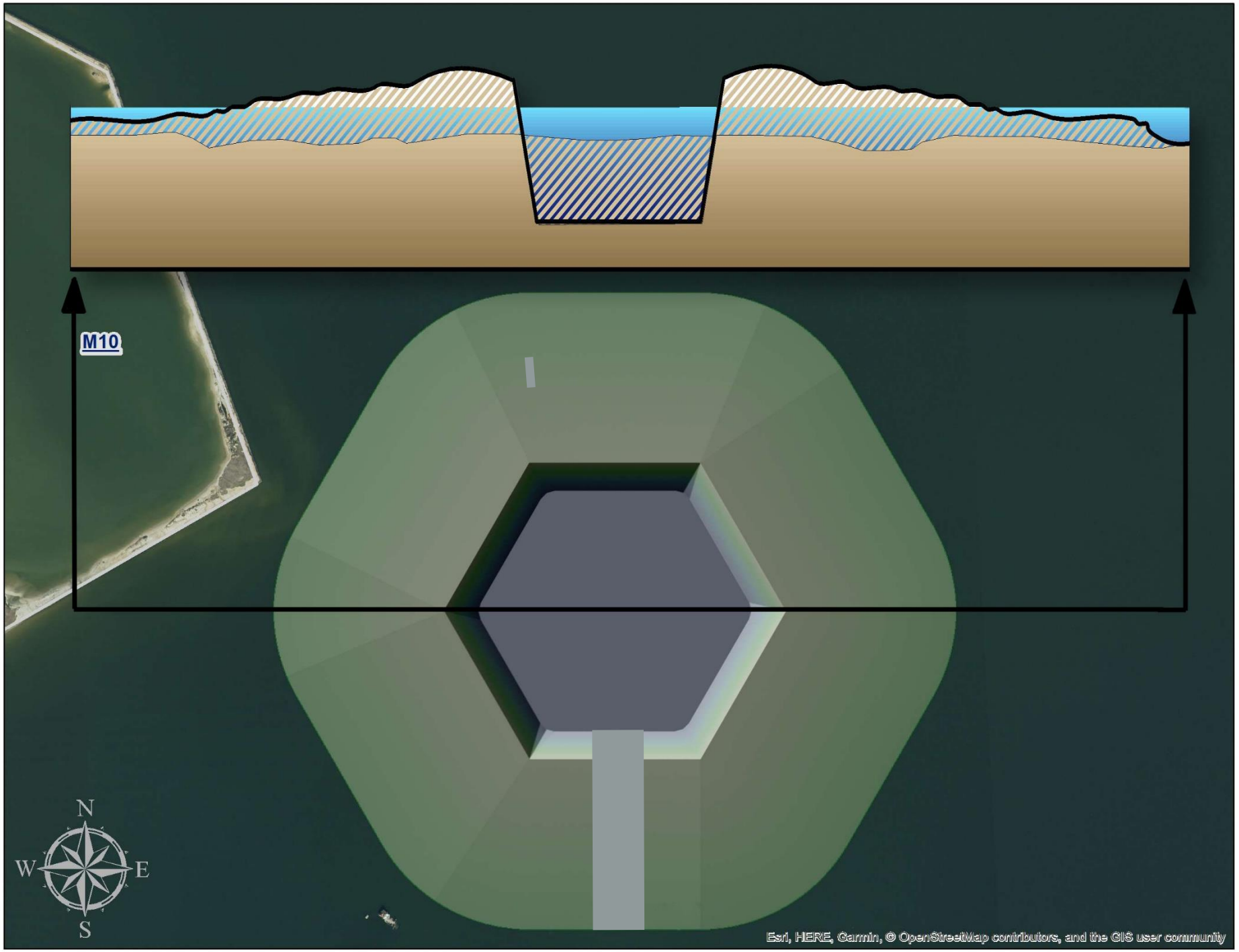
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