OCEN 688
Marine Dredging Class Project

Nick Zager
Derek Wilson
Tirtharaj Bhaumik

Outline

1) Identify Problem
2) Identify Jurisdictions
3) Project Approach
4) STFATE Modeling
5) Beach Nourishment
6) CDF Analysis
7) Summary

Problem

1) Dredge and Dispose 150,000 cyd of sediments contaminated with lead inside Port
2) Maintenance Dredge 750,000 cyd from Intracoastal Waterway
3) Deepen entrance channel by 3 feet = 1.0 million cyd
4) 1.0 million cyd of beach nourishment requested on 1 N. Mile Beach
5) Disposal Areas – 2 CDFs, 1 offshore disposal area, adjacent beach for beach nourishment

Governing Jurisdictions

1) Clean Water Act – Beach Nourishment
2) NPSRA – 5 N. Miles Offshore
3) NEPA – Governs All Dredging Activities
4) Rivers and Harbors Act of 1899 – Permit from USACE for any work inside Navigable Waters
5) Main Agencies – USACE and EPA
6) USACE must coordinate permit review with all State level coastal managers
7) Other Concerns – Federal and State Fish and Wildlife Agencies, Endangered Species (Puffy Wuffies?), Historic Preservation

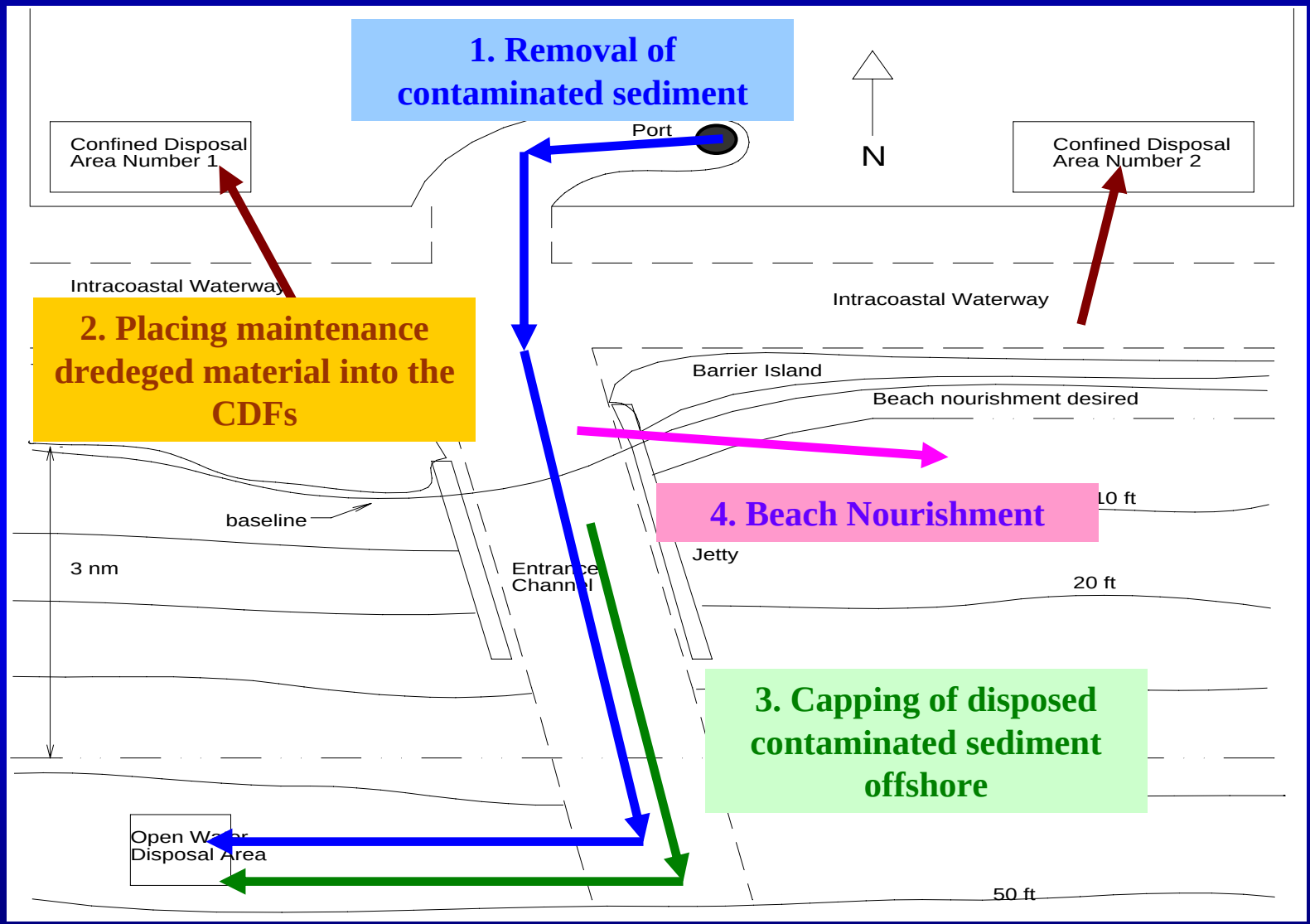
Project Plan

1) Primary Objective – Limit amount of material going offshore = shorter completion time without compromising quality
2) All dredging done with Cutter Suction Head
   - Using several barges instead of Hopper eliminates travel time and production is continuous
   - New material too consolidated for Hopper
   - All maintenance material to CDF's – needs to be pumped
3) All maintenance material - CDFs
   - Close proximity to Intracoastal Waterway
   - Cannot be used for capping

Project Plan Cont.

4) All Contaminated Sediments – Offshore
   - CDFs will be filled with maintenance material
   - Given that CDF will be unusable after capping (not cost effective)
5) Most of new material – capping contaminants
6) Remainder of new material – beach nourishment

