

# LIVING SHORELINES

WHAT WORKS, WHERE  
&  
WHY

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# LIVING SHORELINES

- FACTORS THAT AFFECT DESIGNS
  - WHAT IS THE EXISTING SHORELINE CONDITION?
  - WHAT IS THE SOURCE OF EROSION?
  - WHAT IS THE REASON FOR WORK?
  - WHAT MATERIALS ARE APPROPRIATE FOR THE SITE?
  - IS THERE HISTORY THAT MAY BE USEFUL?

# EXISTING SHORELINE CONDITIONS

- HOW STEEP IS THE BANK?
- IS or WAS THERE A BULKHEAD or RIP RAP?
- HOW MUCH ROOM IS THERE TO WORK WITH?
- CAN IT ALL BE DONE LANDWARD or IS GOING SEAWARD NECESSARY?

# SOURCES OF EROSION

- WIND DRIVEN WAVES
- BOAT WAKES
- COASTAL SUBSIDENCE and SEA LEVEL RISE
- DISCRETE STORM EVENT THAT REQUIRES ACTION
- A COMBINATION OF ANY or ALL OF THE ABOVE



# REASON FOR WORK

- ERODING BANK
- FAILED or FAILING BULKHEAD
- DESIRE TO ARREST LOSS OF YARD
- DESIRE TO RESTORE LOST SALT MARSH
- VIOLATION

