EXHIBIT E-9

OBEC CONSULTING ENGINEERS

Technical Dock & Pile Analysis

HARBOR FLOATING DOCK REPAIRS

PRELINIMARY DOCK AND PILING DESIGN MEMO

Floating Dock and Piling Design Criteria, Loading, and Costs

April 28, 2011

Background

The Port of Brooking Harbor is repairing/replacing recently tsunami damaged docks, wharfs, and ways. Most of the damage is to the docks located inside the inner boat basins, which were severely damaged during the recent March 11, 2011distant-source tsunami generated by a 9.0 magnitude earthquake in northern Japan.

The repairing/replacing of the Harbor facilities will primarily be funded by Federal Emergency Management Administration (FEMA) funding, with a 25% matching contribution required from the Port of Brookings Harbor. Replacement of the floating docks will be in-kind except where the application of modern design codes and regulations results in an increase in structural strength or capacity without enhancement of the use of the facility. Options for strengthening for extreme loadings, such as tsunami, has been considered in the repair design, but has not been implementation due to funding constraints. The purpose of this memo is to establish site-specific design criteria using standard loading protocol for use in designing the new floating dock segments and restraining pile to comply with FEMA repair guidelines.

Purpose and Scope

Design and maximum credible loading criteria for the repair/replacement of the floating docks are summarized herein required to satisfy current, standard design criteria. Additional analysis is provided to determine the level of strengthening required to prevent damage similar to the damage observed on March 11th for anticipated extreme loading events of variable frequency. The most cost-effective strengthening alternatives may consist of replacing all timber pile with steel pipe piling driven to modern standards and/or the installation of supplemental steel pile to provide additional lateral resistance. It is anticipated that strengthening, if pursued, would be funded through a hazard mitigation program.

