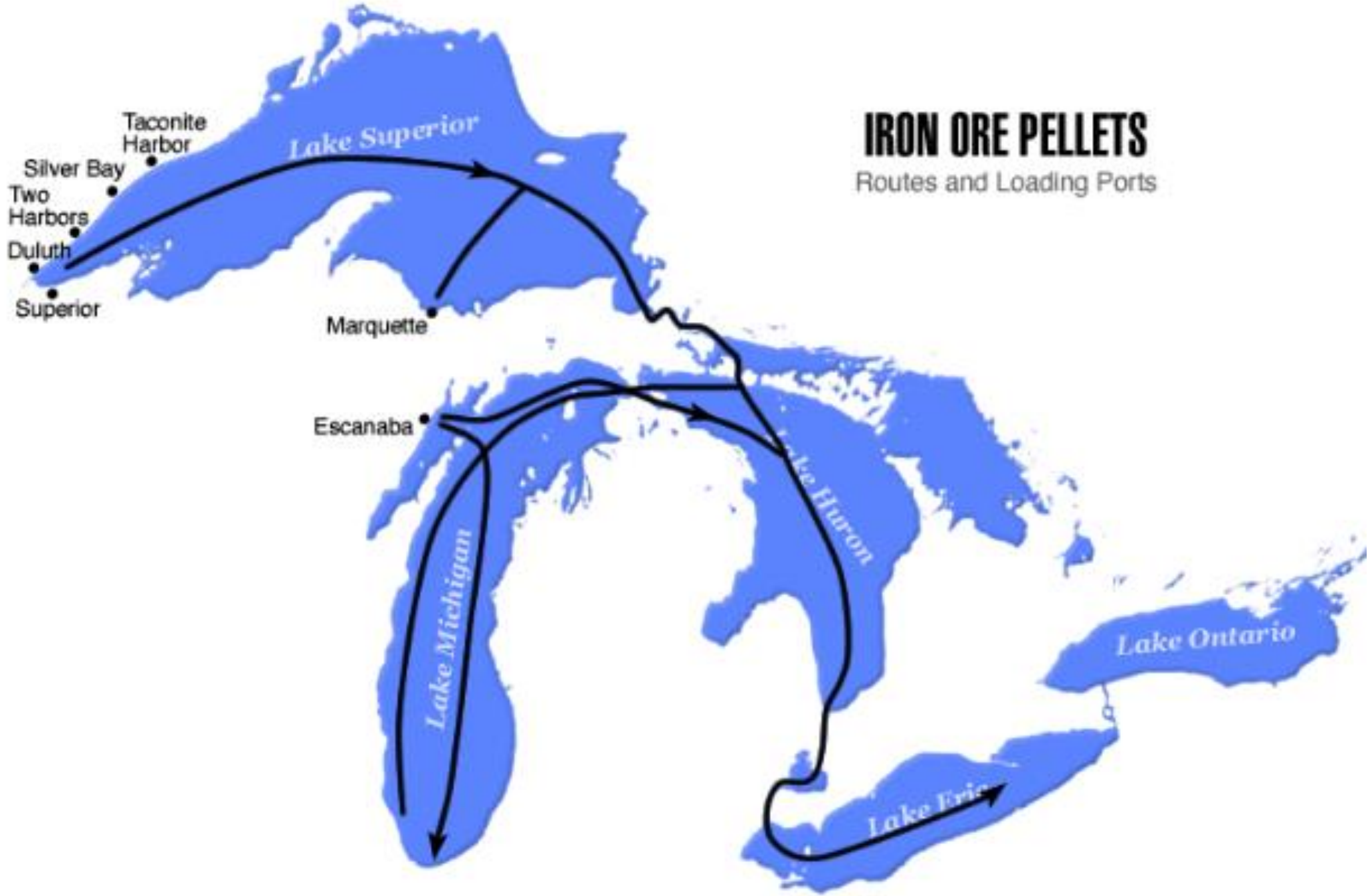
Great Lakes Deep Draft Navigational Dredging from an Operator's Perspective