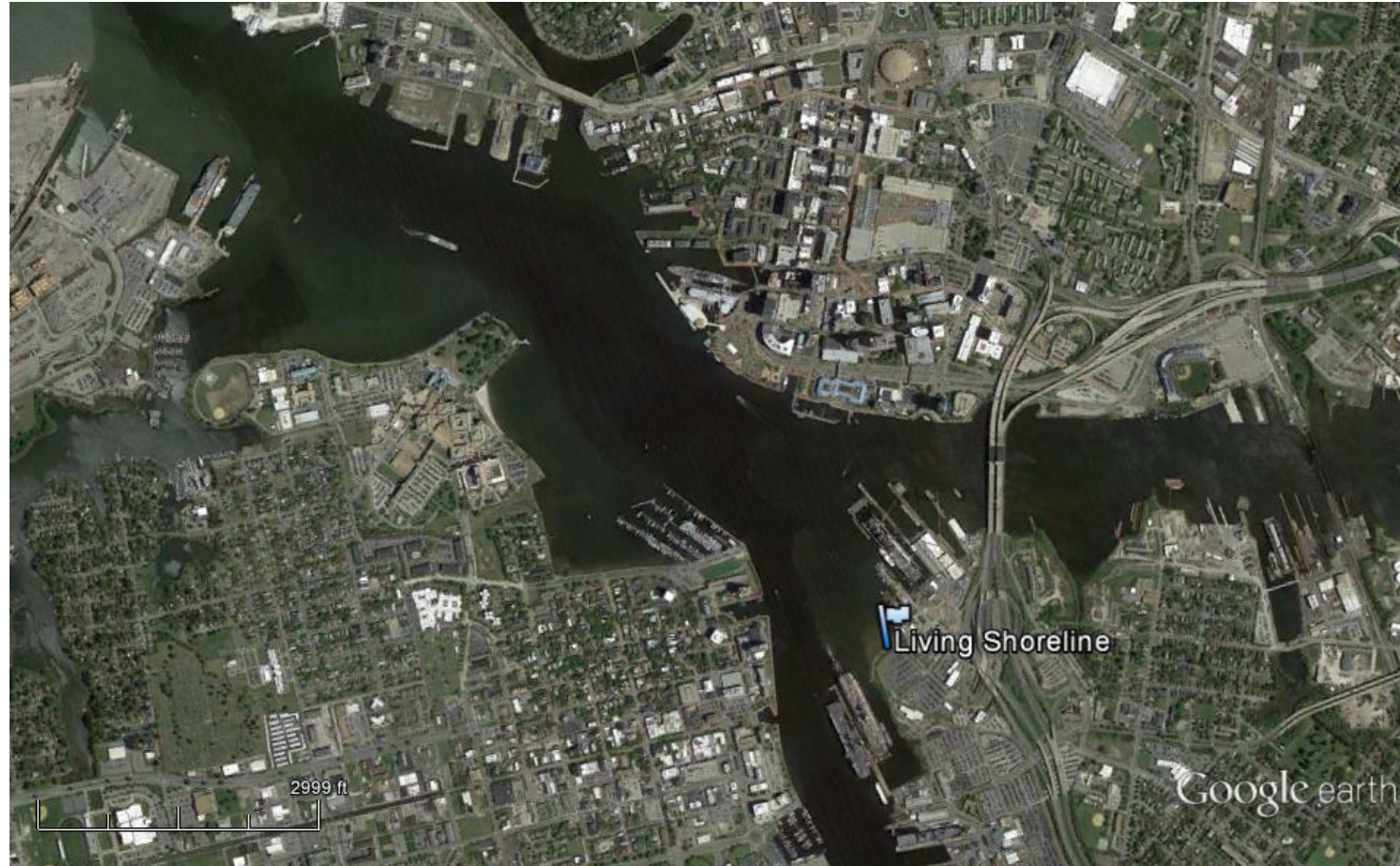
# MATERIALS TO STABILIZE THE TOE

- COIR LOGS
- RIP RAP TOE STABILIZATION
- SAND FILL BEHIND TOE STABILIZATION
- GRADING THE BANK (6:1 IS IDEAL, BUT 3:1 MAY WORK)
- DEFINING THE LANDWARD LIMIT

# HISTORY THAT MAY BE USEFUL

- AERIAL PHOTOGRAPHS SHOWING FORMER SALT MARSH
- GROUND LEVEL PHOTOGRAPHS SHOWING SALT MARSH
- SURVEY SHOWING HISTORIC EDGE OF WATER