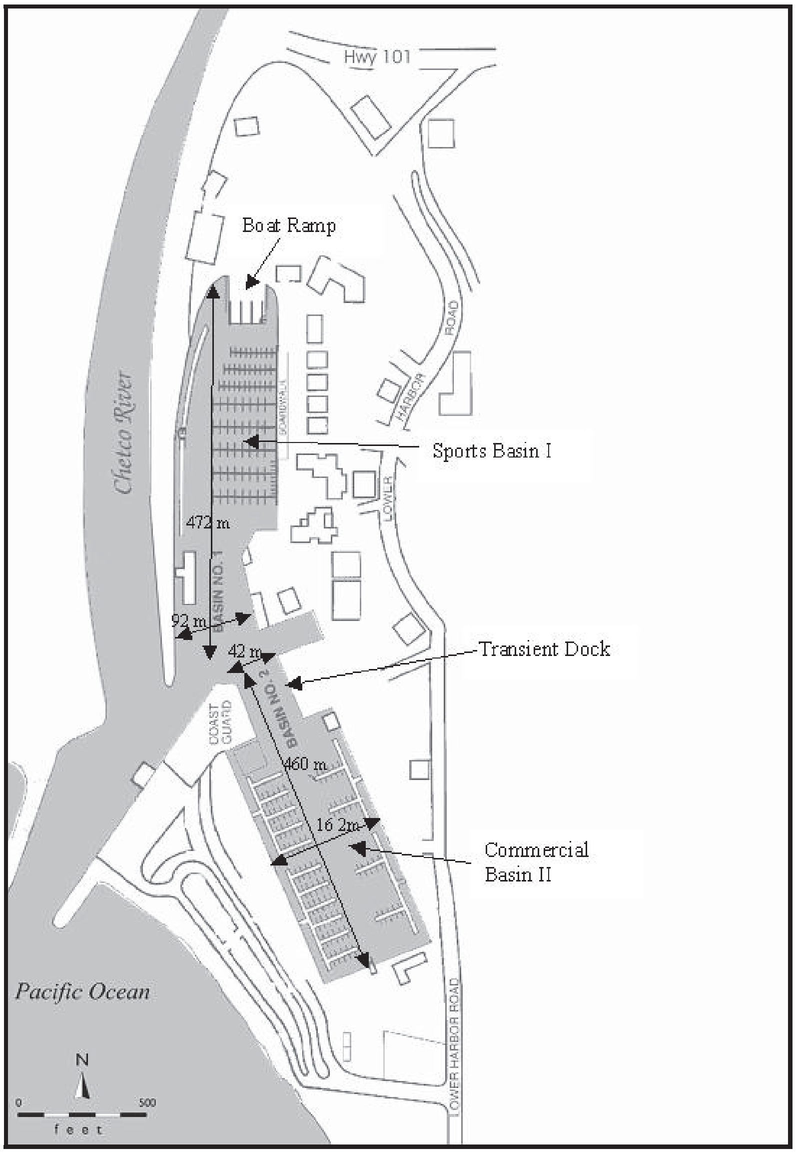
Technical Design Approach

To the layperson the new design of the inner boat basin probably won't look much different than it did before the tsunami. The intent is to reconstruct the same number of slips and the same amount of side-tie length. The most significant change in the new design is that the docks may be more resistant to site-specific service loads than before based on the application of current design standards, use of stronger steel pipe piles driven to modern standards, stronger pile hoop connections to the concrete floats, and strengthened float to float connections. Newer Codes and guidelines as summarized herein will be used design the floating dock repairs.

The strength/resistance of various piling alternatives will be determined and compared to various levels of design loading. This analysis will then enable the Port of Brookings Harbor, FEMA and the Oregon Emergency Management Division to assess the benefit-to-cost ratio of various strengthening alternatives for use is grant funding applications.

Brookings Harbor Layout

Follows is a plan view of Brooking Harbor. The Sport Basin No. 1 is located to the north and somewhat more exposed to wave action from the Pacific Ocean. The Commercial Basin No. 2 is located to the south.



Survey Data

The bottom surface elevation of both Bookings Harbor boat basins was surveyed by Oregon State Marine Board (OSMB) for Port of Bookings Harbor on March 21-23, 2011. For the purposes of this study of piling alternatives, the average bottom surface elevation of both the Sport (northern) boat basin and Commercial (southern) boat basins are both -11-feet (North American Vertical Datum (NAVD) 1988 + 0.4-feet equals MLL tide). In this memo, all elevations will be report in NAVD 1988, which is the basis of the engineered repair plans. The conversion from NAVD 1929 to NAVD 1988 is plus 3.53'.

Hydraulic Data

FEMA has prepared a Flood Insurance Study (FIS) study for City of Brookings in 1985. From the study, the approximate 100-year flood elevation of the Chetco River at the mouth of the boat basins is 13-feet (1929 NAVD), which equals 16.5-feet NAVD 1988. The 500 year flood elevation of the Chetco River at the mouth of the boat basins is 15.5feet (1929 NAVD), which equals 19.0-feet NAVD 1988.

We also have hydraulic data from the Chetco River Bridge plans, dated 1969 by Oregon Department of Transportation giving the extreme high water elevation at the bridge of 14.7-feet (1929 NAVD), which equals 18.2-feet NAVD 1988.

Tides

The tides at Brookings are based on a National Ocean Service (NOS) tide gauge located at Crescent City, California, about 25 miles to the south of Brookings. The next nearest tide station is Port Orford, 55 miles to the north. This station has recorded data continuously since 1933. Brookings is typical referenced to the primary station at Crescent City.

The following table lists the tidal datum and ranges that should be used for Brookings:

Datum's (referenced to MLLW)	**Value (feet)**
Highest Observed Tide	10.7
Mean Higher High Water (MHHW)	6.9
Mean High Water (MHW)	6.3
National Geodetic Vertical Datum-1929 (NGVD 29)	3.8
Mean Tide Level (MTL)	1.2
Mean Low Water (MLW)	1.2
Mean Lower Low Water (MLLW)	0.0
Lowest Observed Water Level	-2.7
Ranges	**Value (feet)**
Diurnal Tidal Range (MHHW-MLLW)	6.9
Mean Tidal Range (MHW – MLW)	5.1

Design of the dock may include tsunami and storm surge superimposed on a reasonably high tide. This is discussed further below.

Tsunami History and Estimated Effects

Tsunamis are seismically generated waves that have impacted the Port of Brookings Harbor in the past and are expected to impact the port in the future. Tsunamis are classified as distant-source such as caused by the March 11, 2011 earthquake in northern Japan and near-source as can be cause by an earthquake in the Cascadian Subduction Fault several hundred kilometers off of the Oregon Coast at Brookings.