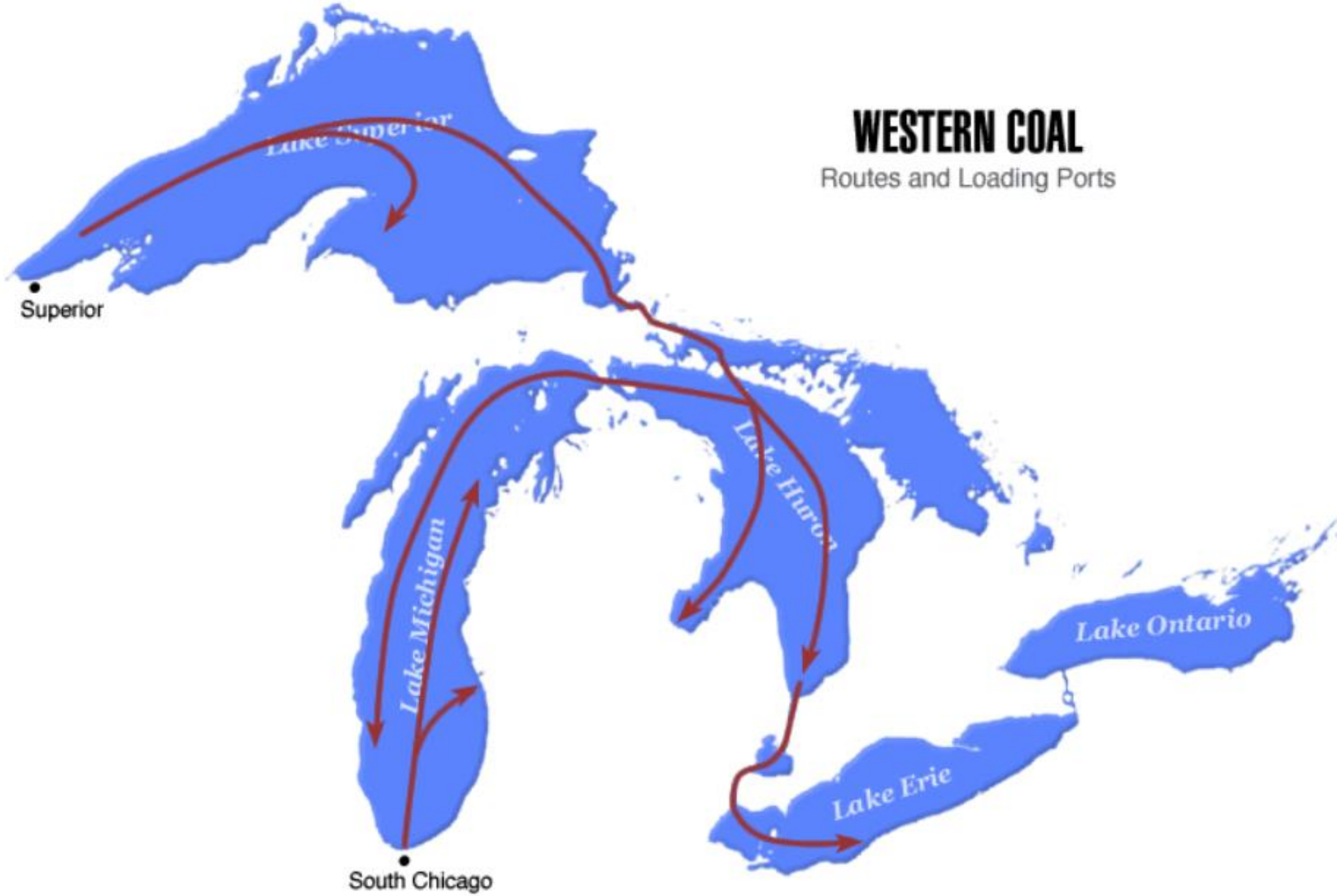
Kevin McMonagle

American Steamship Company

ASC

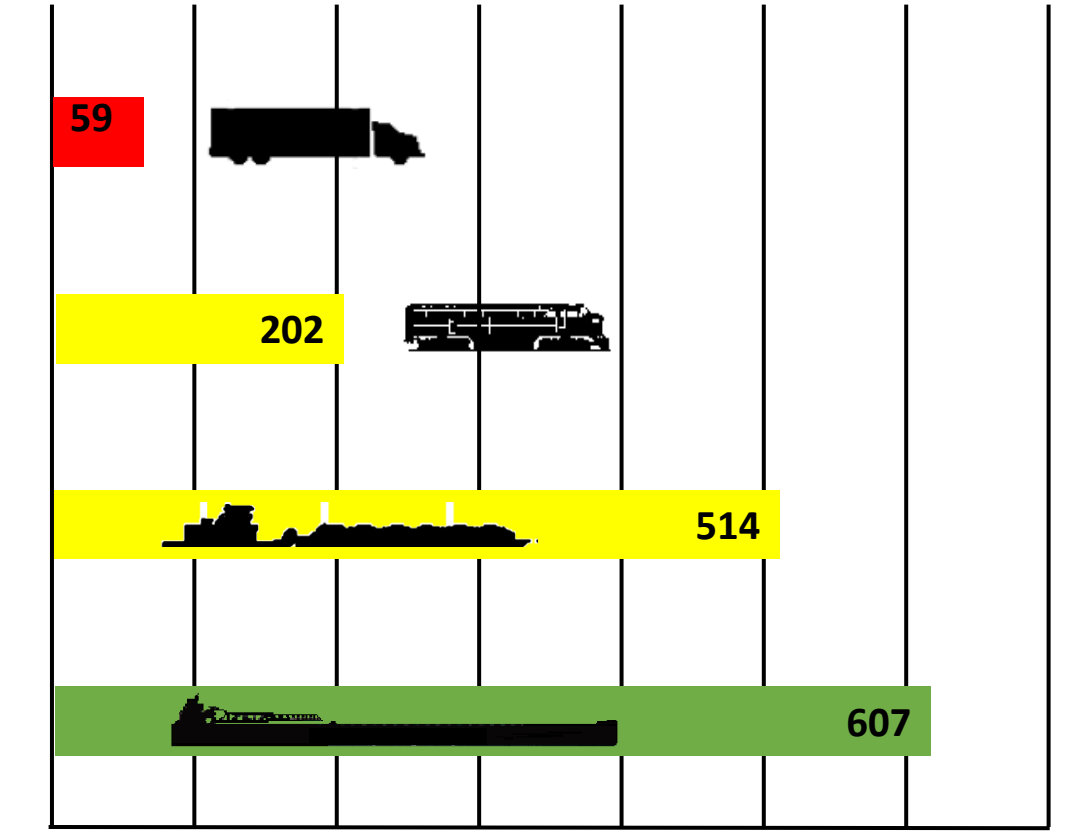
American Steamship Company


IRON ORE PELLETS
Routes and Loading Ports
Taconite Harbor
Silver Bay
Two Harbors
Duluth
Superior
Lake Superior
Marquette
Escanaba
Lake Michigan
Lake Huron
Lake Ontario
Lake Erie

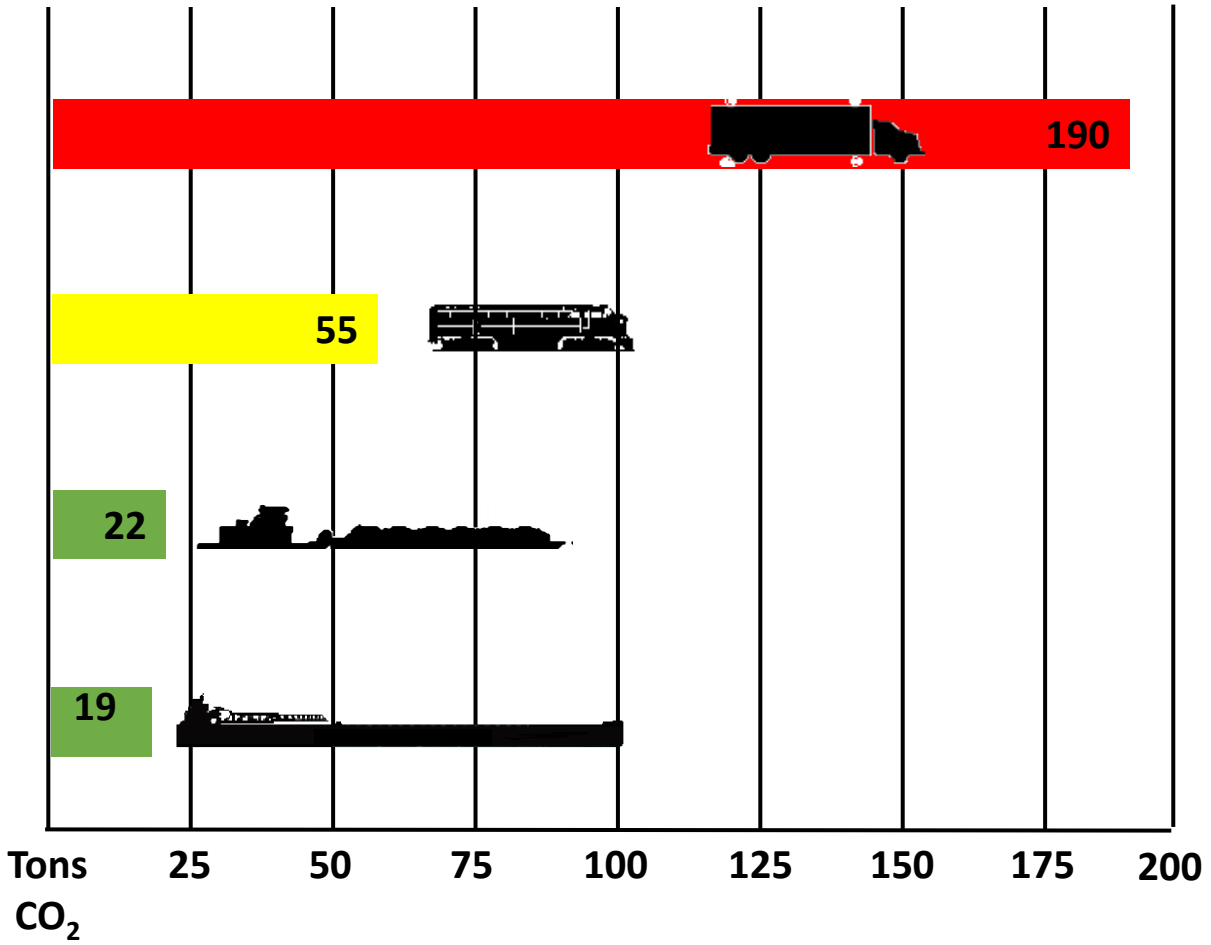

WESTERN COAL
Routes and Loading Ports
Superior
South Chicago
Lake Michigan
Lake Ontario
Lake Erie


LIMESTONE
Routes and Loading Ports
Lake Superior
Port Inland
Pt. Dolomite
Drummond Island
Calcite
Stoneport
Lake Michigan
Lake Huron
Lake Ontario
Lake Erie
Marblehead

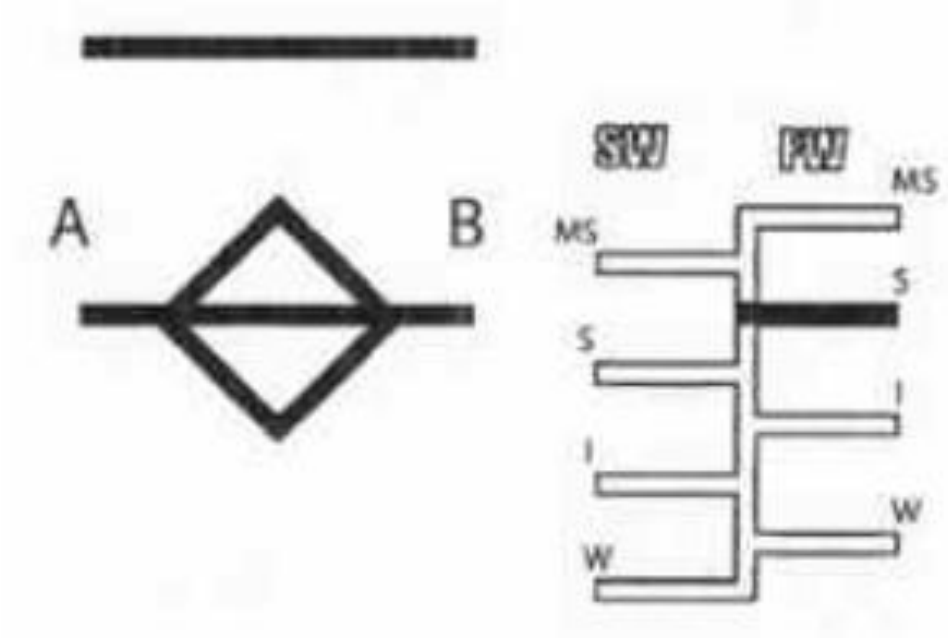
Miles 1 ton of cargo carried per gallon of fuel[1]