# NORFOLK HARBOR EXPOSED SHORE



# FLEET PARKING LOT UPGRADE 2008





# INITIAL SHORELINE GRADING







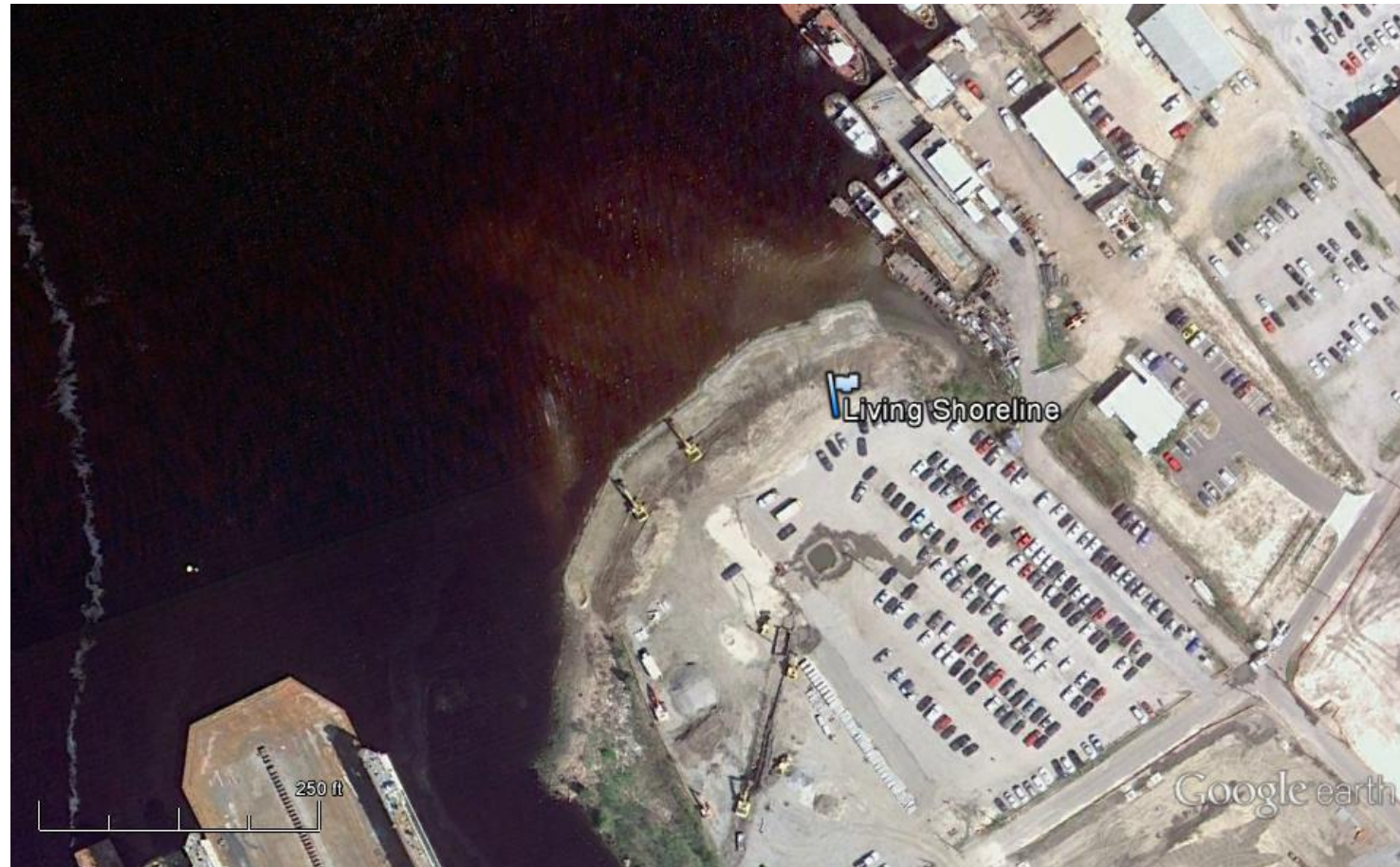


# INDUSTRIAL SHORE





# 2010 BUILDING THE LIVING SHORELINE



# INITIAL PLANTING





# SUMMER 2012





# NORTHEASTER FALL 2012, THE ACID TEST





# NORTHEASTER FALL 2012, THE ACID TEST





# MOST PERFORMED WELL



# THE REPAIR SPRING 2013





FALL 2015





# A FUNCTIONING LIVING SHORELINE





An aerial photograph of a coastal region featuring several islands and peninsulas. The land is densely covered with green trees and vegetation. Interspersed among the landmasses are numerous small, dark-colored bodies of water, likely canals or bays. In the upper left, a long, straight, light-colored strip, possibly a bridge or a causeway, extends from the edge of the frame into the water. In the lower right, another similar strip is visible. A label 'Living Shoreline' in white text with a black outline is positioned in the lower-left quadrant. To the right of the text is a blue pushpin icon, which is placed on a small, narrow landmass. The overall scene depicts a complex, fragmented landscape where land and water are closely integrated.