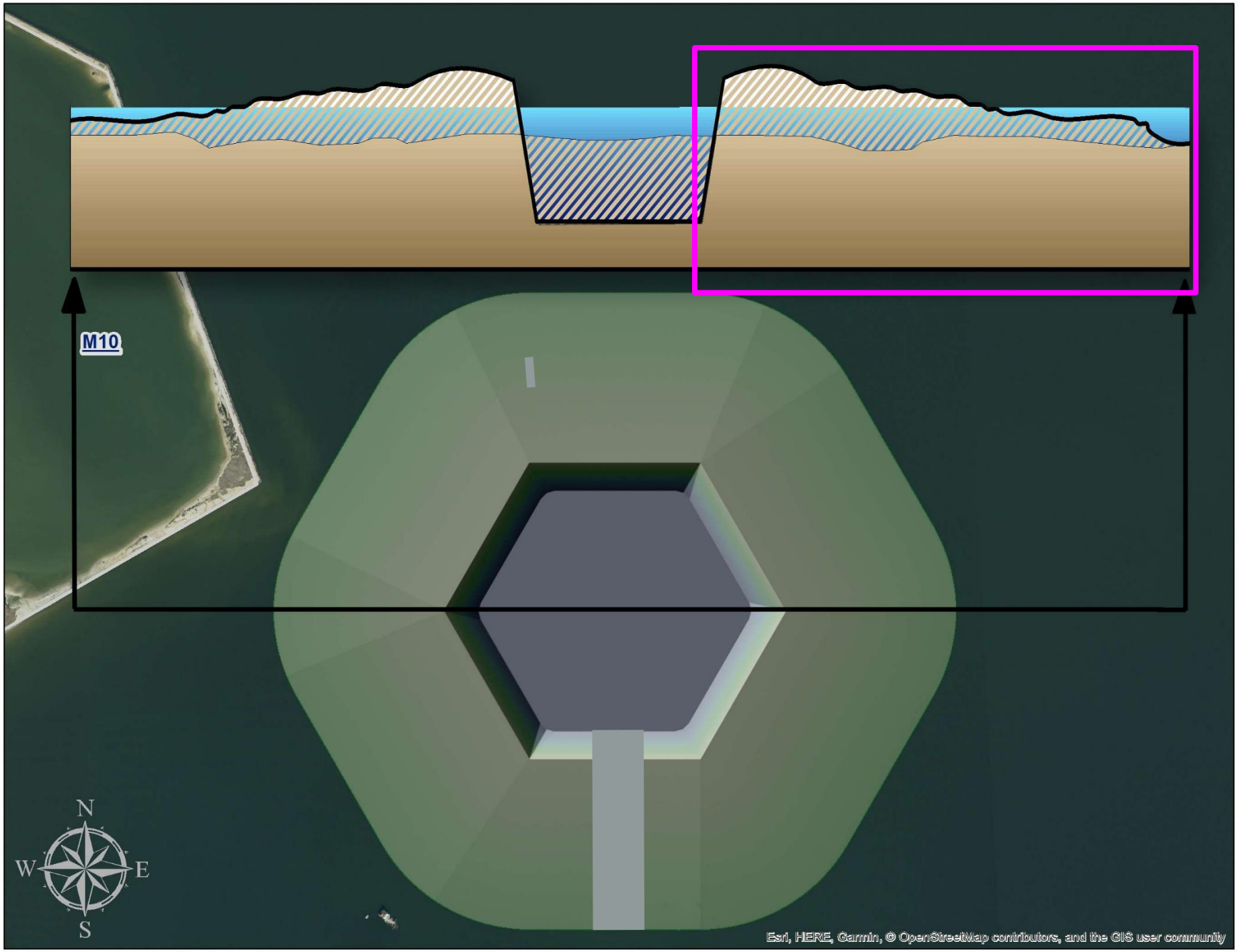
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