Past tsunami data from Brookings and Crescent City, CA have been collected since 1933 and include 33 events; of these, eleven (11) were greater than 1 meter in height, and four (4) have caused damage include the following:

- 1964 Alaska Earthquake; 10-12 foot wave with widespread damage.
- 1995 Kobe Japan earthquake – little or no data available
- Nov. 2006 Kuril Islands (north of Japan) Earthquake; 8.3 magnitude; series of surges; height not given; tsunami warnings given then withdrawn 7 hours before waves hit; $7 million in damage.
- March 11, 2011; 9.0 magnitude event in northern Japan; surge wave heights of 8 feet at approximately low tide; much damage in the harbor area.

One suggested enhancement design criterion for distant-source tsunami is based on a distant-source seismic event similar to that which recently occurred on March 11, 2011 in northern Japan with a performance goal of no collapse and insured safe egress from boats. The return interval is less than 500 years. Design wave heights of as much as 10 feet are suggested for this criterion. The dock pile design will be checked for this loading.

Another criterion for extreme near-source tsunami can be a moderately large to large seismic event on Cascadian Subduction Zone with seismic forces on the order of 0.4 to 0.5g peak horizontal ground acceleration, return interval of less than 500 years, and tsunami heights of as much as 20 feet or more. The dock pile design can be checked for this loading; however, it is highly likely this loading will greatly exceed the strength of even the largest piles. One consideration it to extend the top of the selected pile to ensure in the dock is retained on the piles in this extreme event.

For the observed vessel striking the dock, a 10,000 pound load is applied at the extreme high water wave (high tide + surge or high tide + distant-source tsunami).

Army Corp of Engineers and WEST Consultants Surge Study

The U.S. Army Corps of Engineers (Corps), Portland District (NWP) has conducted a study to assess and reported surge problems in Brookings Harbor. WEST Consultants, Portland, Oregon conducted the study for the Corps. The consultant extensively modeled the port and described the major surge events to be in the 5 to 6-feet range, occuring when the ocean sees large short waves with periods of 5-20 seconds and an average surge event to be in the 2-4 feet range of vertical movement or height. Design for the distant-source tsunami exceeds observed storm surge and will control the design of repairs for this project.

Geotechnical Data

Galli Group is currently working on their geotechnical memo for this project. For the initial filtering of pile sizes, there are several other sources of detailed geotechnical data representative of the soil below the boat basins:

- Chetco River Bridge plans foundation data sheet, dated 1969 by Oregon Department of Transportation

- Brookings Harbor Boardwalk plans foundation data sheet, dated 2010 by OBEC Consulting Engineers

Preliminary soil conditions below the bottom of the boat basins can be summarized as follows:
- -11-feet to -24-feet: Medium dense silty sand and gravel with 0 to 4 blows/feet
- -24-feet to -50-feet: Dense silty sand and gravel with 17 to 40 blows/feet
- -50 feet to – 85-feet: Very dense silty sand and gravel with over 40 blows/feet

From the boardwalk project, the estimated pile tip elevation for a 16-inch diameter ½ -inch wall pipe pile is Elevation -55-feet driven to 440 kip ultimate capacity.

Design Vessel Characteristics

In 1997, the Port of Brookings surveyed the vessels using their harbor and recorded the lengths, beams, and drafts for 607 vessels. The Port also recorded whether vessels used the Sports Basin (North Basin No. I) or the Commercial Basin (South Basin No. 2).

The results of the study, and the design vessel used in this study is as follows:
- Sport Basin No. 1: Length 30-feet, Beam 8-feet, Draft 3-feet, Average Structure Height (for wind loading): 6-feet
- Commercial Basin No. 2: Length 60-feet, Beam 15-feet, Draft 6-feet, Average Structure Height (for wind loading): 12-feet

NAVFAC Unified Facilities Criteria

The primary design criteria for the harbor will be the current Unified Facilities Criteria (UFC) of the United States Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC) and the Office of Air Force Civil Engineering. The UFC documents provide planning, design, construction, sustainment, restoration, and modernization criteria.

Applicable UFC include:
- UFC 4-150-06 Military Harbors and Coastal Facilities, 2001
- UFC 4-152-01 Design: Piers and Wharves, 2005
- UFC 4-152-07 Design: Small Craft Berthing Facilities, 2009

Wind Loading on Design Vessels

A recommended 20 pounds per square foot wind loading on vessels is recommended for the conditions at Brookings Harbor. The following design criteria applies:
- For sport vessels, the typical load to the adjacent piling is 3,060 pounds and approximately 100 pounds per foot to the dock.
- For commercial vessels, the typical load to the adjacent piling is 12,240 pounds and approximately 350 pounds per foot to the dock.