Living Shoreline



# RELATIVELY HIGH ENERGY SHORE

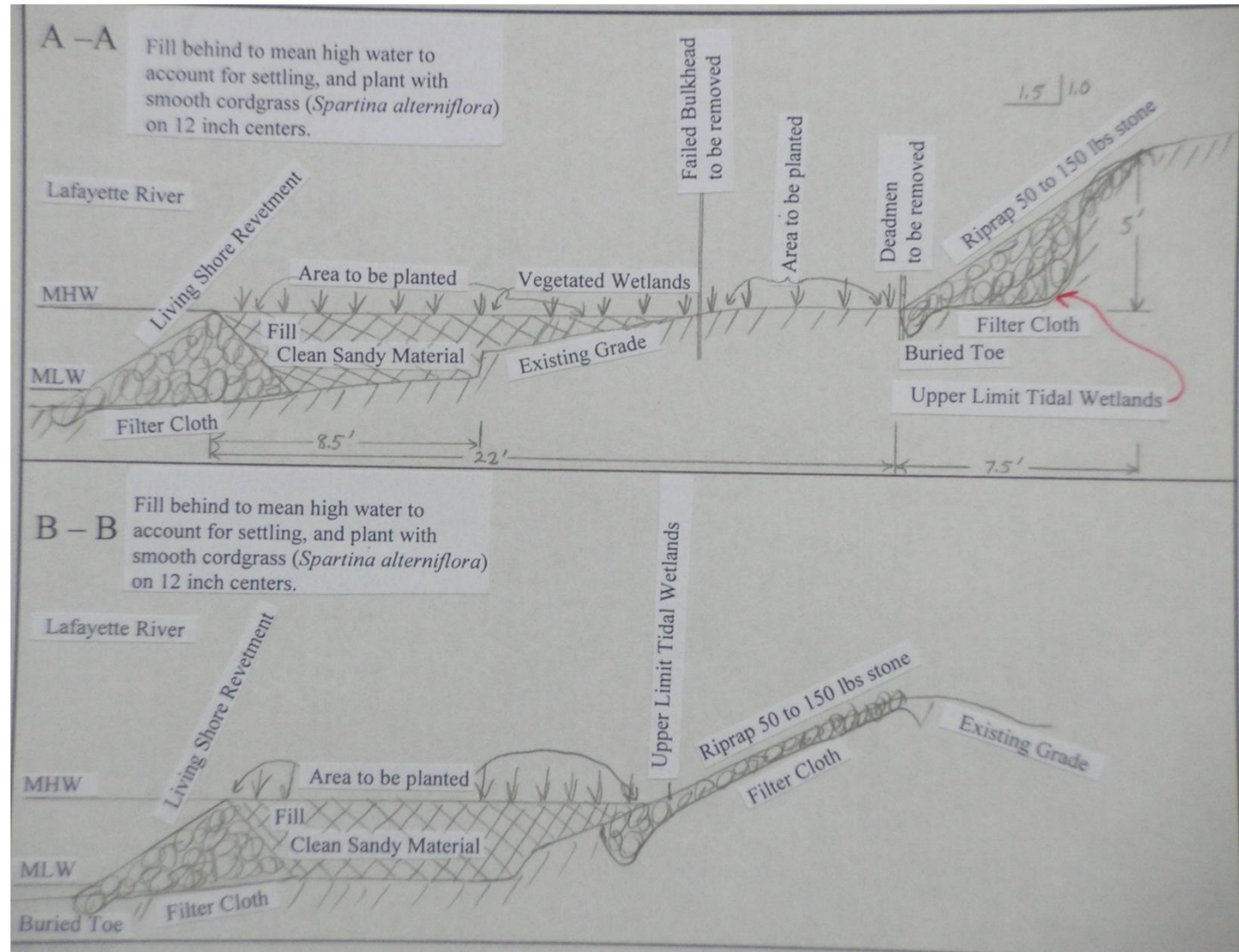




# INITIAL CONDITIONS



# THE PLAN



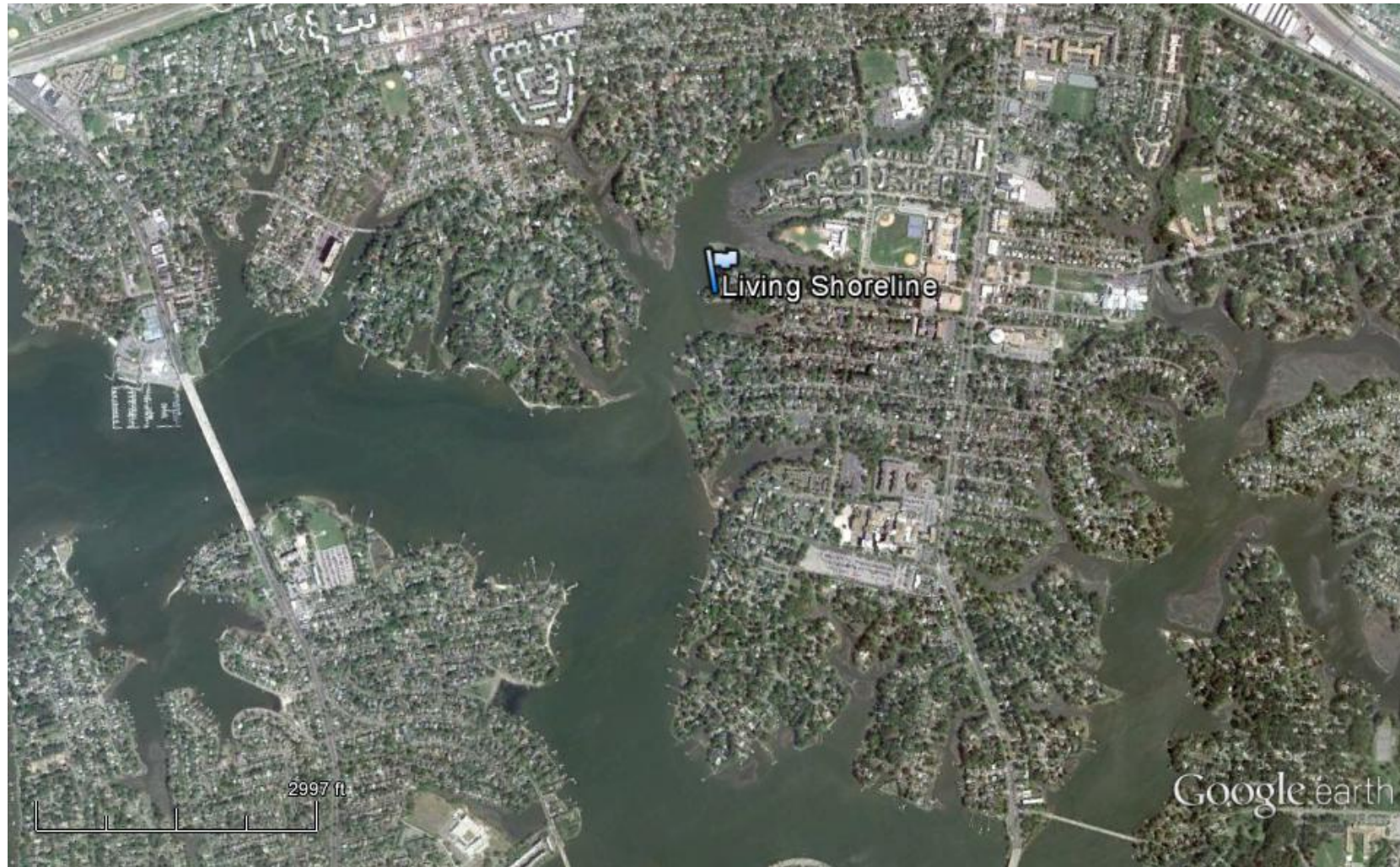


FALL 2015





# HIGH MARSH RESTORATION





# LOW BULKHEAD BEING OVER TOPPED





