

14th/16th Avenue South Bridge Economic Impact Analysis

Prepared for

**King County
Department of Public Works**

by

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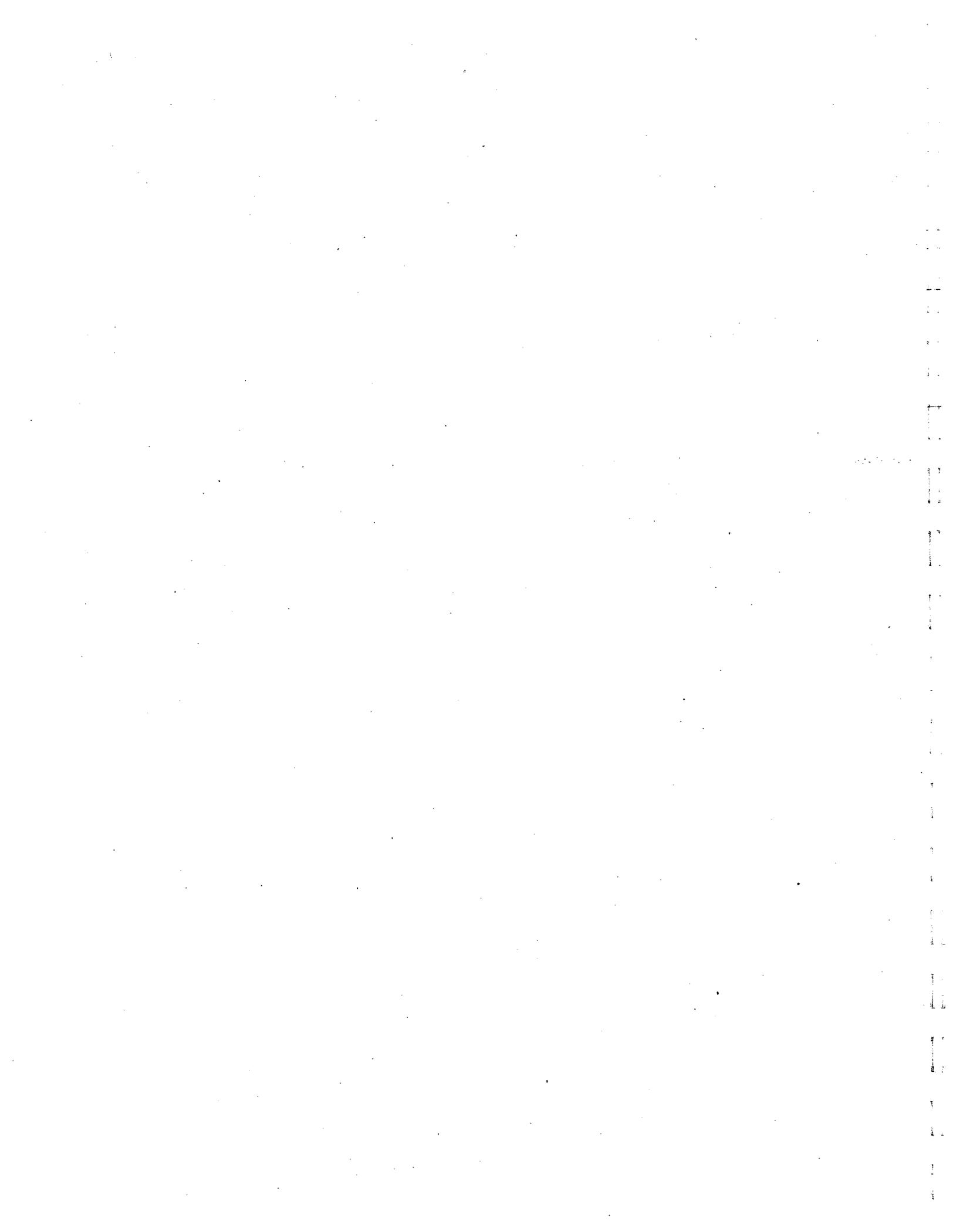
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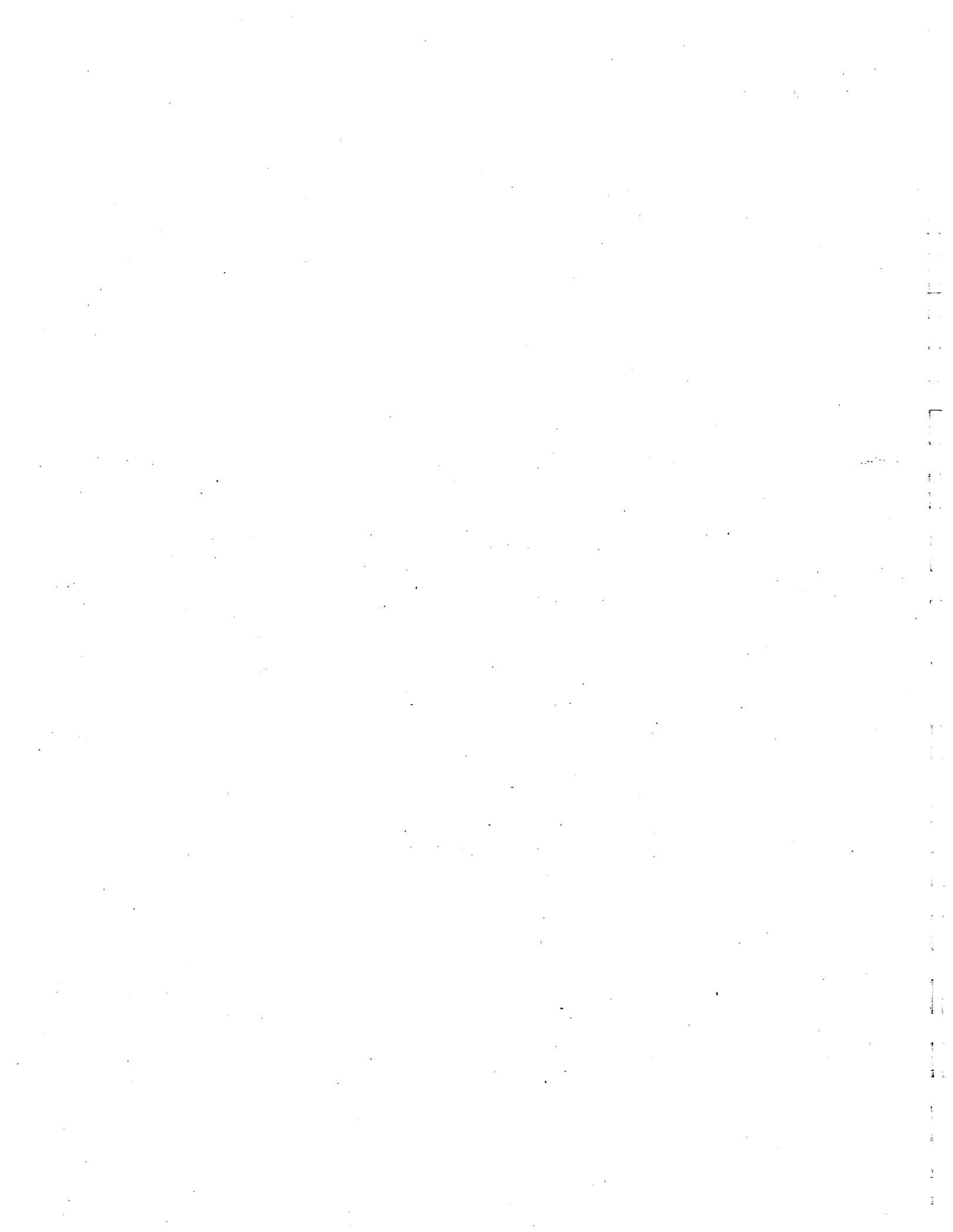
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**Chapter
One:**