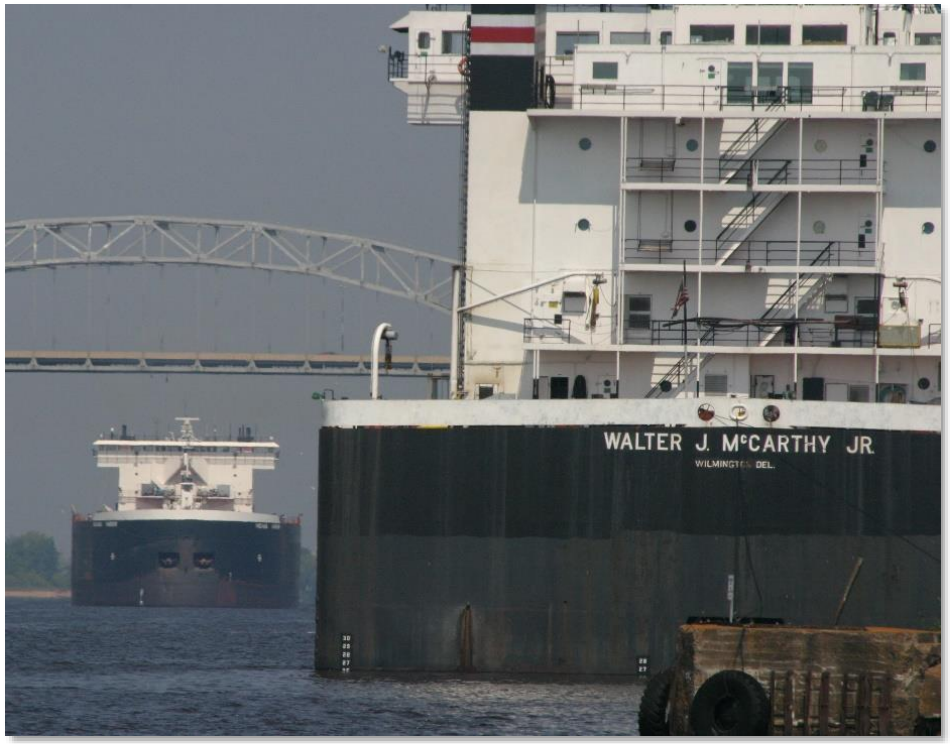


Tons of CO2 produced to move 1,000 tons of cargo 1,000 miles[2]

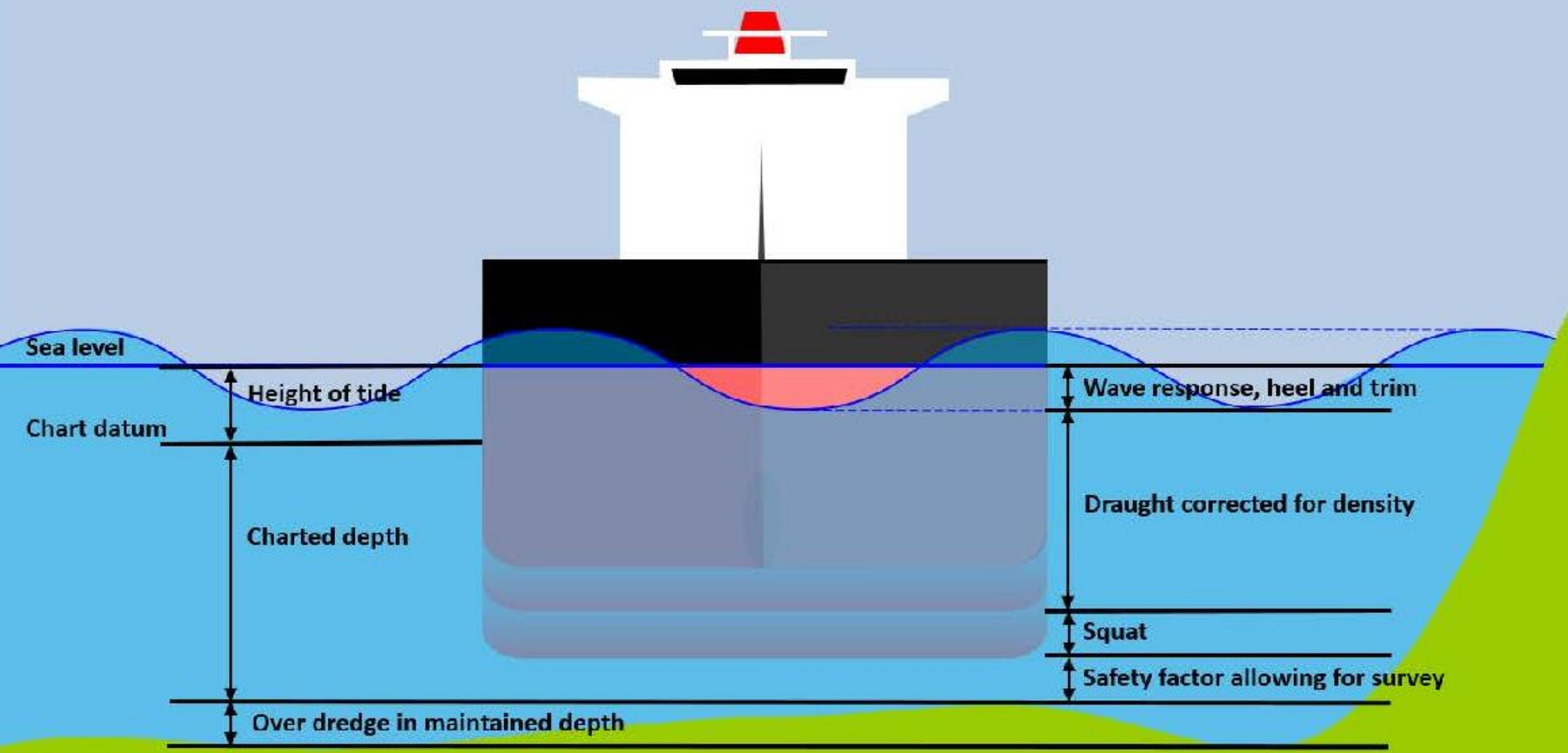


1. *Source: USDOT Maritime Administration and Minnesota Department of Transportation*
2. *Assumes US DOE Fuel and Energy Emission Coefficient of 22.38 lbs of CO_2 per gallon (No.1,2,4 Fuel Oils and Diesel) for Great Lakes Carrier*


A
B
SW
PW
MS
MS
S
S
I
I
W
W


WALTER J. McCARTHY JR.