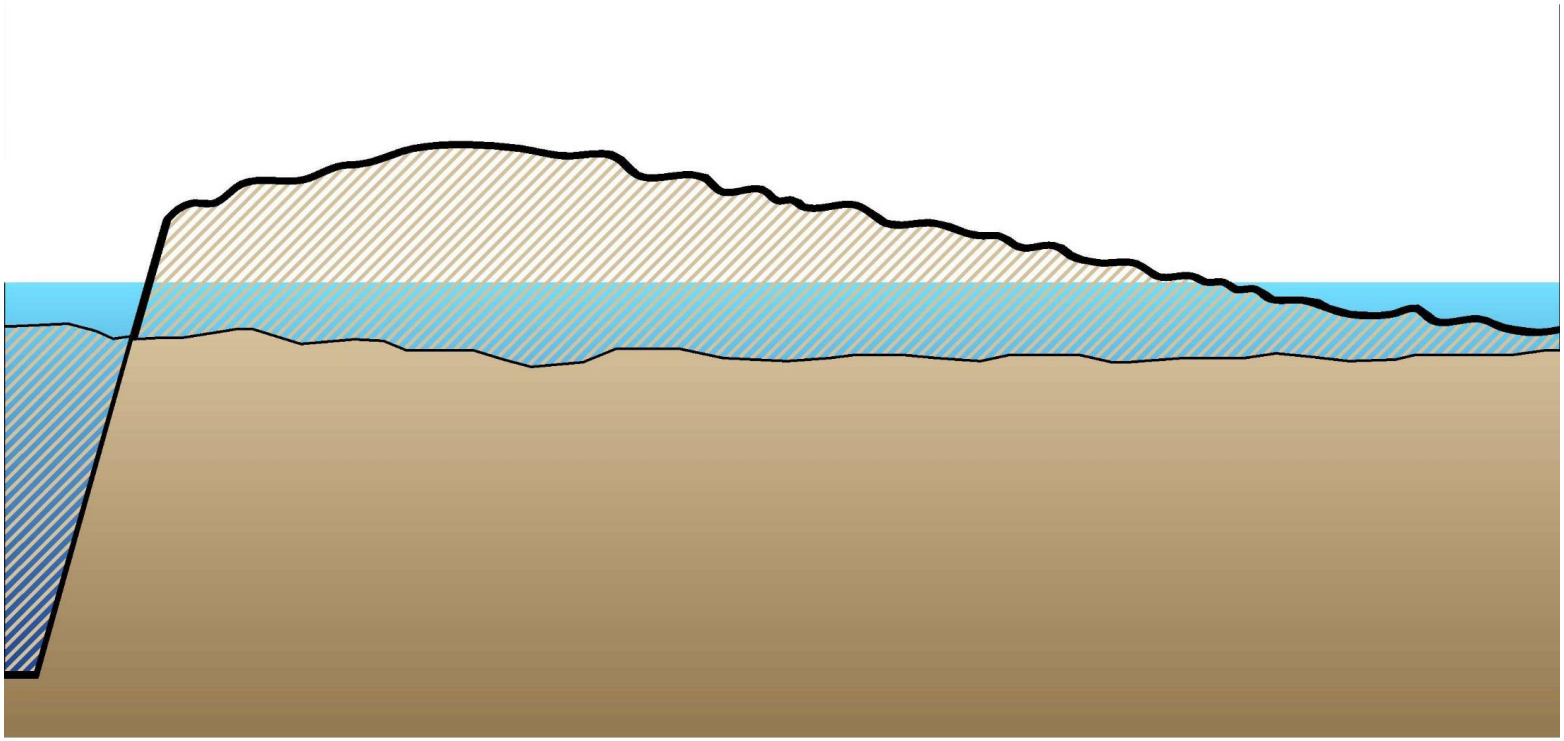
CONFINED AQUATIC DISPOSAL (CAD) CELLS WITH ASSOCIATED ENVIRONMENTAL FEATURES