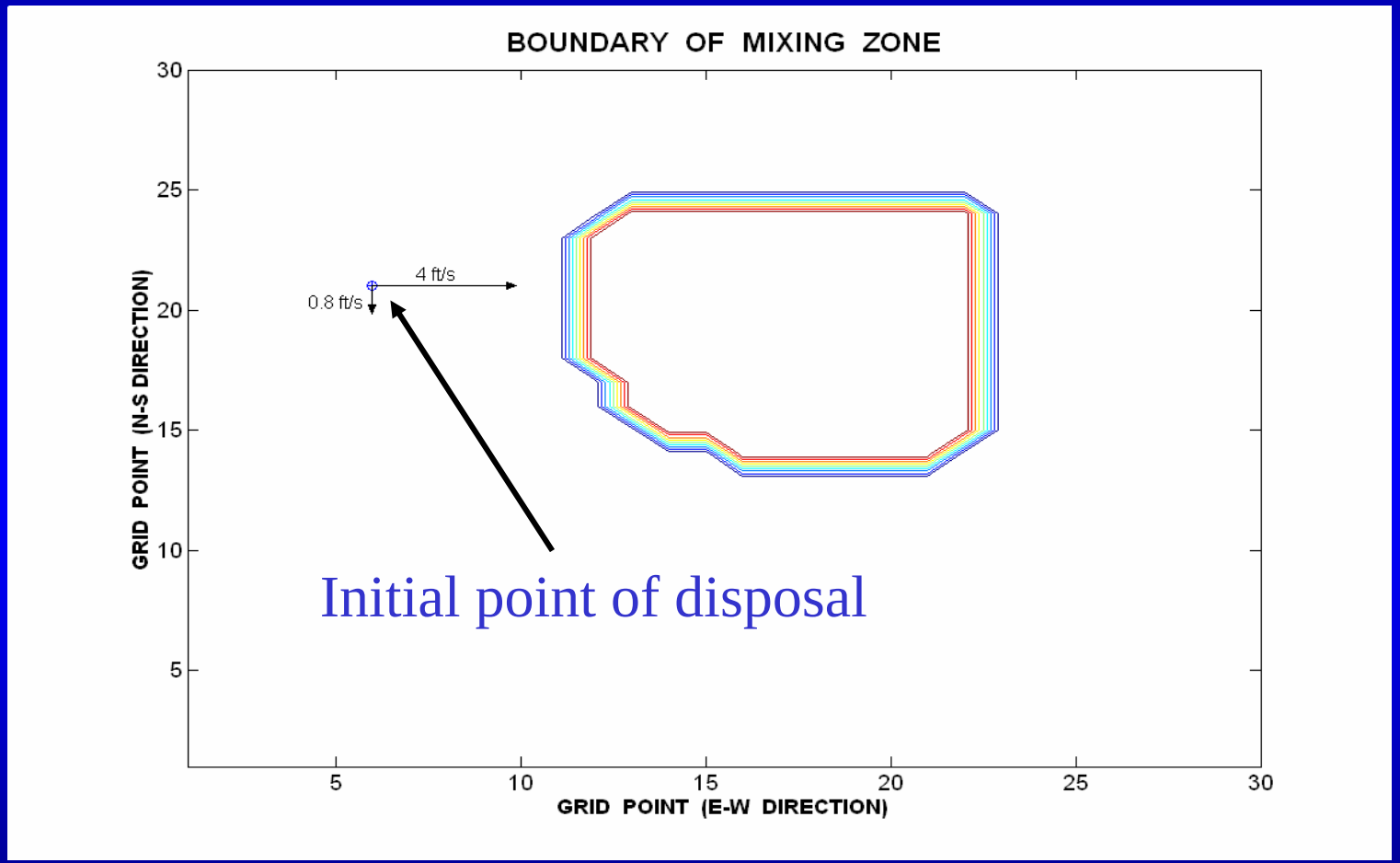
Project Schematic



STFATE Numerical Model

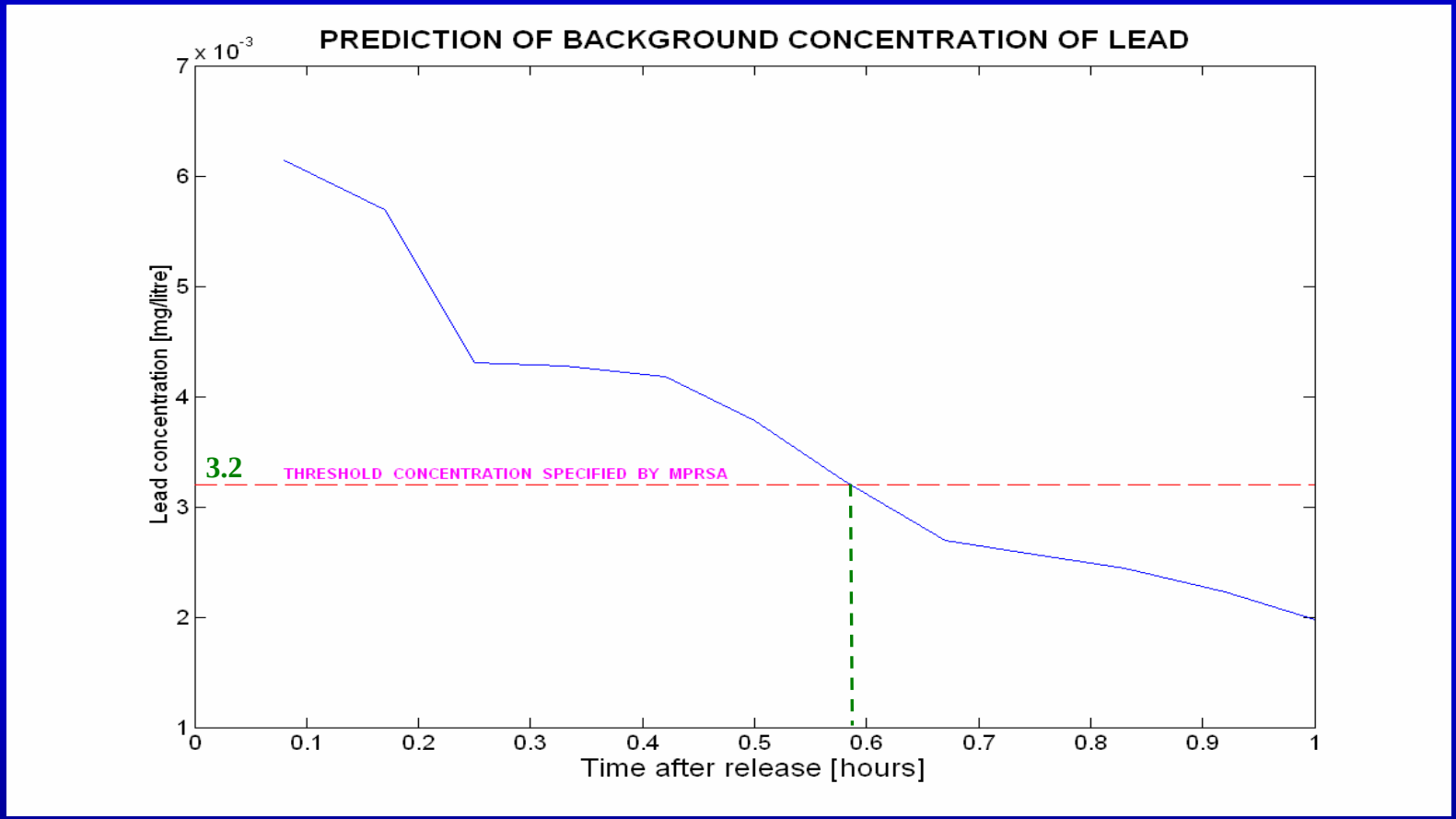
- Open water disposal analysis
- Estimation of time required for contaminant concentration to satisfy MPRSA water quality criteria
- Zone of maximum concentration
- Footprint area and mound thickness