# SHORELINE WAS A MESS



# DEFINE THE OUTER EDGE





FALL 2015





# PLANT NURSERY SPECIES



FALL 2015





# SHORELINE WAS A MESS



# DEFINE THE OUTER EDGE





FALL 2015





# PLANT NURSERY SPECIES

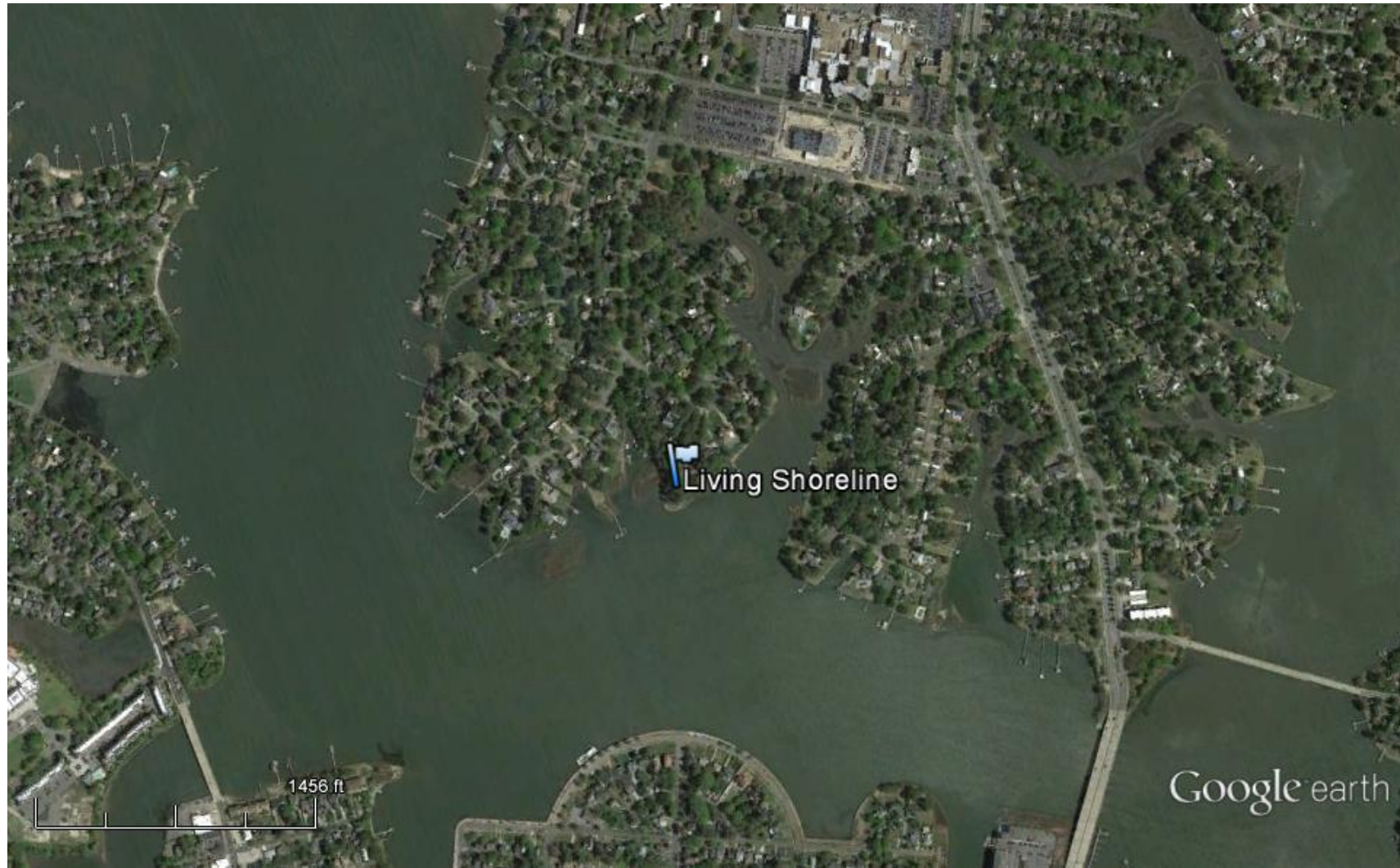




FALL 2015