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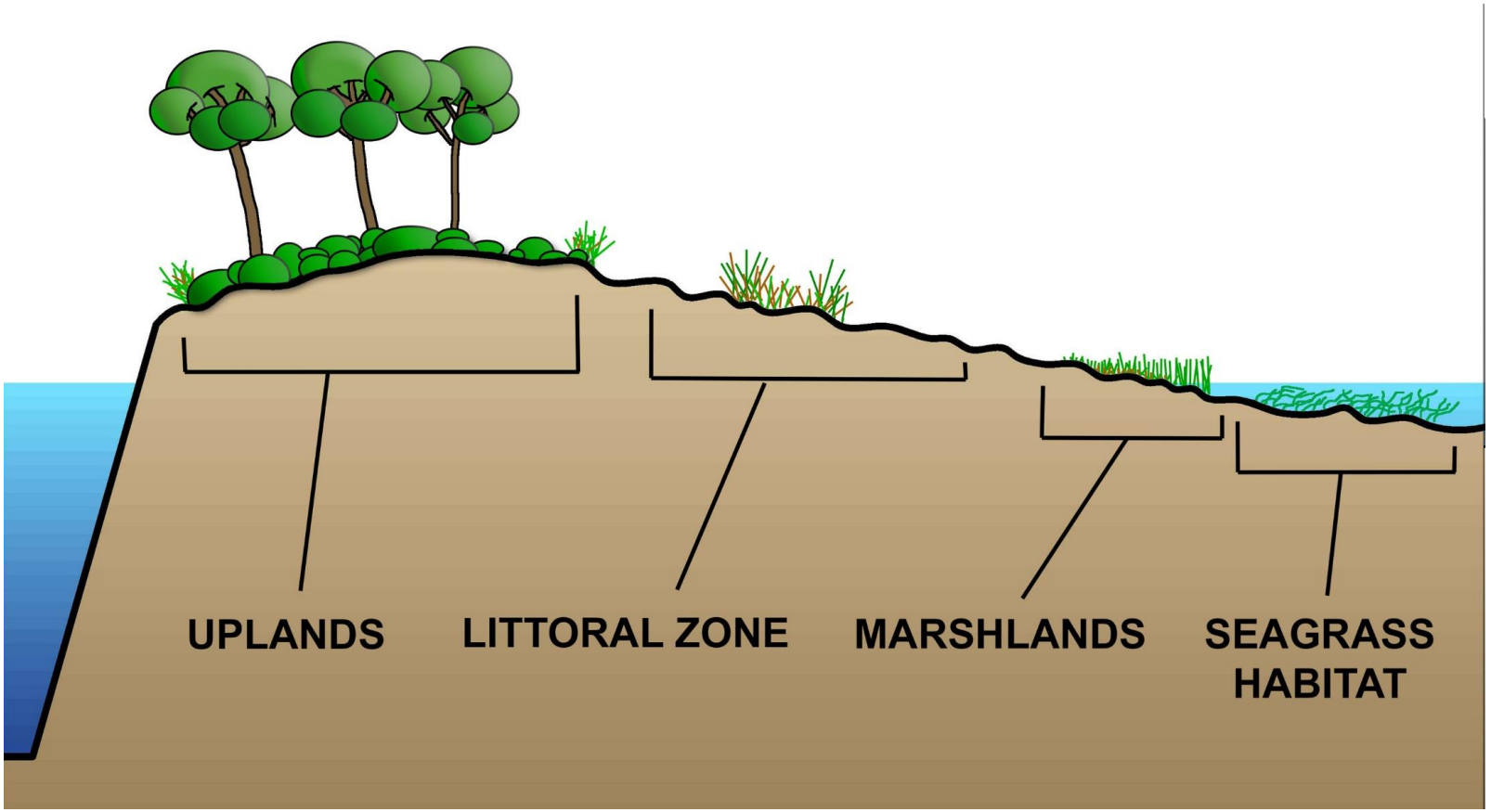

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SCALABLE & REPEATABLE

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SUMMARY

- **CAD Cells proposed for:**

  New Work (Federal Channel & non-Federal Berths)
  Future Maintenance (Federal Channel & non-Federal Berths)

- **All Environmental (Mitigation) features constructed upfront**
- **Keeps material in the system**
- **Available for multiple simultaneous dredging operations**
- **Environmental features built with pristine new work material**
- **Mechanical dredging best method for compromised material**
- **CAD Cell disposal best disposal method for compromised material**
- **Once constructed; quick and easy approvals for non-Federal material**

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