Open Water Disposal Analysis using STFATE



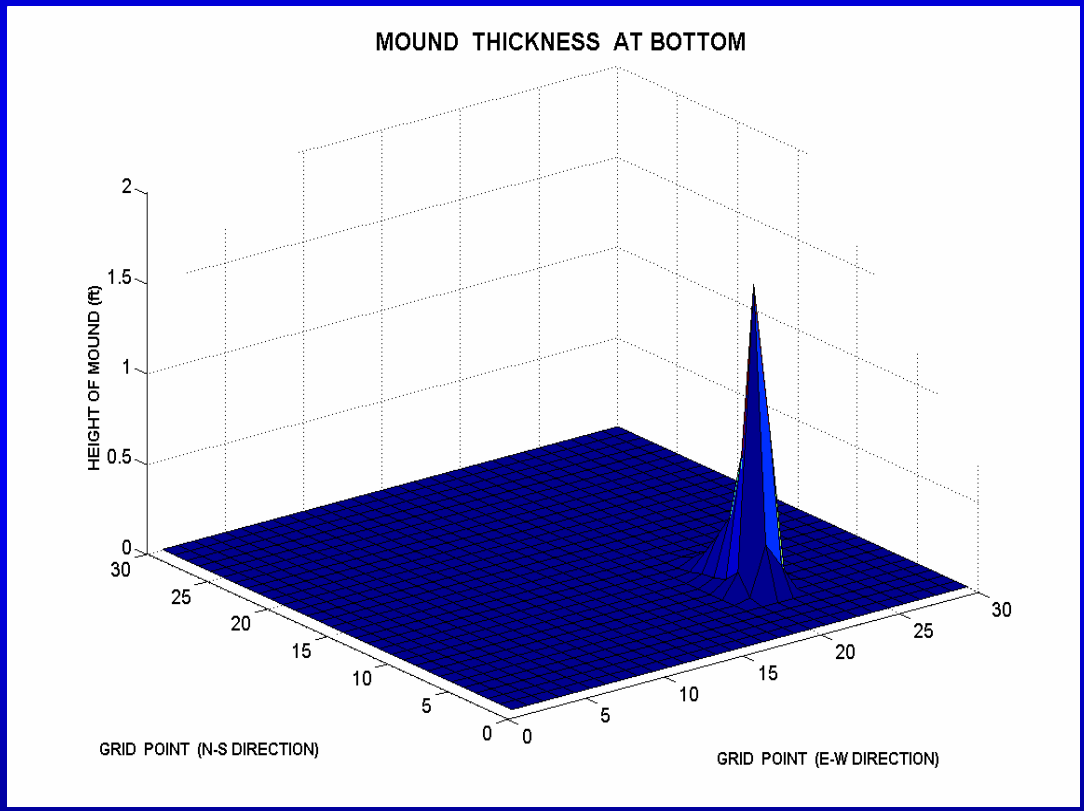
Depth at which the maximum concentration occurs = 23 ft

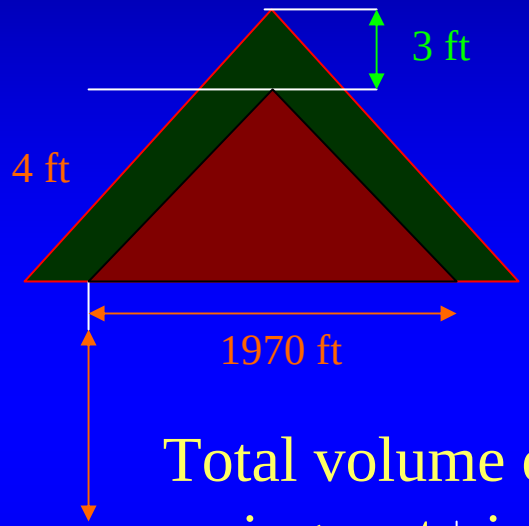
Open Water Disposal Analysis using STFATE