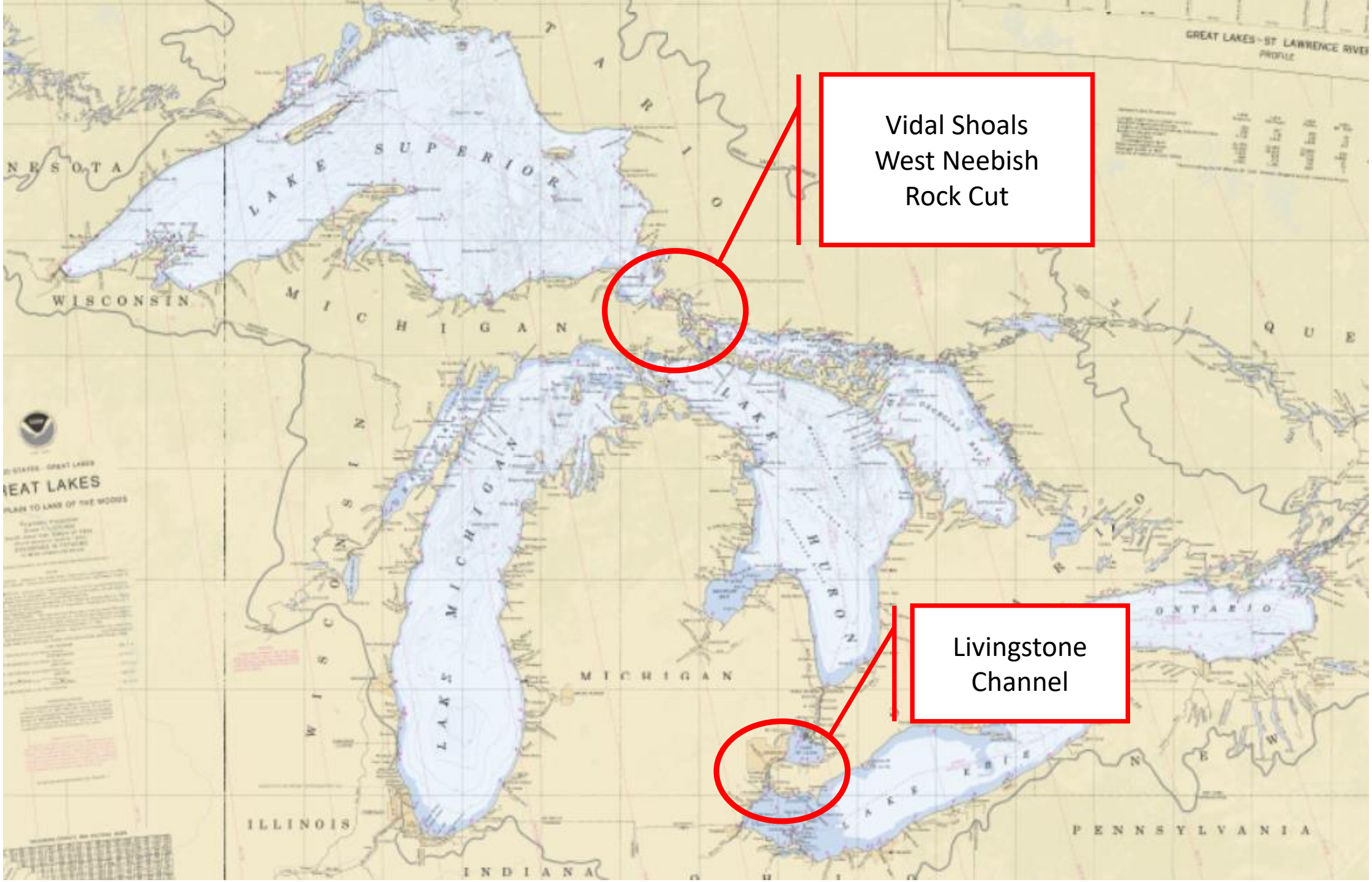
Dynamic Under Keel Clearance Illustration

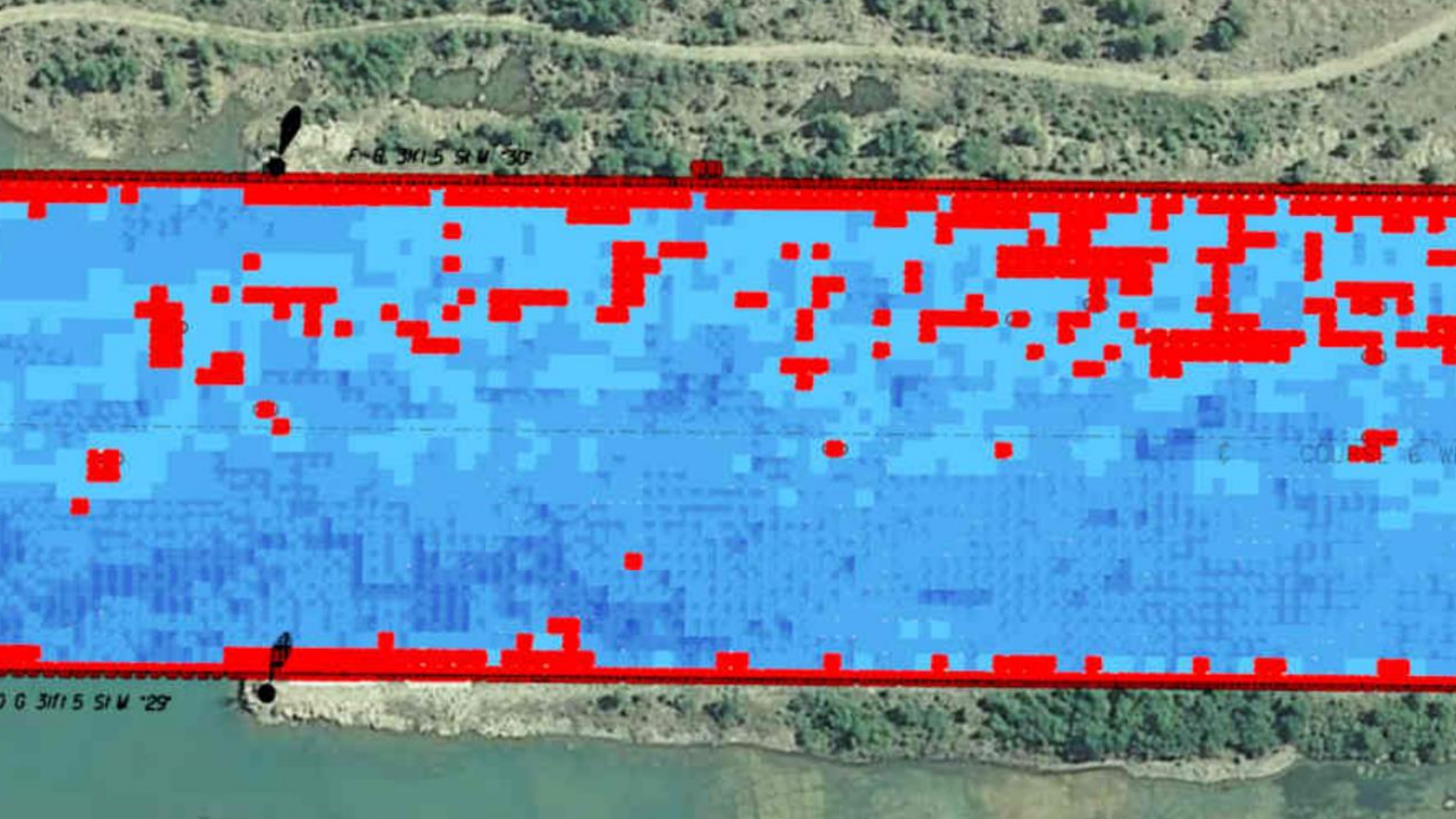


Impact of Dredging on Per-Trip Carrying Capacity
Major Great Lakes Vessel Classes