Introduction



CHAPTER ONE

INTRODUCTION

The 14th/16th Avenue South Street Bridge was originally built in 1931 and over the years has sustained cracking and deterioration of the north pier. The bridge does not currently meet County standards for lateral stability in case of seismic activity. The King County Department of Public Works has conducted several studies to evaluate alternative means of improving the Bridge.

The most recent report¹ presented a summary of investigations that "compared rehabilitation of the existing 14th/16th Avenue South Bridge versus replacement with either an intermediate or high level fixed-span bridge, a moveable bridge or permanent closure of the bridge". After further analysis of traffic circulation patterns, removal of the bridge was not considered a viable option. The remaining options being considered by the County are presented below :

- Rehabilitate existing structure - \$16.5 to \$20.6 million
- Build new fixed span - 100 feet above Mean High Water (MHW) - \$31.5 to \$34.8 million
- Build new fixed span - 55-60 feet above MHW - \$19.7 to \$21.0 million
- Build new bascule bridge - \$46.2 to \$51.9 million

The lower level fixed bridge alternative (55 to 60 feet above mean high water) is the least cost replacement alternative and is approximately the same cost as rehabilitating the existing bridge (excluding ROW acquisition costs). However, there are several other factors that differentiate these alternatives in addition to cost. Specifically, the lower level fixed bridge alternative has several other advantages relative to rehabilitation of the existing bridge:

- design configuration, (the renovation of the existing bridge would require a waiver for non-compliant roadway width, reduction of the size of the sidewalks or reduction in number of lanes)
- structure life, (the replacement structures would have a longer life than rehabilitation alternatives)
- traffic disruption during construction (closure of the bridge during rehabilitation would impede traffic for approximately two years)
- traffic flow would be less effective after construction (rehabilitation of the existing bridge would most likely limit traffic flow to three

¹ **14th/16th Avenue South Bridge Rehabilitation/Replacement Design Report,**
Sverdrup March 1994

lanes as opposed to four lanes under the replacement alternatives),
and

- Traffic safety would be improved by the replacement alternatives (due to the relative number of lanes and shoulder sizes).

Sverdrup Corporation, serving as the County's Design Engineer, recommended replacement of the existing bridge using the lower fixed span option (FBR55). However, the selection of a fixed-span bridge was contingent upon permit approval of vertical restrictions by the Coast Guard.