Wave Loading on Dock and Design Vessels

The recommended design wave height is 2-feet for the observed below-average occasional surge event at Brookings Harbor. Approximate loading applied by this wave on docks and vessels is as follows:

- For the dock, the wave imparts approximately 200 pounds per foot to the dock and 300 pounds per foot to the sport vessels, resulting in a typical load to the adjacent piling loading of approximately 5,100 pounds.
- The wave imparts approximately 500 pounds per foot to the commercial vessels, resulting in a typical load to the adjacent piling of approximately 8,500 pounds.

Service Load and Extreme Loading Design and Recommended Design Criteria

For the design of repair for this dock, it would be appropriate to modify the typical design criteria to include an envelope of design for distant and near-source tsunami and surge observed in the boat basins. These loadings far exceed the typical design loadings and would ensure survivability of the dock for various levels of extreme loading.

For non-extreme service load cases (wind at lower water surfaces, stream force, wind waves, etc), the extreme load cases control the design by inspection.

Recommended extreme Load combinations based on the design references and engineering judgment are as follows.

Service Loadings (typical loading that covers all day-to-day loadings)

- Service Load Case 1: Mean high tide + 2-feet wave +Wind. This yields a design water surface elevation of 10.0-feet. Design strength of piling should not exceed 0.75 yield.

Extreme Service Loadings (Representative loading that represents uncommon conditions that occur infrequently)

- Extreme Service Load Case 2: 100 year high water + Wind at 0.90 pile yield strength. This yields a design water surface elevation of approximately 16.0-feet. Design stress on piling should not exceed 0.9 to 1.2 times the yield strength of piling. The theoretical failure strength of the piling is its tensile strength, which is approximately 1.5 times its yield strength. Therefore, the minimum factor-of-safety at the 1.2 factor is 1.25.
- Extreme Service Load Case 3: High tide + 6-feet storm surge + Wind. This yields a design water surface elevation of approximately 16.0-feet. Design stress on piling should not exceed 0.90 to 1.2 times the yield strength of piling. This load case is expected to yield similar load effects as Extreme Service Load Case 2.

Tsunami Loadings (Extremely atypical loading that represents several levels of once-in-a-lifetime loading)

- Distant-Source Tsunami Load Case 4: Mean high tide + Distant-source tsunami + Boat strike + ½ wind loading. This yields a design water surface elevation of approximately 20-feet. Design stress on piling should not exceed 1.2 to 1.5 times the yield strength of piling. The theoretical failure strength of the piling is its tensile strength, which is approximately 1.5 times its yield strength. Therefore, the minimum factor-of-safety at the 1.5 factor is 1.00.
- Near-Source Tsunami Load Case 5: High tide + Near-source tsunami + Boat strike + ½ wind loading. This yields a design water surface of approximately 30-feet. Costs of

extending piles high enough to retain the dock for this load case are included in the estimated costs for various pile alternatives. No recommended piling stress level is recommended for this load case as it is certain to cause failure due to debris loading and factors outside the scope of the repairs.

Strength of Existing Floating Dock Piling and Recommended Repair Pile Selection

The structural analysis of the existing 12-inch diameter timber piles and 12-inch diameter steel pipe piles (3/8-inch wall assumed) for the the applied loadings determined above indicated the following:

- For the Commercial Basin, the existing 12-inch timber pilings have a factor-of-safety of approximately 0.1 against failure under Extreme Service Load conditions, indicating they are total inadequate. All timber piles should be replaced with the recommended steel pipe pile section for the Commercial docks.
- For the Commercial Basin, the existing 12-inch steel timber pilings have a factor-of-safety of approximately 0.6 against failure under Extreme Service Load conditions indicating they are inadequate and subject to failure under the applied loadings. For replacement piling, the structural analysis indicates they should upsized to 24-inch diameter by 3/8 -inch wall for satisfactory structural performance at the same pile spacing as before. If additional piles locations can be added, 12-inch diameter by 1/2-inch wall can provide satisfactory structural performance with the benefit of using utilizing the capacity of existing pile, maintaining existing 12" diameter pile hoops. Post-tsunami damage assessments indicate that damage is most severe at the entrance to the basin, indicating that the leading docks tend to attenuate and dampen hydraulic energy entering the basin, reducing hydraulic loading on the other docks. Due to funding constraints, therefore, it is recommended that additional pile be installed at Docks P and Q to ensure survivability during anticipated Extreme Service Load events.
- For the Sports Basin, the existing steel 12-inch steel pipe pilings have a factor-of-safety of approximately 1.0 against failure indicating they are inadequate to the extent that the applied loading brings the piles too near to failure. As the leading dock, Dock A tends to attenuate and dampen hydraulic energy entering the basin, reducing loading on the other docks within the basin; an observation confirmed during post-tsunami damage assessments. The use of 12-inch pipe pile with ½" wall thickness combined with the addition of 4 more pile is recommended to ensure survivability of Dock A during Extreme Service Load events. Docks D and E have been modified to allow parallel mooring of boats, which greatly increases the projected area of vessels exposed to both wind and hydraulic loading, greatly increasing loading Docks D and E. The installation of 5 additional 12-in diameter pile at each of Docks D and E is recommended to ensure survivability of the docks during Extreme Service Load events.

Construction costs for installation of piling in the repaired docks is included in the cost preliminary costs estimates for this project.

Floating Dock Design Criteria

Using current OSMB design criteria and design criteria described above, the floating docks should be designed for the following anticipated structural and environmental conditions:

- Mean Low Water (MLW) Elevation = 1.2 feet

- Mean High Water (MHW) Elevation = 6.3 feet
- 100 Year Flood Elevation = 16.5 feet
- Design Wind Wave Height = 2.0 feet height with a wave length of 40 feet
- Basic Wind Speed (UBC) = 94.5 mph from the south southwest
- Desired Interior Wave Climate = 1.0 feet
- Design Recreational Craft Length = 30 feet
- Average Recreational Craft Profile Height = 6 feet
- Average Recreational Craft Draft = 3 feet
- Design Commercial Vessel Length = 60 feet
- Average Commercial Vessel Profile Height = 12 feet
- Average Commercial Vessel Draft = 6 feet
- Float should be designed to support a live load of 40 pounds per square foot of deck area, with a minimum freeboard of not less than eleven (11) inches.
- Freeboard under dead load only shall not be less than fourteen (14) inches and should not exceed seventeen (17) inches.
- Floatation units are designed to be capable of supporting a 400 pound point load moving in any area on a float without structural damage or excessive rolling or tilting.
- Floatation units are designed to be capable of spanning 30 feet supporting a 500 pound per foot lateral load applied to the float timber rails without structural damage or excessive lateral deflection.
- Maximum transverse slope for main floats: 1% or one (1) inch per eight (8) feet of width.
- Maximum longitudinal slope: 1% or one (1) inch per eight (8) feet.
- Flotation units and connecting structural system are designed for vertical and lateral loading with allowance for 25% area of opening (space between float units) for fiberglass grating for below dock light penetration in areas of new dock. In sections of existing dock, light penetrations can be eliminated. This requirement has been stipulated by NOAA Marine Fisheries during environmental permit consultation. See Float Repalacement Plan and Float List.
- Minimum timber float connection rails shall be double 4 by 8 (S4S) for sport docks and double 4 by 10 (S4S) for commercial docks. Splice new rails at extension of existing dock to existing rails. No rail splices shall be allowed within 2' of a light wells or float joints for continuity.
- Pipe hoop anchor floats shall be design for a tension load of 11,000 pound for the commercial docks and 8,000 pounds for the sport docks

BROOKINGS HARBOR FLOATING DOCK REPAIRS
PRELINIMARY DESIGN MEMO
g Design Criteria and Loading and
Repair Piling Alternatives versus Costs

DRAFT April 22, 2011

Design Loadings

1) Service Load Case 1: High tide+ 3' wave + Wind. This yields a design water surface elevation of 8-feet.

Sport Dock			Commerical Dock	
Elev	8	Ft	Elev	8
Force	9600	Pound	Force	17200

2) Extreme Service Load Case 1: 100 year high water + 3' wave + 1/2 wind . This yields a design water surface elevation of 16.0-feet.