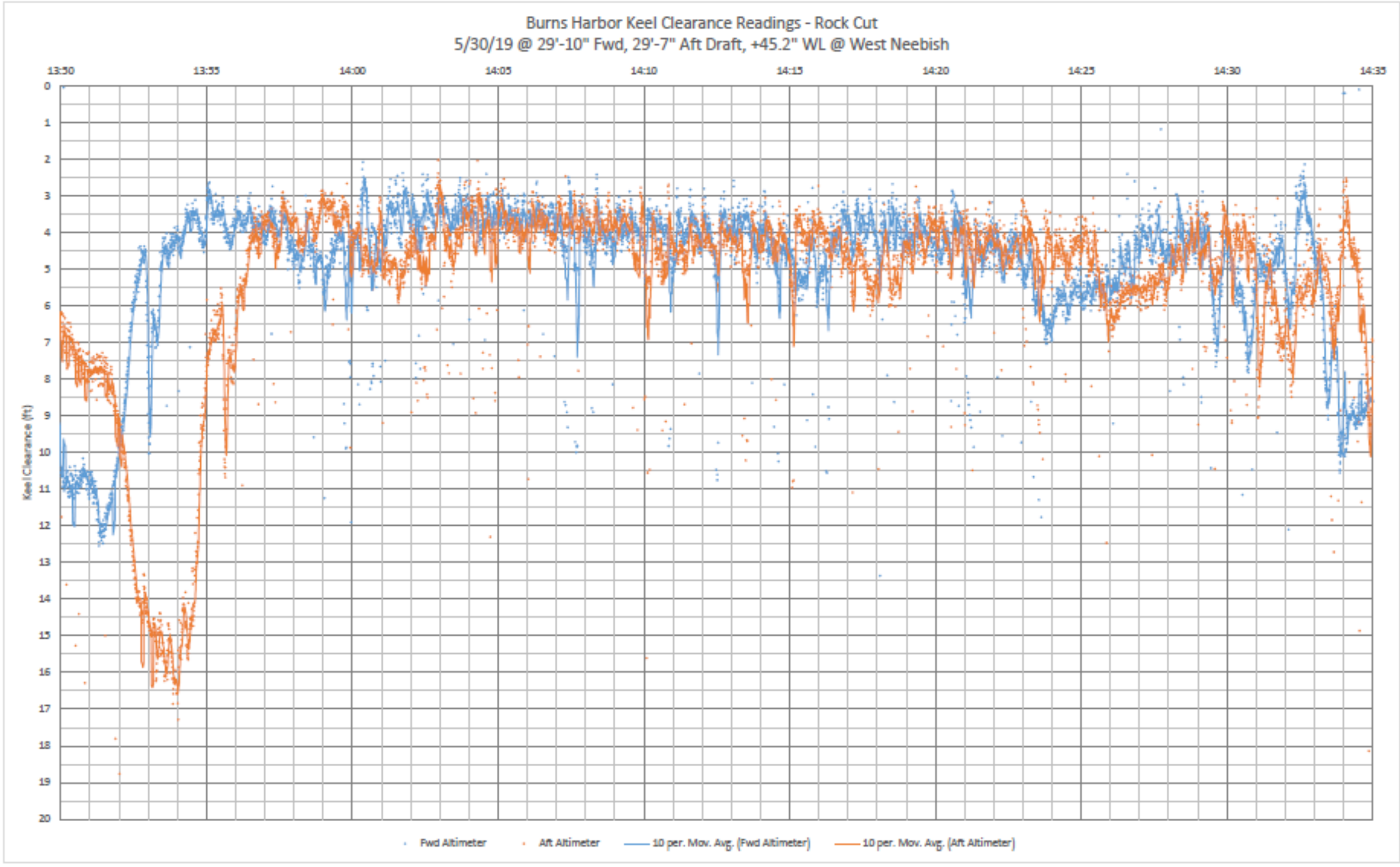
Major Great Lakes Vessel Classes	Vessel Length (feet)	Per-Trip Carrying Capacity	Capacity Per Inch Of Draft*
	1,000	69,664	267
	806	34,720	146
	767	28,336	127
	730	27,558	115
	635	22,064	107
	501	13,776	71

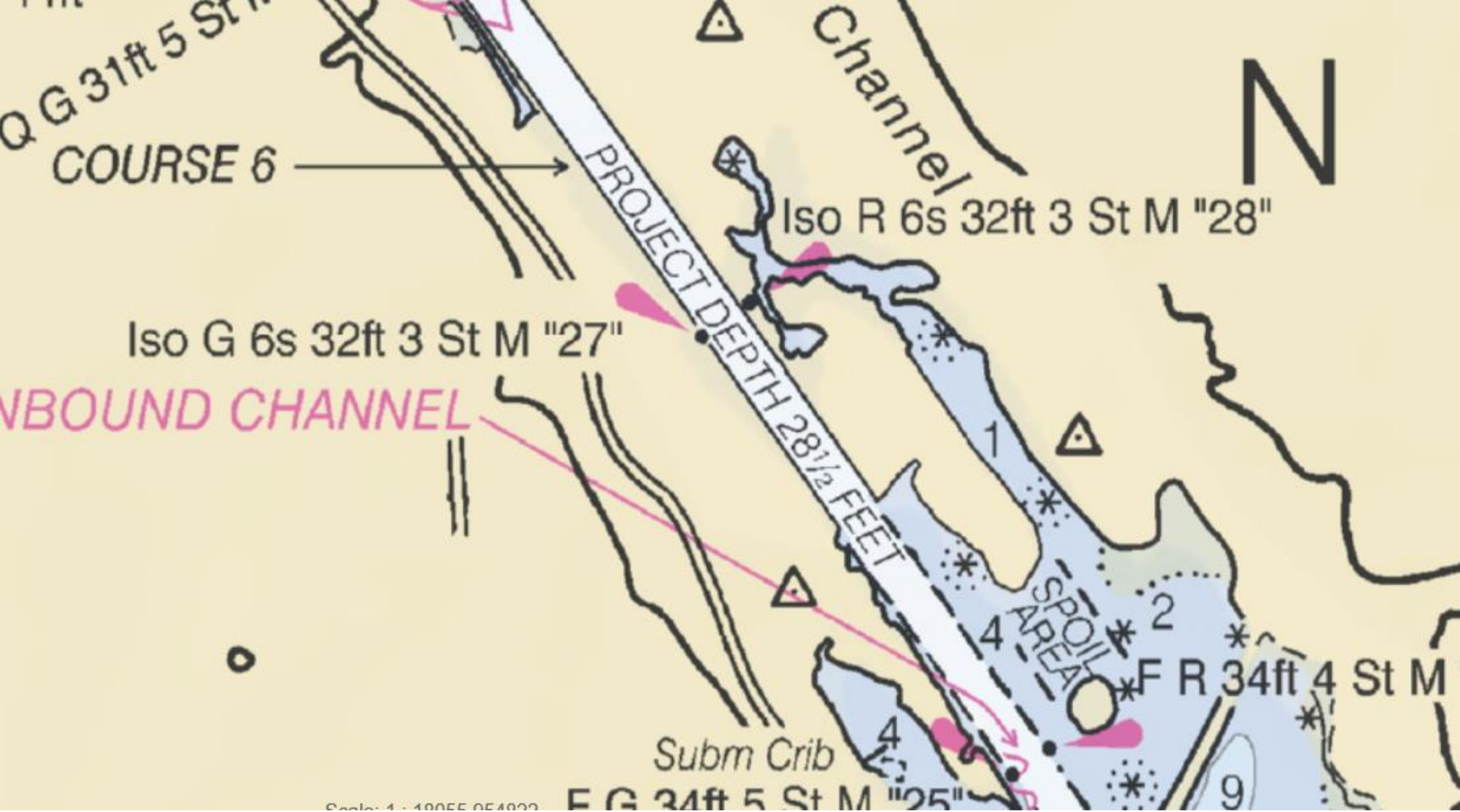
*Capacity per inch of draft reflects the incremental tonnage carried at normal loaded draft.