Previous Waterway Users Study Results

As a part of earlier study efforts², the US Coast Guard posted a public notice to solicit comments on vertical clearance requirements to the proposed replacement. They received nine (9) responses to this notice from:

- U.S. Army Corps of Engineers
- Crowley Marine Services
- U.S. Department of Interior, Fish and Wildlife Service
- State of Washington Department of Community Development
- Manson Construction & Engineering Company
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration
- Delta Marine Industries, Inc.
- Foss Maritime
- International Terminal Company

In addition to these nine respondents, Sverdrup staff contacted other potentially impacted waterfront businesses regarding the potential impacts. Most upriver users felt that the proposed 55 to 60 foot clearance would allow transit by tugs, barges, most recreational and commercial boats, dredging equipment and other users.

However, the identified users that would be impacted included: Manson Company, Delta Marine Industries (DMI), South Park Marina, and the Duwamish Yacht Club. The potential impacts to these facilities are described in greater detail in the following chapters.

²14th/16th Avenue South Bridge Operational Study and Life Cycle Cost Analysis
Comparing Bridge Replacement versus Rehabilitation by Sverdrup Corporation,
April 1993, Page 43

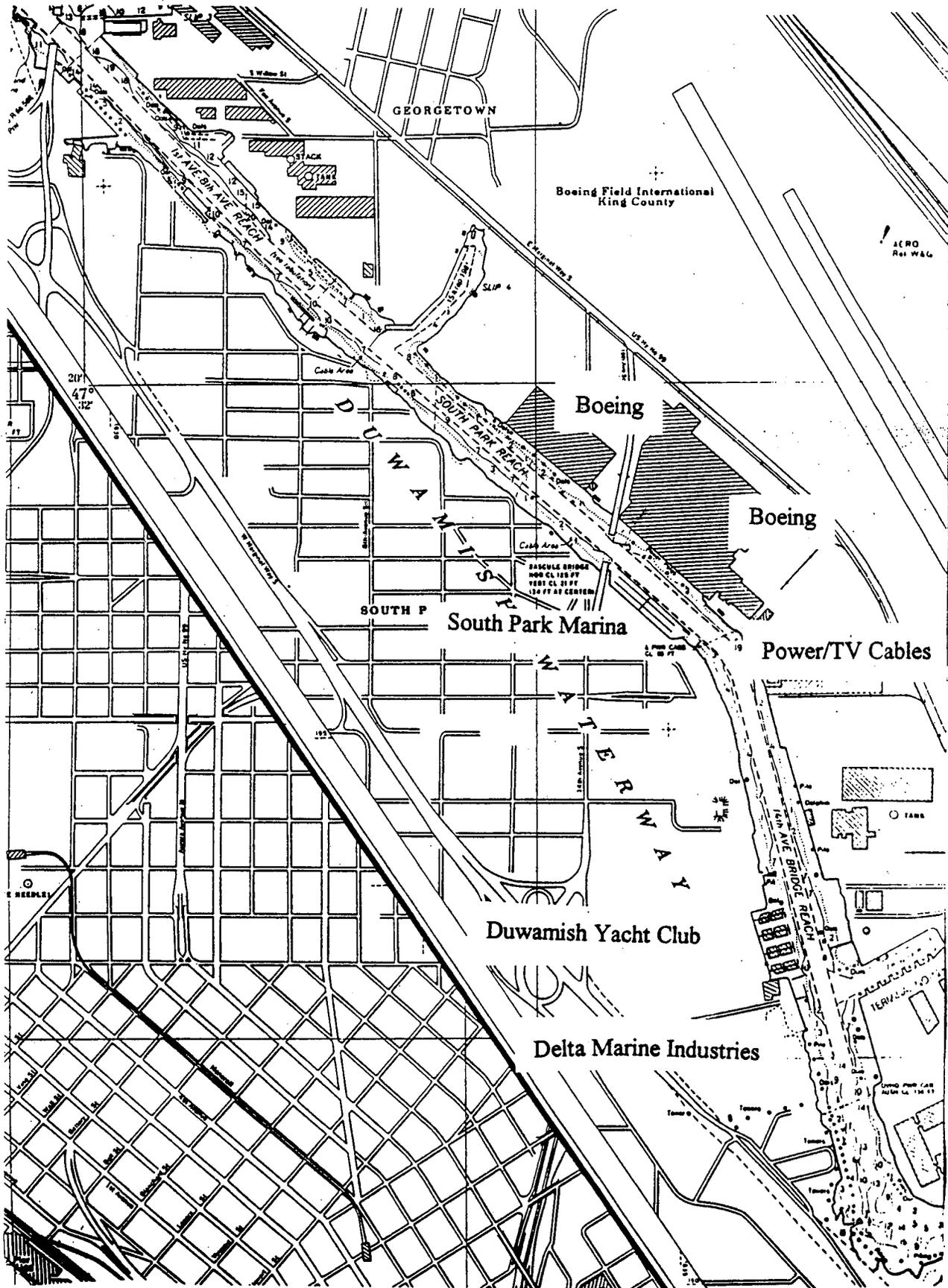
Organization and Purpose of the Report

As a result of the concerns expressed by waterway users, the Coast Guard suggested that the vertical clearance of the Bridge should be a minimum of 100 feet above MHW.