Time after which lead concentration falls below threshold = 35 mins

Open Water Disposal Analysis using STFATE





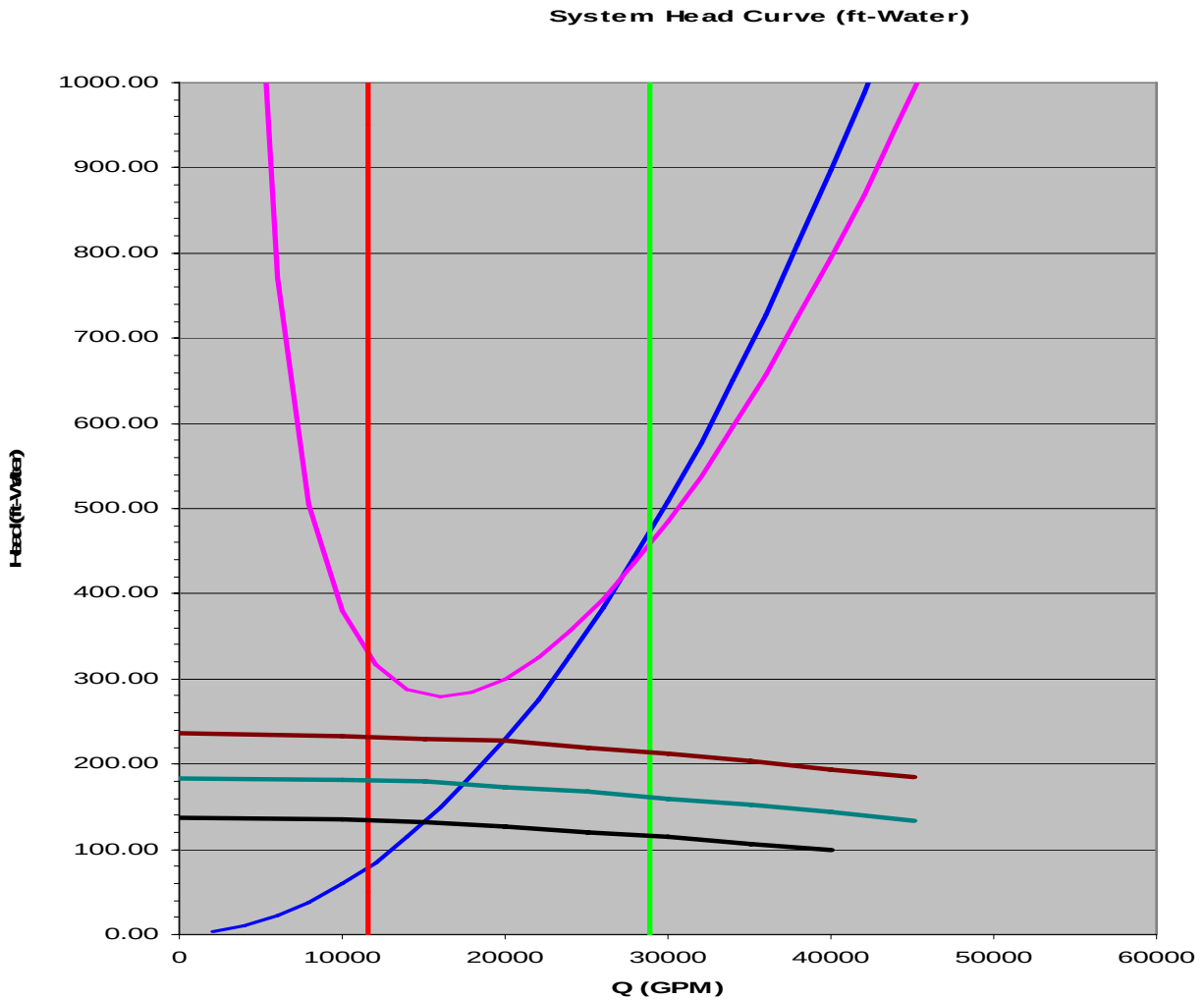
Total volume of capping material = **674,000 yd^3**