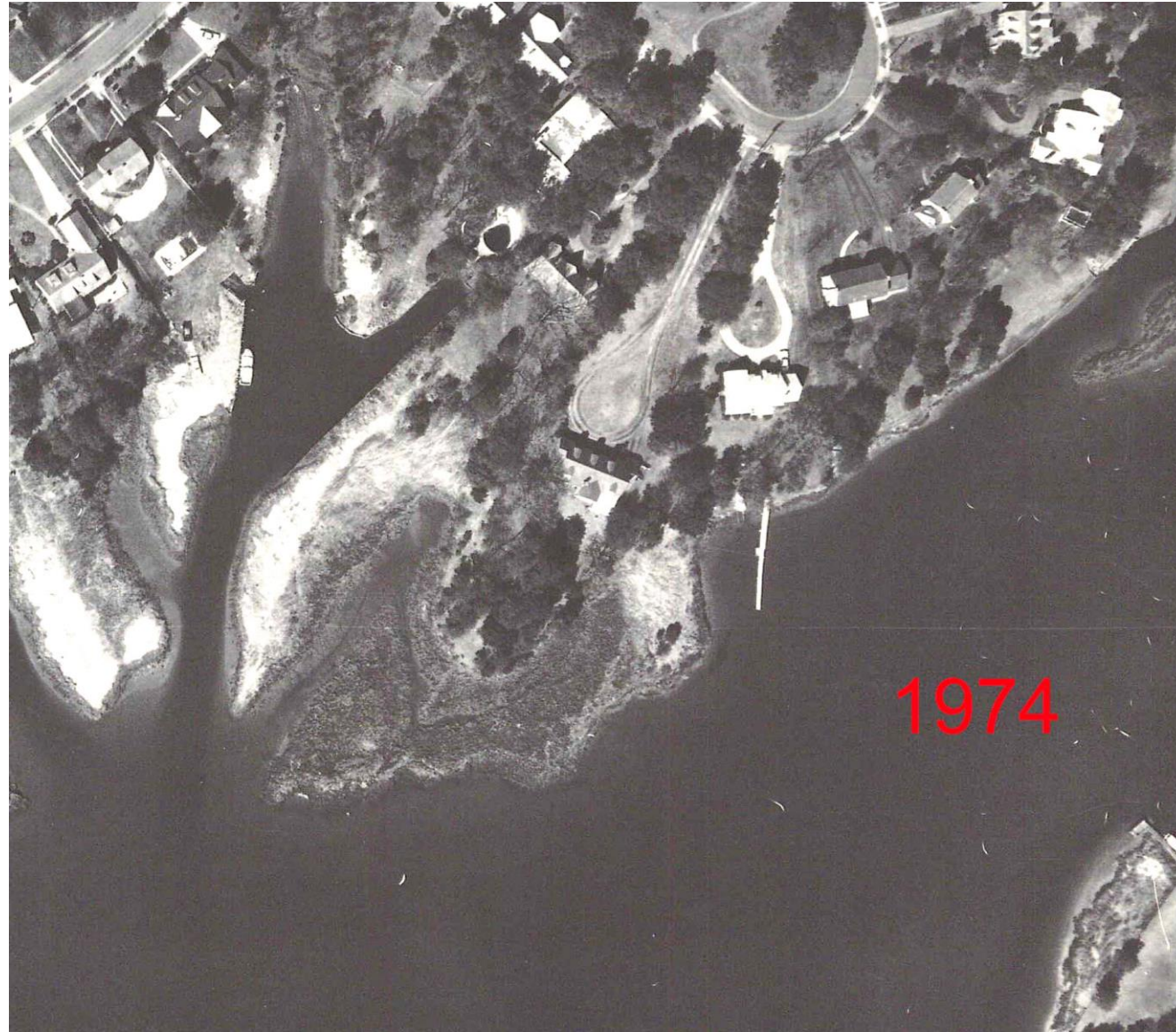


# LAFAYETTE RIVER





# LOST SHORELINE



# BY 2006 LOST 1.5 ACRES SALT MARSH





# BUILT MARSH TOE RIP RAP & FILLED





NOVEMBER 2015

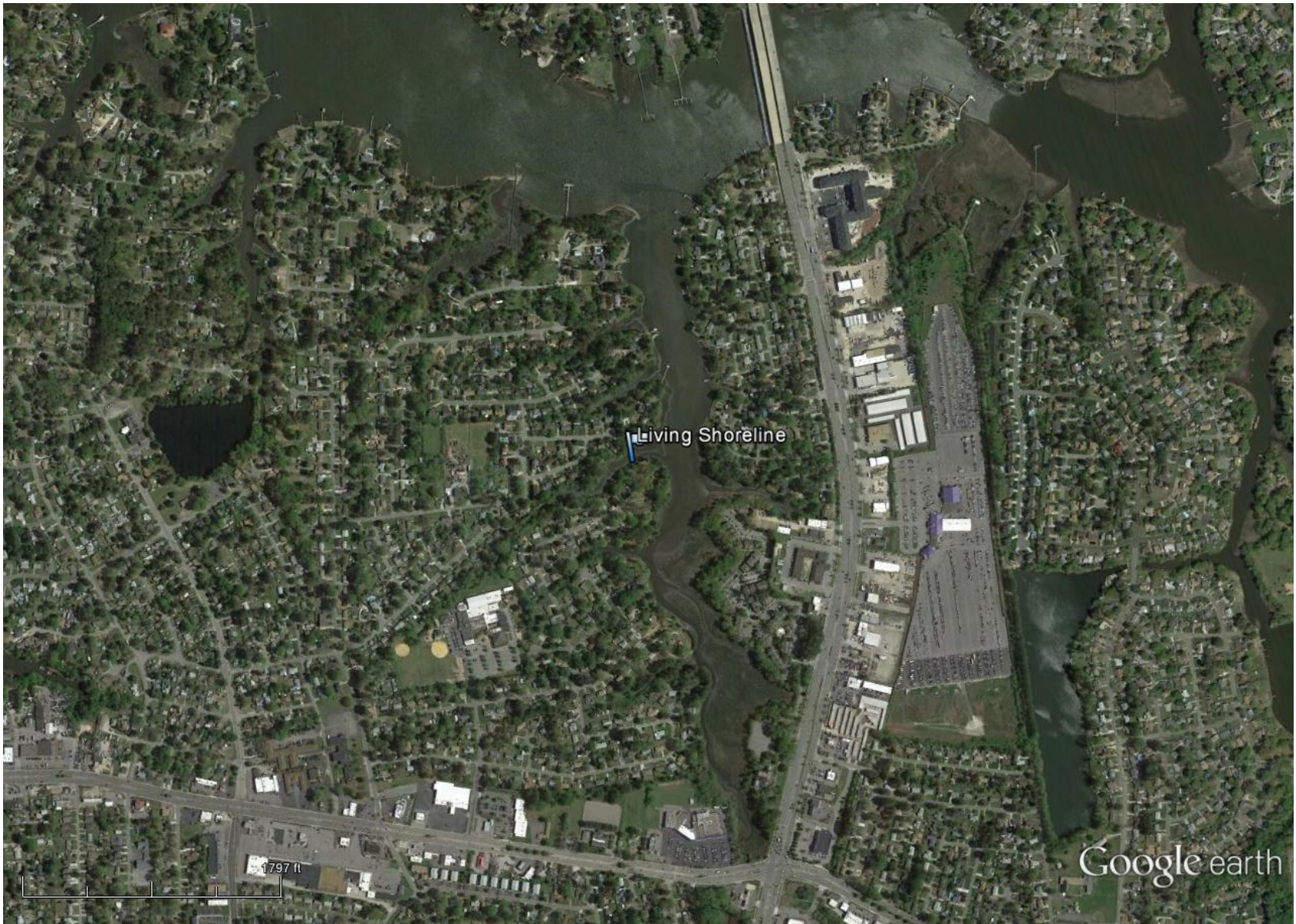





# CITY OF NORFOLK PROJECT










An aerial photograph showing a residential neighborhood on the left, characterized by houses and paved roads. A dense forest of green trees separates the houses from a large, calm river on the right. A label 'Living Shoreline' with a small blue icon is positioned on the riverbank, pointing to a specific area of the shoreline. The river's surface is dark and still, reflecting the surrounding environment.

 Living Shoreline



# BRANCH OF KING CREEK, EASTERN BRANCH ELIZABETH RIVER





# COIR LOGS, SAND FILL & PLANT