The County's desire to build a fixed span will only be accommodated by the Coast Guard and other Federal funding agencies if an economic study of existing and potential future uses is undertaken that demonstrates in a convincing manner that construction of a fixed span (55 to 60 feet above MHW) could be accomplished and still minimize (and/or compensate) the impacts to existing and potential users. This is the key objective of this study.

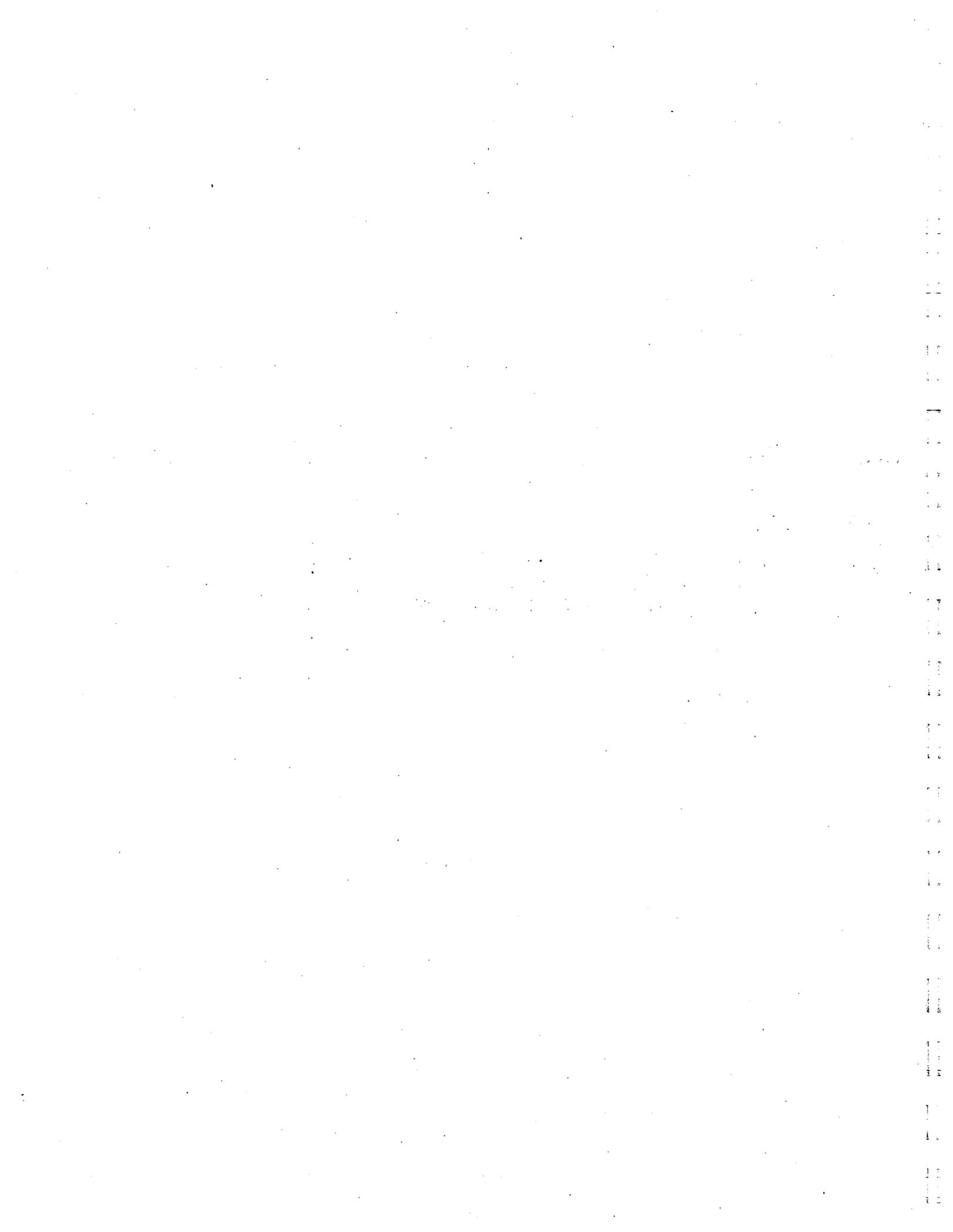
The impact analysis is organized in the following order:

- Description of Waterway and Facility Characteristics (Chapter Two)
- Description of Vessel Traffic through the Existing Bridge (Chapter Three)
- Discussion of Potential Impacts to Existing and Future Waterway Uses (Chapter Four)
- Discussion of Upland Impacts (Chapter Five)
- Conclusions and Recommendations (Chapter Six)



**Chapter
Two:**

**Waterway and
Facility
Characteristics**



CHAPTER TWO WATERWAY AND FACILITY CHARACTERISTICS

General Overview

The Duwamish River is a freshwater extension of the Seattle Harbor, extending 5.12 miles upstream from the mouth of the river at the south end of Elliott Bay. The U.S. Army Corps of Engineers (USCOE) maintains a navigational channel along the length of the waterway, which serves as the base of operations for a variety of water-dependent uses, including bulk and neo-bulk ship operations, container barge operations, dry bulk barge operations, ship building and ship repair, and recreational vessel moorage.