Sport Dock			Commerical Dock	
Elev	16	Ft	Elev	16
Force	7800	Pound	Force	17200

3) Extreme Service Load Case 2: High tide + 6-feet storm surge + Wind. This yields a design water surface elevation of 16.0-feet.

Sport Dock		Commerical Dock	
Elev	16	Elev	16
Force	3600	Force	14400

4) Extreme Distant-Source Tsunami Load Case 3: High tide + Distant-source tsunami + Boat strike + ½ wind at 1.2 pile yield strength.

Sport Dock		Commerical Dock	
Elev	20	Elev	20
Force	11800	Force	17200

NOTE: Extreme Loading Criteria 4 & 5 will not be used for economic reasons by POBH direction.

5) Extreme Near-Source Tsunami Load Case 4: High tide + Near-source tsunami + Boat strike + ½ wind. for this load case.

Sport Dock		Commerical Dock	
Elev	30	Elev	30
Force	11800	Force	17200

Point of Fixity

Pile	Wt	Area	S	Mom Cap Sfy	I	D=1.8(EI/n)^-5 n	E	Depth to Fix D	Elev @ Fix Below -11	Est Min Emb	Est Min Tip
	Pound	in^2	in^3	kip-ft	in^4	Soil Coef	Modulus	Ft	Ft	3D	Ft
12 timber Pile			113	17	1018	28	1800	6.1	-17.1	6.1	-17.1
12-Inch Pipe Piles by 3/8-Inch Wall	49.6	14.6	43.8	128	279	28	29000	8.2	-19.2	24.7	-35.7
12-Inch Pipe Piles by 1/2-Inch Wall	65.4	19.64	56.71	165	361	28	29000	8.7	-19.7	26.0	-37.0
16-Inch Pipe Piles by 3/8-Inch Wall	62.6	18.4	70.3	205	562	28	29000	9.5	-20.5	28.4	-39.4
16-Inch Pipe Piles by 1/2-Inch Wall	82.8	24.4	91.5	267	732	28	29000	10.0	-21.0	30.0	-41.0
24-Inch Pipe Piles by 3/8-Inch Wall	94.6	27.8	161.9	472	1943	28	29000	12.1	-23.1	36.4	-47.4
24-Inch Pipe Piles by 1/2-Inch Wall	125.5	36.9	212.5	620	2550	28	29000	12.8	-23.8	38.5	-49.5

Steel Pile	Fy=	35000	psi	Ft=	50000	psi
	Material	ASTM A252 Gr 2				
Timber	Fb	1300	psi	Fult	1800	psi

Pile Bending

		Sport Dock (Pile layout requires each pile to carry 67% of load)							Commerical Dock (Pile layout requires each pile to carry 67%5load)						
		Force	Dock El	Elev Fix	Dock-Fix	Moment	% Yield	% Tensile	Force	Dock El	Elev Fix	Dock-Fix	Moment	% Yield	% Tensil
12 Timber Piles						Kip-Ft		FOS					Kip-Ft		FOS
Load Case	1	8160	8	-17.1	25.1	205	8.1	0.2	17200	8	-19.2	27.2	468	18.4	0.1
Load Case	2	6630	16	-17.1	33.1	220	8.6	0.2	17200	16	-19.2	35.2	606	23.8	0.1
Load Case	3	3060	16	-17.1	33.1	101	4.0	0.4	14400	16	-19.2	35.2	507	20.0	0.1
Load Case	4	11800	20	-17.1	37.1	438	17.2	0.1	17200	20	-19.2	39.2	675	26.5	0.1
Load Case	5	11800	30	-17.1	47.1	556	21.9	0.1	17200	30	-19.2	49.2	847	33.3	0.0
12-Inch Pipe Piles by 3/8-Inch Wall															