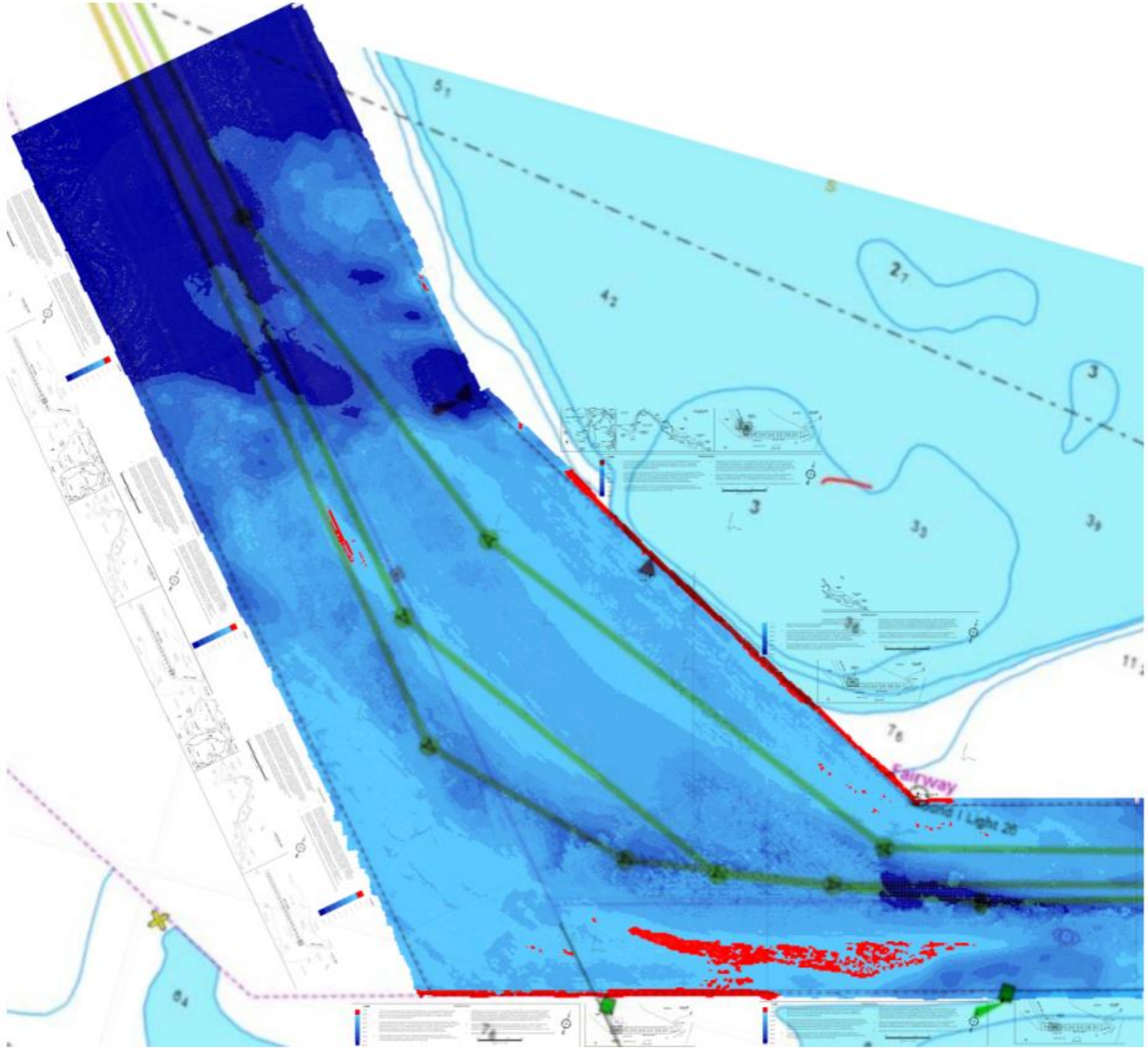

Vidal Shoals
West Neebish
Rock Cut
Livingstone
Channel
LAKE SUPERIOR
MICHIGAN
LAKE MICHIGAN
LAKE HURON
ONTARIO
WISCONSIN
ILLINOIS
INDIANA
PENNSYLVANIA
GREAT LAKES