The 14th/16th Avenue South Bridge is near the upper end of the federally maintained channel, approximately 3.8 miles above the mouth of the river via the West Channel. Vessels sailing to the upper reaches of the channel pass through four other bridges before reaching the 14th/16th Avenue South Bridge, including three opening spans (SW Spokane Street, Burlington Northern Railroad, and 1st Avenue South) and one fixed span (West Seattle Freeway).

The following sections summarize the current configuration of the Duwamish Waterway, facilities located upriver and current uses of the channel.

Channel Characteristics

The section of the Duwamish River under study in this report is part of the Seattle Harbor navigation project, which was originally authorized by the River and Harbor Act of March 2, 1919, and modified by subsequent acts dated March 3, 1925, July 3, 1930, and August 30, 1935.

The project authorizes dredging the Duwamish Waterway 200 feet wide and 30 feet deep between the West Waterway (Spokane Street) and 1st Avenue South; 150 feet by 20 feet between 1st and 8th Avenues South; and 150 feet by 15 feet to a point approximately 1.4 miles above the 14th/16th Avenue South Bridge.

The authorization also provides for a turning basin 500 feet by 250 feet and 15 feet deep, and a settling basin with a capacity of about 100,000 cubic yards at the upper end of the waterway.

The project was completed in 1931, except for the settling basin and the turning basin south of the 1st Avenue Bridge, which were deauthorized in 1986.

While the following table shows the channel having a depth of less than 15 feet in the 14th Ave Bridge Reach at the time of the survey, the channel is maintained regularly by the Corps of Engineers at the project depth of 15 feet.

Table 1

<i>Seattle Harbor Project Dimensions and Controlling Depths - Duwamish Waterway</i>						
<i>Name of Channel</i>	<i>Left Outside Quarter</i>	<i>Middle Half of Channel</i>	<i>Right Outside Quarter</i>	<i>Width (feet)</i>	<i>Length (naut miles)</i>	<i>Depth (feet)</i>
Harbor Island Reach	26.7	29.1	18.3	200	0.5	30
Georgetown Reach	27.3	27.5	25.7	200	1.7	30
1st Ave/8th Ave Reach	18.1	18.2	13.3	150	0.7	20
South Park Reach	11.0	16.3	9.6	150	0.5	15
14th Ave Bridge Reach	12.0	12.3	10.7	150	0.85	15

Controlling depths from seaward in feet at Mean Lower Low Water
Source: USCOE Port Series No. 36

Currently one of the vertical height restrictions on the river is imposed by the West Seattle Freeway bridge, which has a vertical clearance of 140 feet at Mean High Water (MHW). However, TV and electrical power cables just upstream of the 14th/16th Avenue South Bridge also constrain vertical heights passing through this reach of the River. This is described in greater detail in the following sections.

Description of Vertical Constraints Impacting the Waterway

Bridges

As listed in the following table five bridges cross the navigation channel of the Duwamish Waterway, between Elliott Bay and the upper end of the navigable waterway. The table lists clearances for all five bridges, including channel width, bridge type, and clearance height at high water. Clearances are listed at mean high water (MHW) because the waterway is subject to tidal fluctuations.

In addition to these existing bridges, construction is scheduled to begin shortly on a second bascule bridge adjacent to and aligned with the existing 1st Avenue South Bridge. The design of this new span is such that the dimensions of the Duwamish River Navigation Channel will not be affected.

<i>Seattle Harbor Project Dimensions</i>					
<i>List of Bridges</i>					
<i>Duwamish Waterway</i>					
Miles above mouth	Location and Name	Type	Horizontal Clearance (feet)	Vertical Clearance (feet HW)	Remarks
0.2	West Seattle Freeway	Fixed	150	140	
0.3	SW Spokane Street (West Seattle low level)	Swing	240	55	
0.4	Burlington Northern Railroad	Bascule	150	7	
2.5	1st Avenue, South	Bascule	150	24	120 feet between open leaves
3.8	14th Avenue, South	Bascule	125	21	41 feet at center of span
Controlling depths from seaward in feet at mean lower low water					
Source: USCOE Port Series No. 36					

Cables

In addition to the bridges listed above, there is also a powerline crossing the Duwamish just south of the 14th/16th Avenue South Bridge at 17th Avenue South and South Dallas Street. According to NOAA charts, this line has an authorized clearance of 90 feet high at MHW.

According to the Seattle City Light personnel (Mr. Tom Teevin) the midconductor of the powerline crossing the Duwamish River at 17th S and S Dallas is a main distribution line for The Boeing Company and has an authorized clearance of 90 feet above MHW. With the above clearance requirement, vessel height is restricted to 90 feet above MHW. This is the controlling height restriction which impacts all users upriver of the 14th/16th Avenue South Bridge, south of South Park Marina. This limitation impacts Delta Marine Industries, Inc and the Duwamish Yacht Club and other waterway users at the upper end of the waterway.