Load Case	**1**	**8160**	**8**	**-19.2**	**27.2**	**222**	**1.2**	**1.2**	17200	8	-19.2	27.2	468	2.4	0.6
Load Case	**2**	**6630**	**16**	**-19.2**	**35.2**	**234**	**1.2**	**1.2**	17200	16	-19.2	35.2	606	3.2	0.5
Load Case	**3**	**3060**	**16**	**-19.2**	**35.2**	**108**	**0.6**	**2.5**	14400	16	-19.2	35.2	507	2.6	0.5
Load Case	4	11800	20	-19.2	39.2	463	2.4	0.6	17200	20	-19.2	39.2	675	3.5	0.4
Load Case	5	11800	30	-19.2	49.2	581	3.0	0.5	17200	30	-19.2	49.2	847	4.4	0.3
16-Inch Pipe Piles by 3/8-Inch Wall															
Load Case	1	8160	8	-20.5	28.5	232	0.8	1.9	17200	8	-20.5	28.5	490	1.6	0.9
Load Case	2	6630	16	-20.5	36.5	242	0.8	1.8	17200	16	-20.5	36.5	627	2.0	0.7
Load Case	3	3060	16	-20.5	36.5	112	0.4	3.9	14400	16	-20.5	36.5	525	1.7	0.8
Load Case	4	11800	20	-20.5	40.5	478	1.6	0.9	17200	20	-20.5	40.5	696	2.3	0.6
Load Case	5	11800	30	-20.5	50.5	596	1.9	0.7	17200	30	-20.5	50.5	868	2.8	0.5
16-Inch Pipe Piles by 1/2-Inch Wall															
Load Case	1	8160	8	-21.0	29.0	237	0.6	2.4	17200	8	-21.0	29.0	499	1.2	1.1
Load Case	2	6630	16	-21.0	37.0	245	0.6	2.3	17200	16	-21.0	37.0	636	1.6	0.9
Load Case	3	3060	16	-21.0	37.0	113	0.3	5.1	14400	16	-21.0	37.0	533	1.3	1.1
Load Case	4	11800	20	-21.0	41.0	484	1.2	1.2	17200	20	-21.0	41.0	705	1.8	0.8
Load Case	5	11800	30	-21.0	51.0	602	1.5	1.0	17200	30	-21.0	51.0	877	2.2	0.7
24-Inch Pipe Piles by 3/8-Inch Wall															
Load Case	1	8160	8	-23.1	31.1	254	0.4	4.0	17200	8	-23.1	31.1	536	0.8	1.9
Load Case	2	6630	16	-23.1	39.1	260	0.4	3.9	17200	16	-23.1	39.1	673	1.0	1.5
Load Case	3	3060	16	-23.1	39.1	120	0.2	8.4	14400	16	-23.1	39.1	564	0.8	1.8
Load Case	4	11800	20	-23.1	43.1	509	0.7	2.0	17200	20	-23.1	43.1	742	1.0	1.4
Load Case	5	11800	30	-23.1	53.1	627	0.9	1.6	17200	30	-23.1	53.1	914	1.3	1.1
24-Inch Pipe Piles by 1/2-Inch Wall															
Load Case	1	8160	8	-23.8	31.8	260	0.3	5.1	17200	8	-23.8	31.8	547	0.6	2.4
Load Case	2	6630	16	-23.8	39.8	264	0.3	5.0	17200	16	-23.8	39.8	685	0.7	1.9
Load Case	3	3060	16	-23.8	39.8	122	0.1	10.9	14400	16	-23.8	39.8	573	0.6	2.3
Load Case	4	11800	20	-23.8	43.8	517	0.6	2.6	17200	20	-23.8	43.8	754	0.8	1.8
Load Case	5	11800	30	-23.8	53.8	635	0.7	2.1	17200	30	-23.8	53.8	926	1.0	1.4

NOTE: Need to add additional pile to Commercial Dock to increase design Distribution Factor. By adding one pile to the main dock for each pile located at the end of a finger dock, horizontal finger loads will have on average two pile available for direct distribution. This will reduce the load

12-Inch Pipe Piles by 1/2-Inch Wall															
Load Case	1	4080	8	-19.2	27.2	111	0.4	3.2	**8600**	**8**	**-19.2**	**27.2**	**234**	**0.9**	**1.5**
Load Case	2	3315	16	-19.2	35.2	117	0.5	3.0	**8600**	**16**	**-19.2**	**35.2**	**303**	**1.2**	**1.2**
Load Case	3	1530	16	-19.2	35.2	54	0.2	6.6	**7200**	**16**	**-19.2**	**35.2**	**254**	**1.0**	**1.4**
Load Case	4	11800	20	-19.2	39.2	463	2.4	0.6	17200	20	-19.2	39.2	675	3.5	0.4
Load Case	5	11800	30	-19.2	49.2	581	3.0	0.5	17200	30	-19.2	49.2	847	4.4	0.3