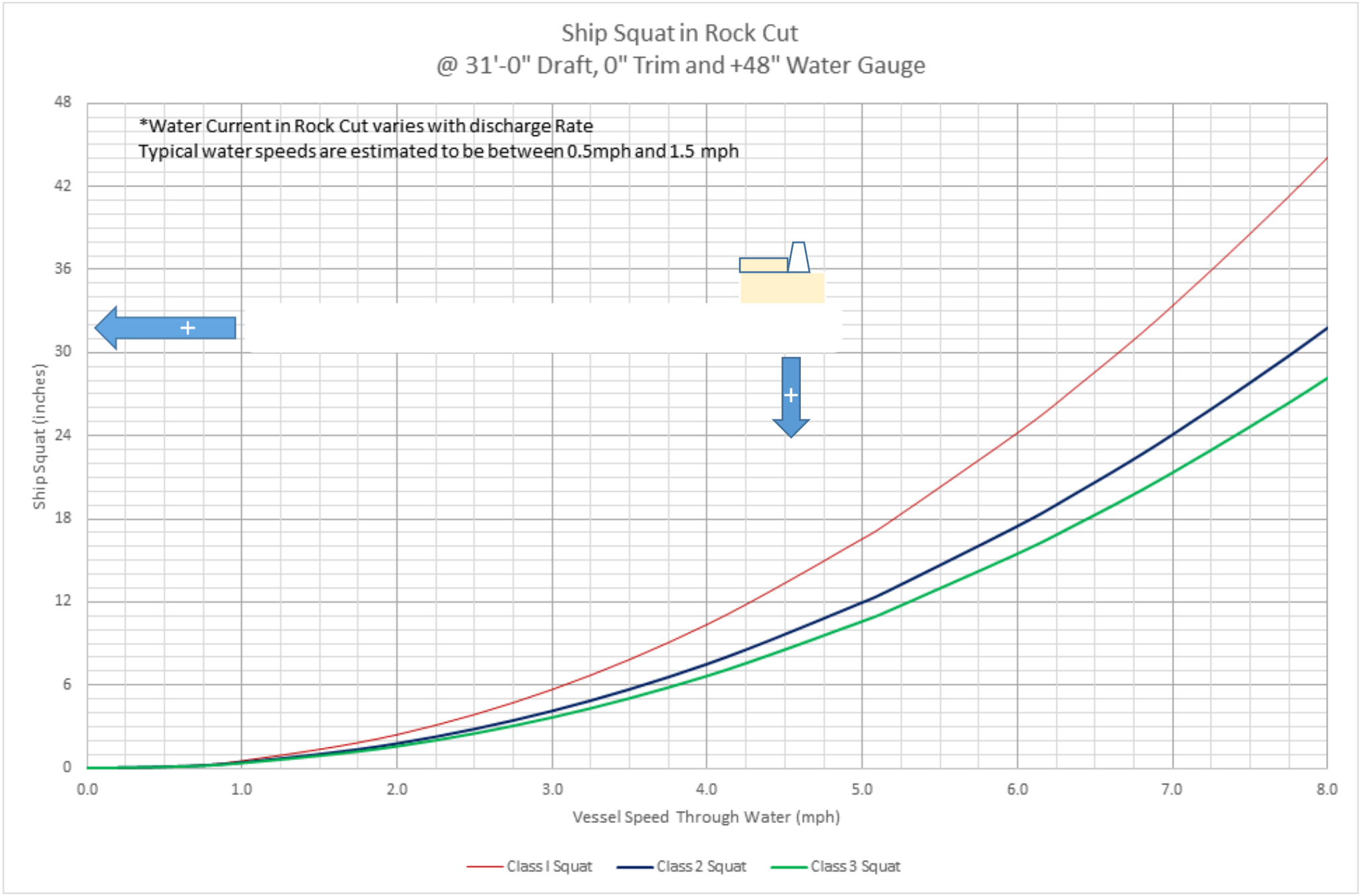


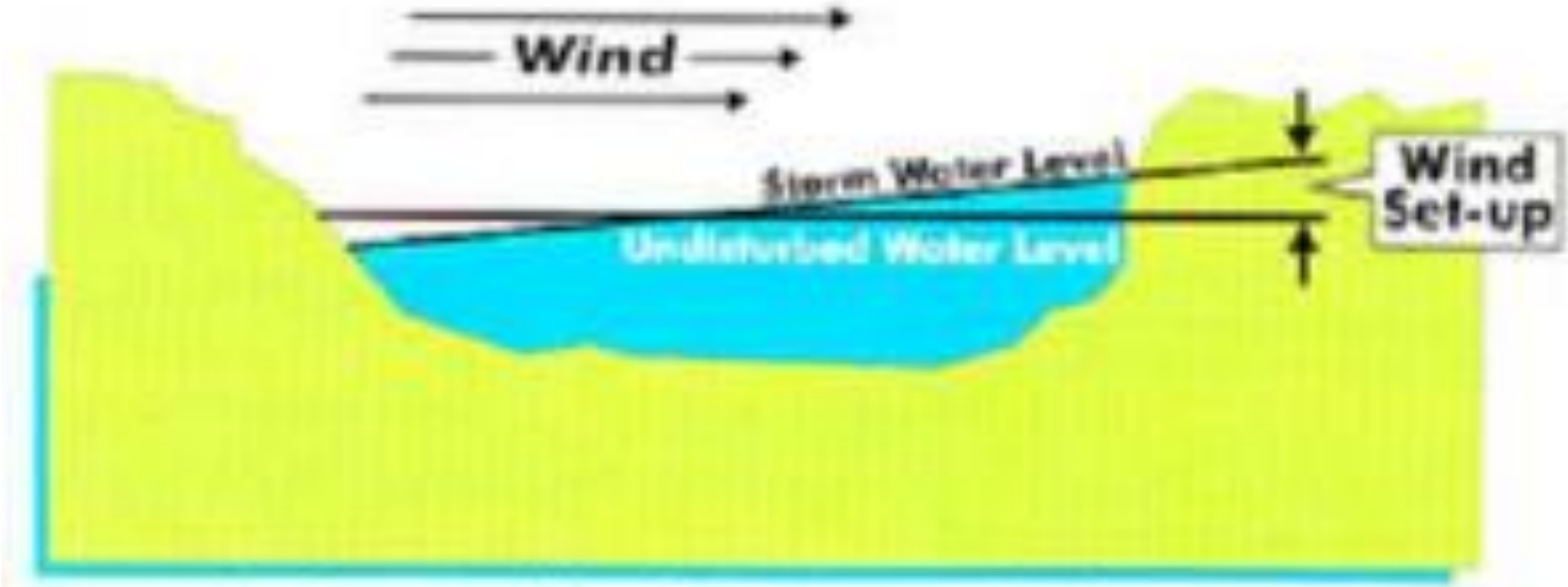

28.4 28.6 29.6 28.8 29.2 28.7 28.6 28.9 28.9 28.9 29.3 29.3
28.6 28.9 29.6 29.1 29.0 28.4 28.5 28.7 27.9 29.1 29.3 28.9
29.6 28.9 28.4 28.3 28.4 28.5 28.8 28.4 28.9 29.2 29.4 29.1
28.3 28.4 28.5 28.4 27.7 28.3 28.6 29.1 29.3 29.2 29.1 29.0
28.7 28.7 28.8 28.4 28.6 28.6 28.4 29.9 29.0 28.7 28.7 29.2
29.1 29.1 29.3 29.4 29.1 28.7 29.7 28.8 29.3 29.5 29.0 29.3
29.4 29.5 29.0 29.2 29.0 28.7 29.6 29.5 29.6 29.7 29.5 29.5


Burns Harbor Keel Clearance Readings - Rock Cut
5/30/19 @ 29'-10" Fwd, 29'-7" Aft Draft, +45.2" WL @ West Neebish
13:50
13:55
14:00
14:05
14:10
14:15
14:20
14:25
14:30
14:35
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
Keel Clearance (ft)
Fwd Altimeter
Aft Altimeter
10 per. Mov. Avg. (Fwd Altimeter)
10 per. Mov. Avg. (Aft Altimeter)


Q G 31ft 5 St
COURSE 6
PROJECT DEPTH 28½ FEET
Channel
N
Iso R 6s 32ft 3 St M "28"
Iso G 6s 32ft 3 St M "27"
NBOUND CHANNEL
1
SPOIL AREA
4
2
F R 34ft 4 St M
4
Subm Crib
F G 34ft 5 St M "25"
9