A 20-foot safety allowance is mandated by the Code of Federal Regulations (CFR Chapter 11 (7-1-93 Edition, page 430):

"The following minimum clearances are required for aerial power transmission lines crossing navigable waters of the United States. These clearances are related to the clearances over the navigable channel provided by existing fixed bridges, or the clearances which would be required by the U.S. Coast Guard for new bridges, in the vicinity of the proposed power line crossing. The clearances are based on the low point of the line under conditions which produce the greatest sag taking into consideration temperature, load, wind, length or span and type of supports as outlined in the National Electrical Safety Code (see Table 3)."

Table 3

<i>Clearance Requirements for Transmission Lines across Navigable Waterways</i>	
Nominal system Voltage (kV)	Minimum additional clearance (in feet) above clearance required for bridges
115 and below	20
138	22
161	24
230	26
350	30
500	35
700	42
750-765	45

Source: United States Code of Federal Regulations

There is also a TV cable located at this crossing. The 90 foot vertical height constraint (above MHW) is the controlling factor limiting navigation upriver of this point.

This crossing is located at the approximate midpoint of Boeing Field and as a result, is governed by the height restriction zone of Boeing Field. A formal request to ascertain height restriction impacts has been submitted by Sverdrup personnel.

Modifying the height of the crossing to allow transit by larger vessels is problematic for a number of reasons. First, the Boeing Company needs an uninterrupted supply of power which eliminates the option of temporarily removing the line. Second, City Light has an easement for this crossing and efforts to relocate the crossing would be extremely expensive. Third, the proximity of the crossing to Boeing Field places a restriction on the height of the towers. In short, allowing temporary or permanent access to vessels with a height above 90 feet will be very expensive if not impossible.

Tidal Influence

The proximity of the lower Duwamish River to an arm of the Pacific Ocean (Elliott Bay) causes the river level to vary with the tide more than eight feet at the upper end of the channel. The following table documents the range of tides both in Elliott Bay (at the foot of Madison Street) and in the Duwamish River at 8th Avenue South, approximately 0.5 miles downstream from the 14th/16th Avenue South Bridge (the nearest measurement point to the bridge).

As shown in the table above, the level of the river in the Duwamish Waterway varies 7.5 feet between Mean Low Water (MLW) and Mean

High Water (MHW) 11.1 feet between MHW and MLLW and as much as 15.9 feet between Mean Higher High Water (MHHW) and Extreme Low Water. At MLW, the vertical bridge clearances increase by 7.5 feet giving the fixed West Seattle Freeway span a clearance of 147.5 feet and the 14th/16th Avenue South Bridge a clearance of 48.5 feet at the center of the span.

Table 4

<i>Tides in Elliott Bay and the Duwamish River (sounding in feet at Mean Lower Low Water)</i>				
Location	MHHW	MHW	MLW	Extreme Low
Elliott Bay	11.4	10.5	2.8	-4.5
Duwamish Waterway	11.1	10.3	2.8	-
Source: NOAA Chart 18450				

With an air draft clearance allowance of 2.5 feet, the existing 14th/16th Avenue South Bridge has a usable clearance of 46 feet in the closed position.

ADD 5'
for low tide
clearance

Replacement of the bridge by a fixed-span bridge 55 to 60 feet above MHW would yield a usable vertical clearance of approximately 60 to 65 feet at MLW.

Using the tides to maximize passage is suitable for virtually all current users of the waterway. This procedure is used at numerous other fixed bridge spans throughout the United States. Discussions with U.S. Army Corps of Engineers (headquarters division in Washington) and State Transportation officials in the southeast United States illustrates that several movable-span bridges are being replaced with fixed span bridges. These fixed-span bridges are sized to allow transit by vessels with a height up to 65 feet. This trend is discussed in greater detail in the following chapter.

Facilities Located Above the 14th/16th Avenue South Bridge

The following section briefly describes the waterfront facilities that are located upriver of the 14th/16th Street bridge. Chapter 4 provides greater details on potential facility impacts due to height restrictions from the fixed spans.