Time for placing = **7 days**

Time for capping = **28 days**

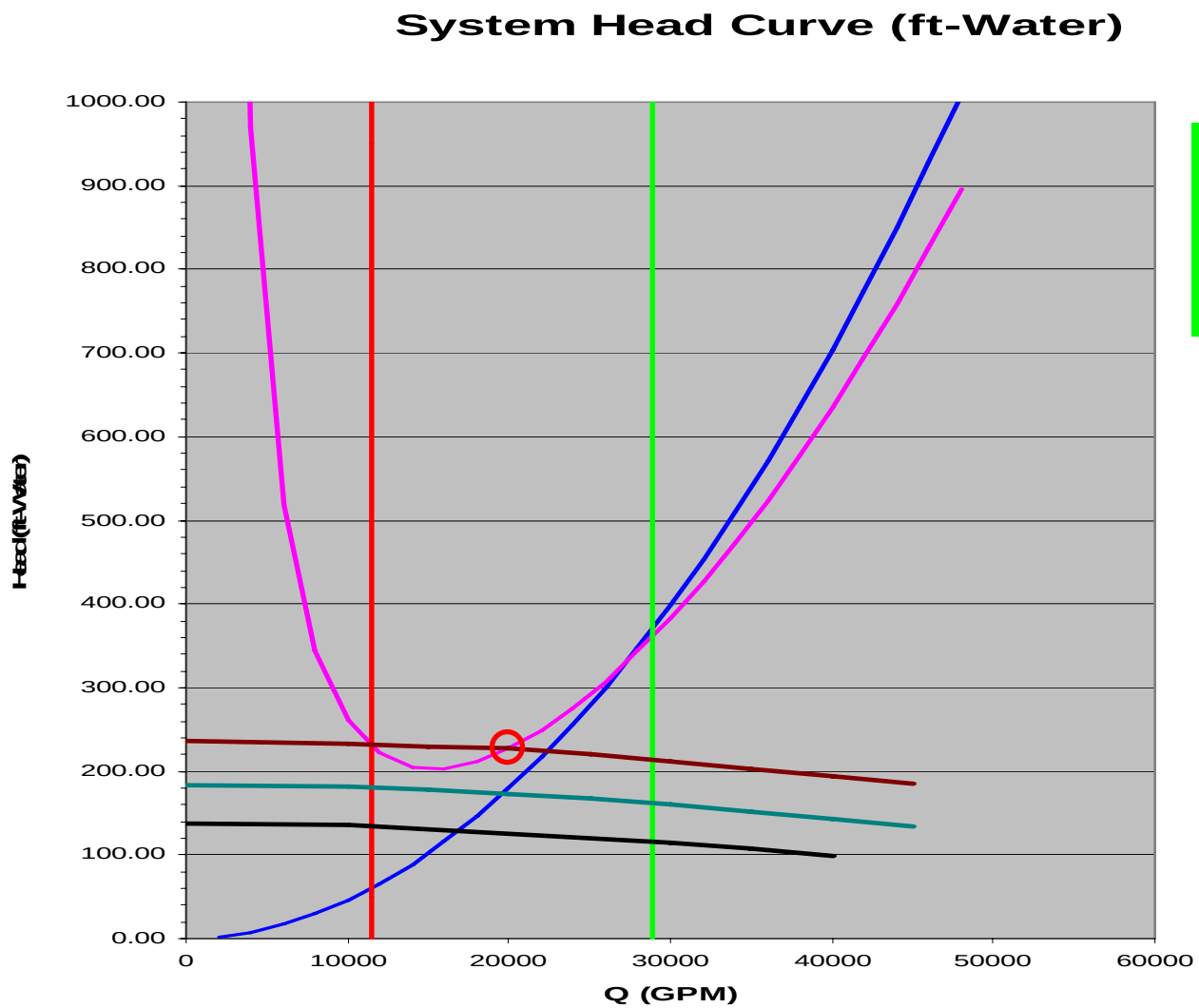
Volume of new work material available for beach nourishment = (1,000,000 – 674,000) yd^3 = **326,000 yd^3**

Beach Nourishment



With 6000 ft pipeline length we don't get any operating point !

