

**TABLE 4-5
DESIGN BASIS ICE ENVIRONMENT CRITERIA FOR NORTHSTAR**

Ice Condition or Parameter	Average or Typical Values	Design or Extreme Values
Ice Type	First-Year Ice	Multi-year ice
Ice Zone	Landfast Ice	Summer multi-year invasions Freeze-up multi-year invasions
Ice Season		
Freeze-up	October 7	3rd week in September to the 4th week in October
Breakup	July 4	4th week in June to the 2nd week in July
First Open Water	mid-July	N/A
Ice Season Duration	290 ± 8 days	N/A
Total Open Water	75 ± 10 days	N/A
Summer Ice Invasion	--	2-3 times during summer
Max. Sheet Ice Thickness	6 feet	7.5 feet
Multi-Year Ice Parameters		
Presence	1 in 2 years during summer 1 in 3 to 4 years during freeze-up	N/A N/A
Multi-Year Ice Concentration	0.5 to 1.0 tenths	2 to 3 tenths
Floe Diameter	1,000 to 1,500 feet	4,000 to 5,000 feet
Floe Thickness - Nearshore	23 to 26 feet	Water-depth-limited
Floe Thickness - Pack	13 to 17 feet	30 to 33 feet
Keel Depth	30 to 33 feet	Water-depth-limited
Ice Crushing Pressure	100 to 175 psi	200-250 psi
Ice Speed in 20 to 40 feet (6 to 12 meters) of water		
Summer	0.2 to 0.4 knots	3 to 4 knots
Freeze-up	0.3 to 0.6 knots	3 to 4 knots

**TABLE 4-5 (Cont.)
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Ice Condition or Parameter	Average or Typical Values	Design or Extreme Values
Ice Gouge Depths		
Simpson Lagoon	<1 foot ¹	<3 feet ¹
0- to 16-foot Water Depth	<1 foot ¹	<3.5 feet ¹
16- to 34-foot Water Depth	<2 feet ¹	<3.5 to 6 feet ¹
Strudel Scours		
Depth	<4 feet ¹ □	< 4.4 feet
Width	<50 feet ¹ □	90 to 110 feet in diameter
Population	40 to 50 per year	75 to 100 per year
Density	5 to 10 per square mile	20 to 25 per square mile

- Notes: 1 = Based on pipeline route surveys conducted in the Seal Island region (Coastal Frontiers, 1996:1 through 6.
 < = Less than
 N/A = Not applicable
 psi = pounds per square inch

Source: BPXA, 1997b:Table 2.1-5