Figure 1

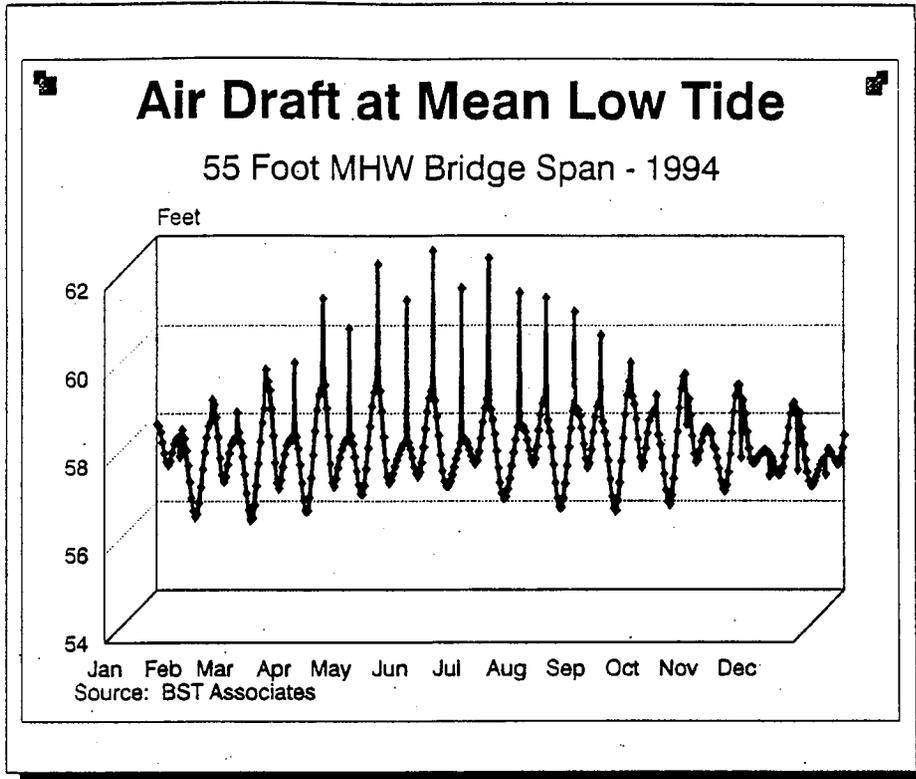
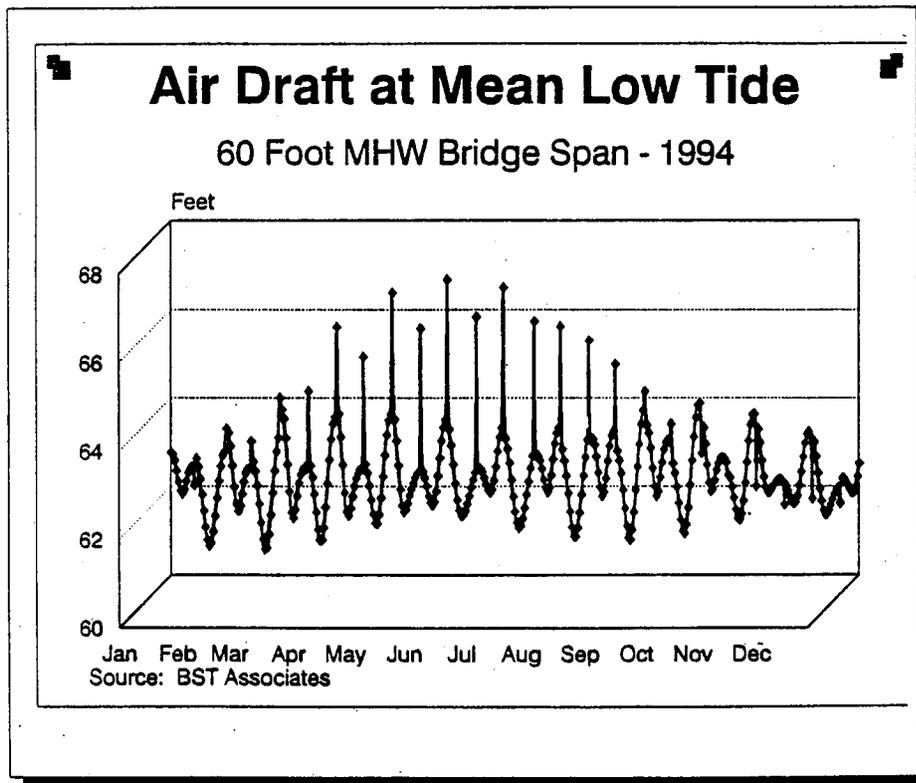


Figure 2



The Corps of Engineers Port Series No. 36 lists two dock facilities upriver from the 14th/16th Avenue South Bridge: the Boeing Company Wharf, and Delta Marine Industries Wharf. (See map on page 4).

The Boeing Company Wharf

The Boeing Company owns or controls most of the land on the east side of the Duwamish River between the 14th/16th Avenue South Bridge and the end of the navigation channel (with the exception of the idled Monsanto Chemical facility and a Kenworth truck facility). The Boeing Company Wharf consists of a series of six concrete-decked loading platforms, 30 feet by 30 feet each and 16 feet high, with a depth alongside of 18 feet. The Boeing Defense and Space Group controls the wharf, but the facility is currently not in use and is fenced off. Prior to purchase of this facility by Boeing in 1985 this property was used by SeaFreeze, a cold storage firm which received fish from fishing vessels.

Boeing has used heavy-lift marine equipment in the distant past to assist with placement of air conditioning equipment and other equipment on company buildings. However, a Boeing spokesman indicated that the change from a manufacturing to a mockup/testing plant would minimize the need for heavy lift operations.