Beach Nourishment

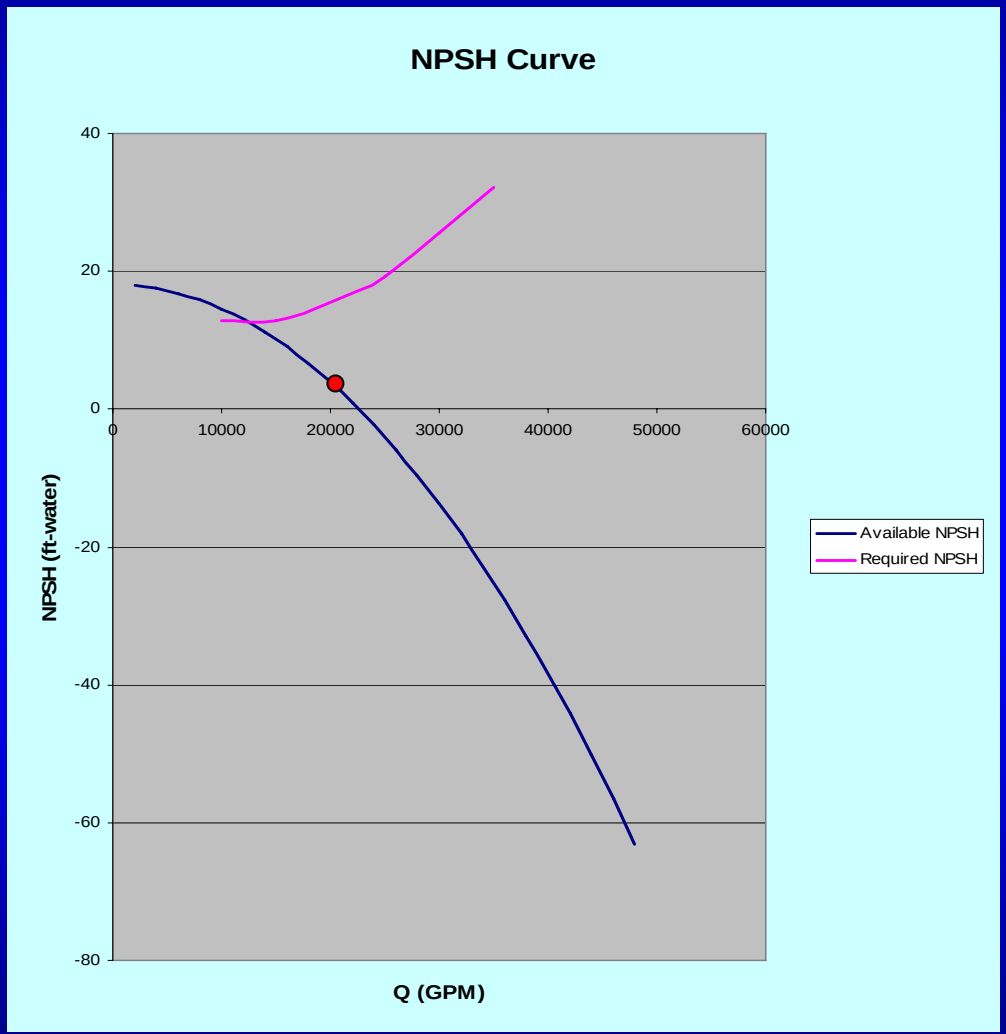


Pipe length reduced to 4000 ft gives an operating point for 425 RPM

Production (insitu) = 644.3 yd^3/hour

Time to complete beach nourishment = 32 days

Pump Cavitation check

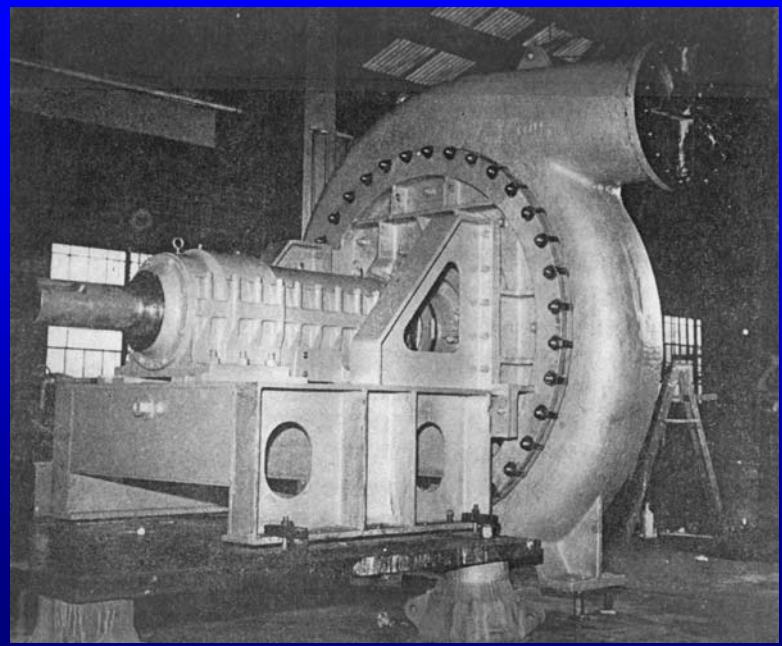


RPM	375	325	425
	(man.)	(calc)	(calc)
Q GPM	NPSH R (ft-water)	NPSH R (ft-water)	NPSH R (ft-water)
10000	10	7.5	12.8
15000	10	7.5	12.8
20000	12	9.0	15.4
25000	15	11.3	19.3
30000	20	15.0	25.7
35000	25	18.8	32.1