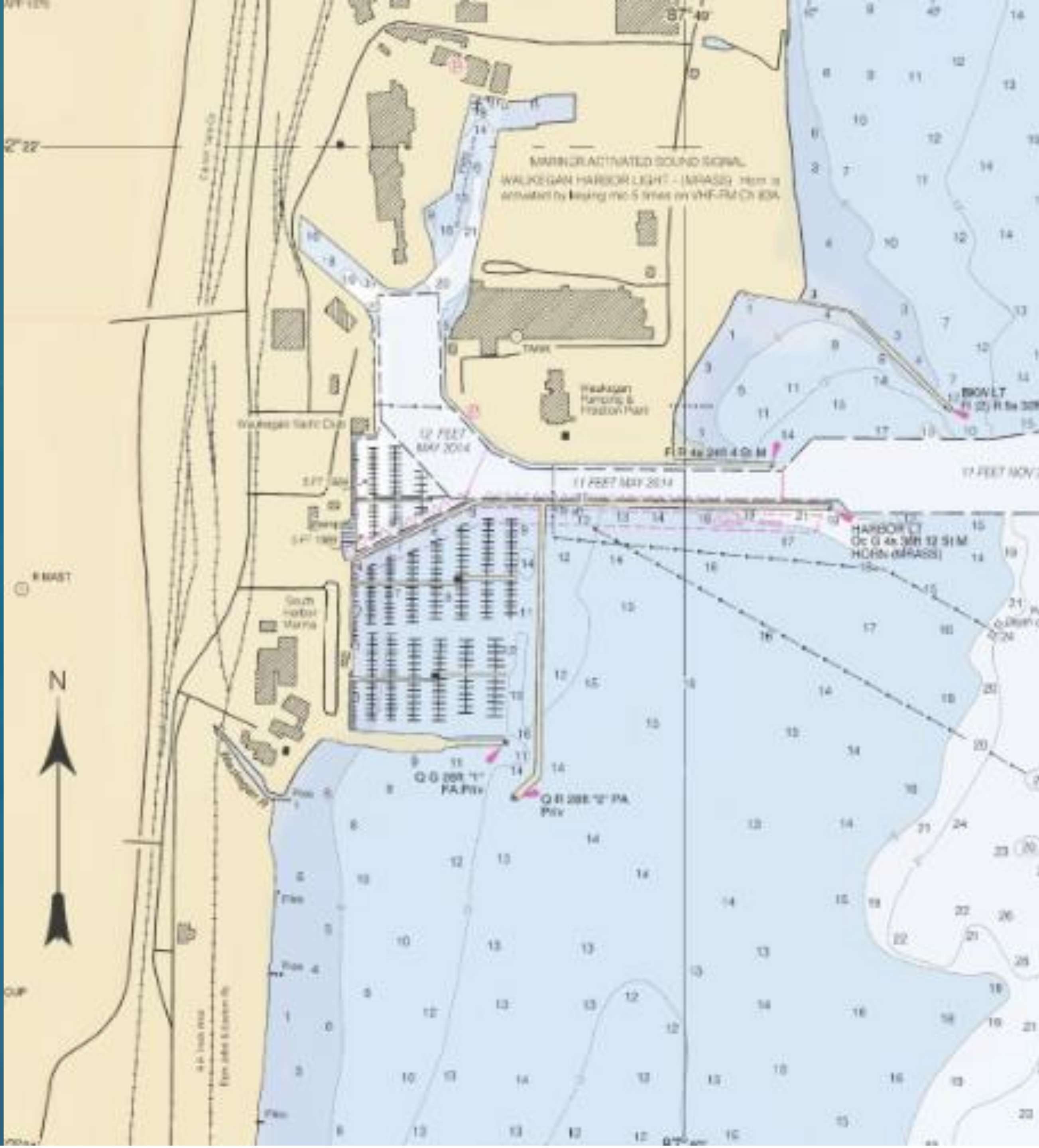

Fairway

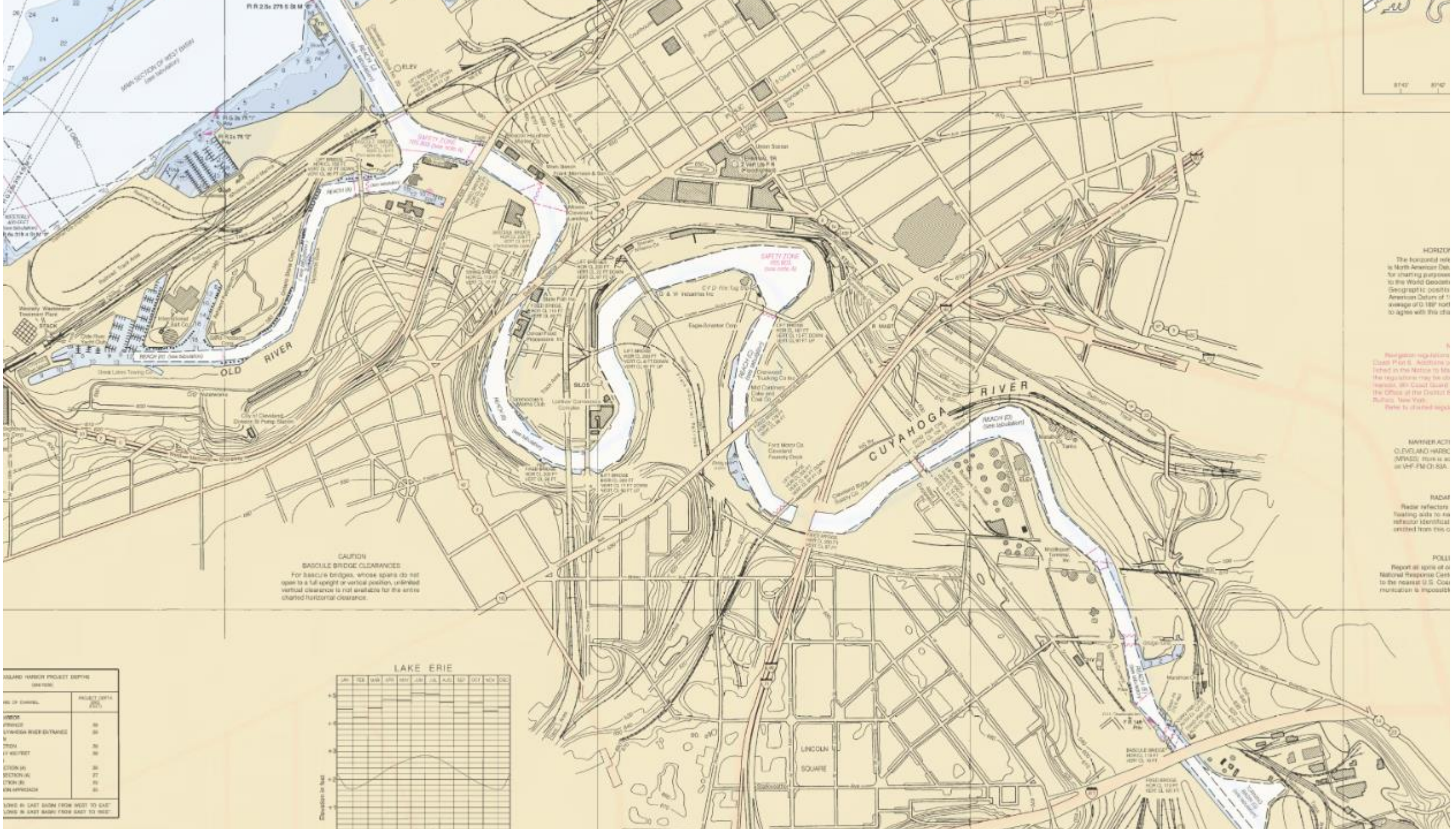

Ship Squat in Rock Cut
@ 31'-0" Draft, 0" Trim and +48" Water Gauge
*Water Current in Rock Cut varies with discharge Rate
Typical water speeds are estimated to be between 0.5mph and 1.5 mph
Ship Squat (inches)
48
42
36
30
24
18
12
6
0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
Vessel Speed Through Water (mph)
Class I Squat
Class 2 Squat
Class 3 Squat

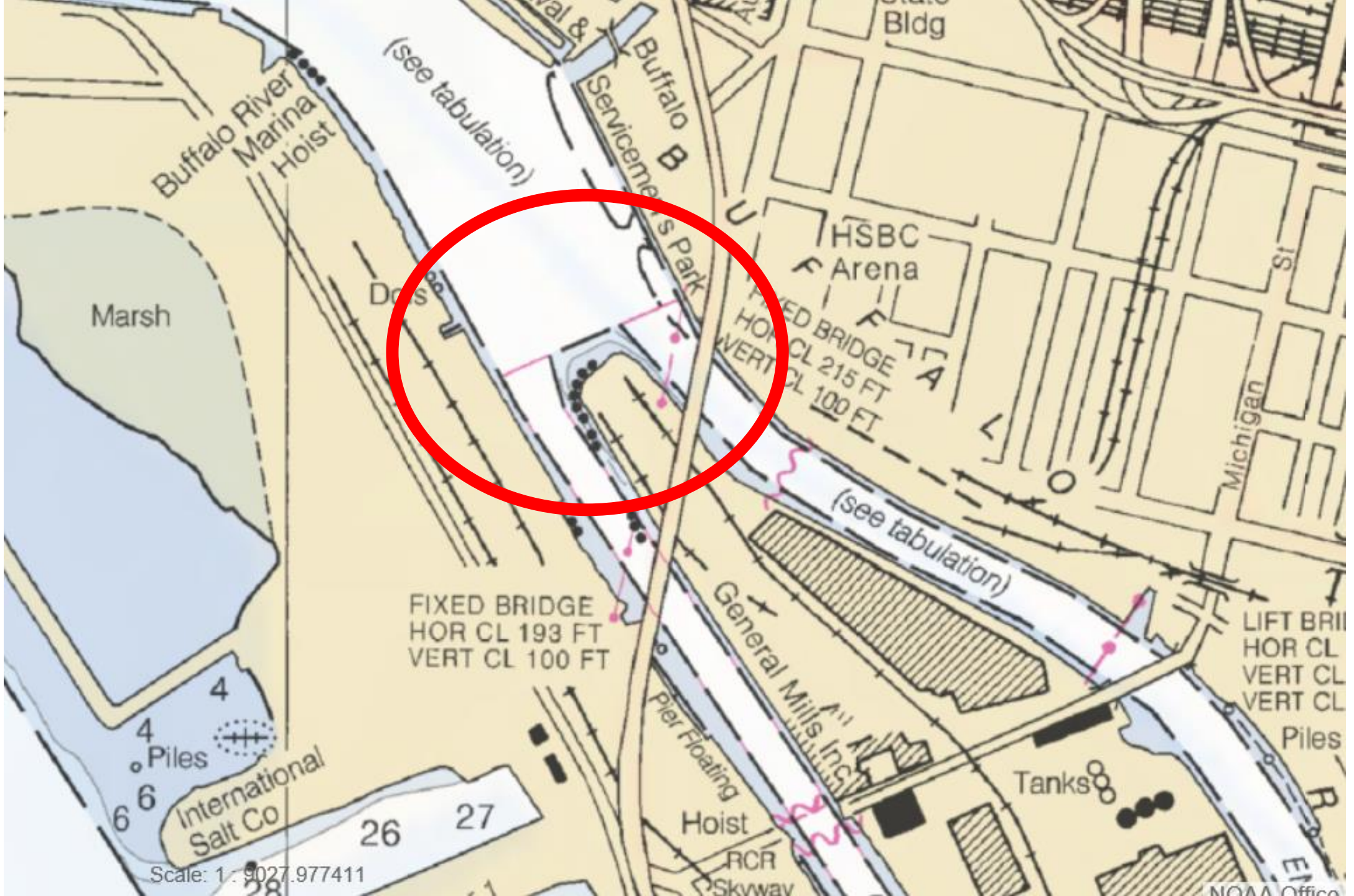


Lake profile showing wind set-up


Lake
137
E Sea Horse Dr
Pershing Rd
Government Pier


MARINER ACTIVATED SOUND SIGNAL
12 FEET MAY 2014
11 FEET MAY 2014
HARBOR LT
N


OLD RIVER
CUYAHOGA RIVER
LAKE ERIE
CAUTION
BASCULE BRIDGE CLEARANCES
For bascule bridges, whose spans do not open to a full upright or vertical position, unlimited vertical clearance is not available for the entire charted horizontal clearance.
LINCOLN SQUARE
SAFETY ZONE
REACH (D) (see tabulation)
REACH (B) (see tabulation)
REACH (C) (see tabulation)
MAIN SECTION OF WEST BASIN (see tabulation)
Elevation in feet


Buffalo River Marina Hoist
(see tabulation)
Buffalo B
Marsh
HSBC Arena
FIXED BRIDGE
HOR CL 215 FT
VERT CL 100 FT
Michigan
(see tabulation)
FIXED BRIDGE
HOR CL 193 FT
VERT CL 100 FT
General Mills Inc
Pier Floating
Piles
International Salt Co
26
27
Hoist
RCR
Skyway
Tanks
Piles
Scale: 1 : 9027.977411


MICHIGAN
HURON