NPSHA < NPSHR

Hence, we need a ladder pump to avoid cavitation

Equipment Used



Dredged Material Confined Disposal

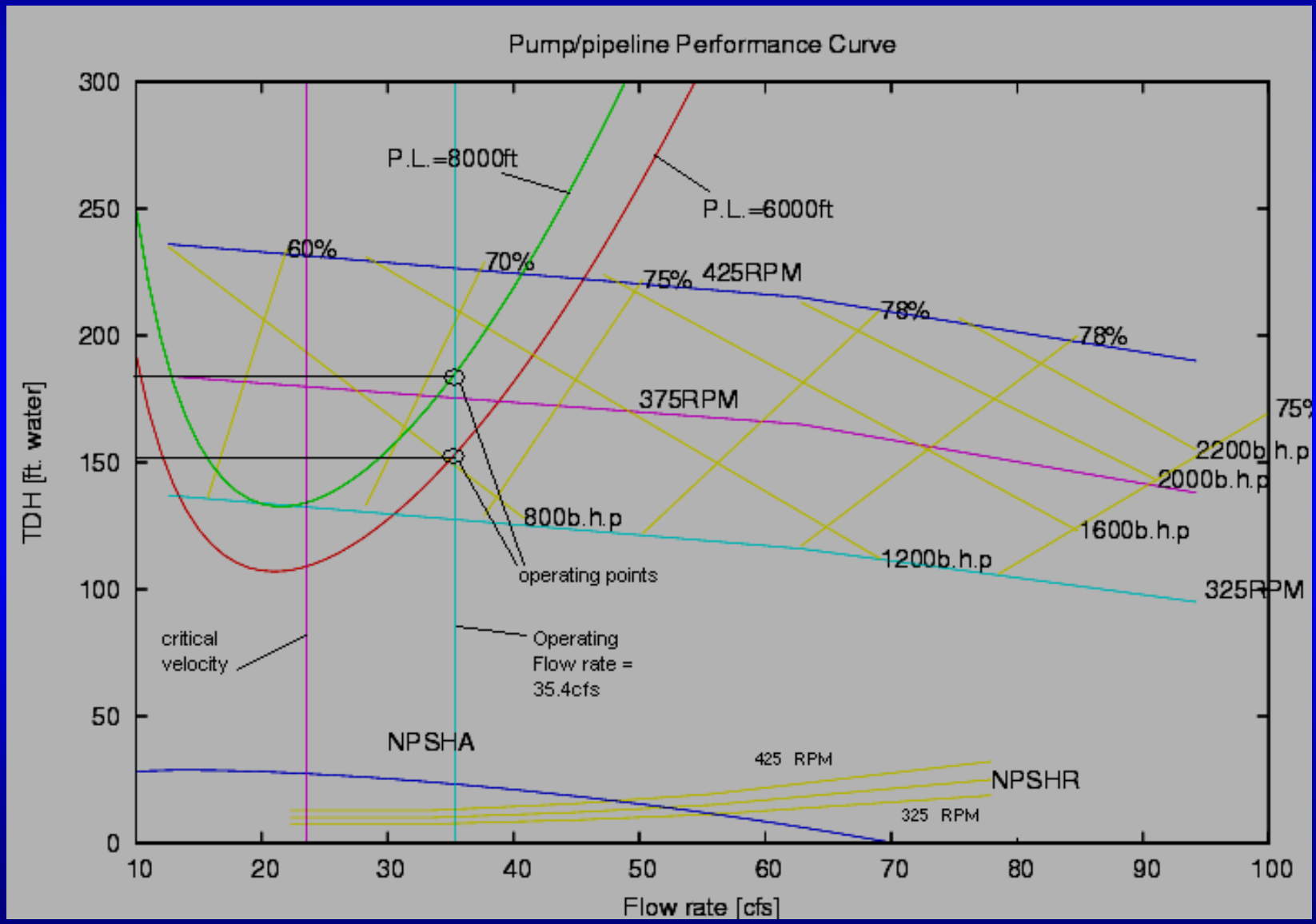
Given

- 750,000cyd. in-situ material
- 2@100acre CDFs
- 6000ft and 8000 ft. pipelines

Determine

- Production rate (cu.yd/hr)
- Capacity, zone settling, solids removal
- Weir length required

Dredged Material Confined Disposal



Dredged Material Confined Disposal

40 ft. Req. Weir length

Production rate 1024cyd/hr

Time for placing material in the CDFs = 46 days

Dredged Material Confined Disposal

Conclusions

1. Contaminated Material Placement, Capping, etc meets environmental limits.
2. Maintenance material adequately dredged by equipment and disposed into provided upland facilities.
3. New Material
4. Remainder of new material – beach nourishment
5. 115 Day + Mobilization / Demobilization


THANK YOU