Further discussions with Boeing officials indicated that the proposed bridge height would not constrain any existing or potential company plans for use of the waterway. Previous use of Manson heavy lift equipment to place HVAC equipment on Boeing buildings occurred long ago and is unlikely to occur again.³

Monsanto Wharf

In February of 1991, Rhone Poulenc purchased the Monsanto Wharf which is also located in Slip 6. When active, this facility received lignin and caustic soda by barge from pulp/paper and chemical plants respectively. Barge activity averaged 2 barges per week during this period, according to a company spokesman.⁴

Since its acquisition by Rhone Poulenc the facility has been idle because the company shifted the manufacture of vanillin to the S.E. United States. Rhone Poulenc no longer needs the wharf and has attempted to lease or sell the facility. Efforts to date to lease or sell the wharf have been unsuccessful because of the facility's distance upriver and concerns about the environmental status of sediments adjacent to the wharf.⁵

³Telephone Conversations with Jeff Zahir, Manager, Corporate Planning, The Boeing Company, date : July 19, 1994

⁴Telephone conversation with Buzz Rahier, Rhone Poulenc, date July 19, 1994

⁵Telephone conversation with Rick Osterhout, CB-Commercial, date July 19, 1994

The Delta Marine Industries Wharf

The Delta Marine Industries Wharf is located on the west side of the Duwamish River across from the Boeing Company Wharf. The facility consists of a row of permanently-moored 8-foot wide floats used for outfitting and repairing vessels. A shop at the back of the property is used for manufacturing fiberglass fishing and recreational boats. The wharf includes a 125-ton electric-hydraulic stiff-leg derrick with a 105-foot boom mounted on a bull-wheel. This derrick can lift Purse Seiners and other craft that weigh approximately 100 tons or less.

DMI builds and repairs motor yachts and fishing vessels. Vertical clearance allowing transit by vessels built and/or repaired at DMI could be impacted using a lower level span (i.e., 55 feet to 60 feet) according to DMI's response to the Coast Guard public notice. This potential impact is reviewed in greater detail in the next chapter.

In addition, DMI launches and retrieves larger vessels using floating derricks. Manson provides this service with company owned floating derricks (i.e., such as the Haakan, Manson 24 and other derricks) which can require up to 100 feet of clearance. These potential impacts are also discussed in greater detail below.

South Park Marina and Duwamish Yacht Club

In addition to these facilities, there are two recreational marinas (South Park Marina and Duwamish Yacht Club) and a barge mooring area.

The Waterways User Study undertaken by Sverdrup Corporation indicated that South Park Marina and the Duwamish Yacht Club could be impacted by height restrictions depending on the height of the fixed span. According to this study, "the maximum boat height (in the South Park Marina) is approximately 60 feet and only two or three boats are greater than 50 feet in height. The tenants displaced by a height restriction could be replaced without hardship. Therefore the impacts to the South Park Marina would be negligible although the proposed 55 feet height would limit the time when taller boats could pass beneath the bridge to lower tides" (Page 44).

Duwamish Yacht Club was reported in the same study to have 42 uncovered slips whose owners' vessels would all be impacted at 55 feet and 13 of which would be impacted at 60 feet. This potential impact associated with height restrictions to sailboats appears to be overstated based upon a more detailed review of vessel characteristics and discussions with the sailboat representative of the Yacht Club.

South Park Marina

The South Park Marina is located immediately upstream of the 14th/16th Avenue South Bridge on the west bank and has moorage space for 150

boats. The fixed spans would have minimal impact on the marina according to the owner.⁶

Moorage charges are \$5.25 per foot per month at this marina. The marina is full and has a waiting list. The tenants tend to be people who work in the area (e.g. especially at Boeing) rather than local residents, so one advantage of the location is its proximity to places of employment. Another advantage of mooring upriver is the freshwater environment, which is much less corrosive on boats than saltwater. Also, despite the fact that the marina is approximately five miles from open water the trip only takes 45 minutes at the posted speed limit of 7 knots. This compares very favorably with moorage in Lake Union, which is also freshwater but is more expensive, and requires a trip through the government locks to reach saltwater.

Duwamish Yacht Club

The Duwamish Yacht Club is located farther upstream adjacent to Delta Marine Industries.

The Yacht Club has 106 slips of which 64 are covered and 42 uncovered. According to a tenant of the facility (who represents the sailboat owners in the facility), there are currently 9 sailboats in the yacht club, with an average mast height of 57 feet from the water line. According to the sailboat representative of the Yacht Club, there would be minimal impact if the span was 60 feet above MHW.⁷

Impacts to recreational vessels are discussed in greater detail below.

Kenco Marine facility

In addition to the above mentioned facilities, barges and vessels are also moored to pilings at the Kenco Marine facility which is on the western bank of the turning basin, at the upper end of the navigation project. This area is upstream from all other water-oriented activities on the Duwamish Waterway. A company owner indicated that the proposed fixed spans would have limited impact on company operations.⁸

Beyond this point upstream the river is blocked to navigation by a number of low-level fixed bridges which precludes passage by all but the smallest vessels.

⁶Interview with Guy Crow, owner and operator of South Park Marina.

⁷Telephone conversation with Brian Guptil, date July 19, 1994.

⁸Telephone conversation with Tom Kent, July 18, 1994

Summary Conclusions

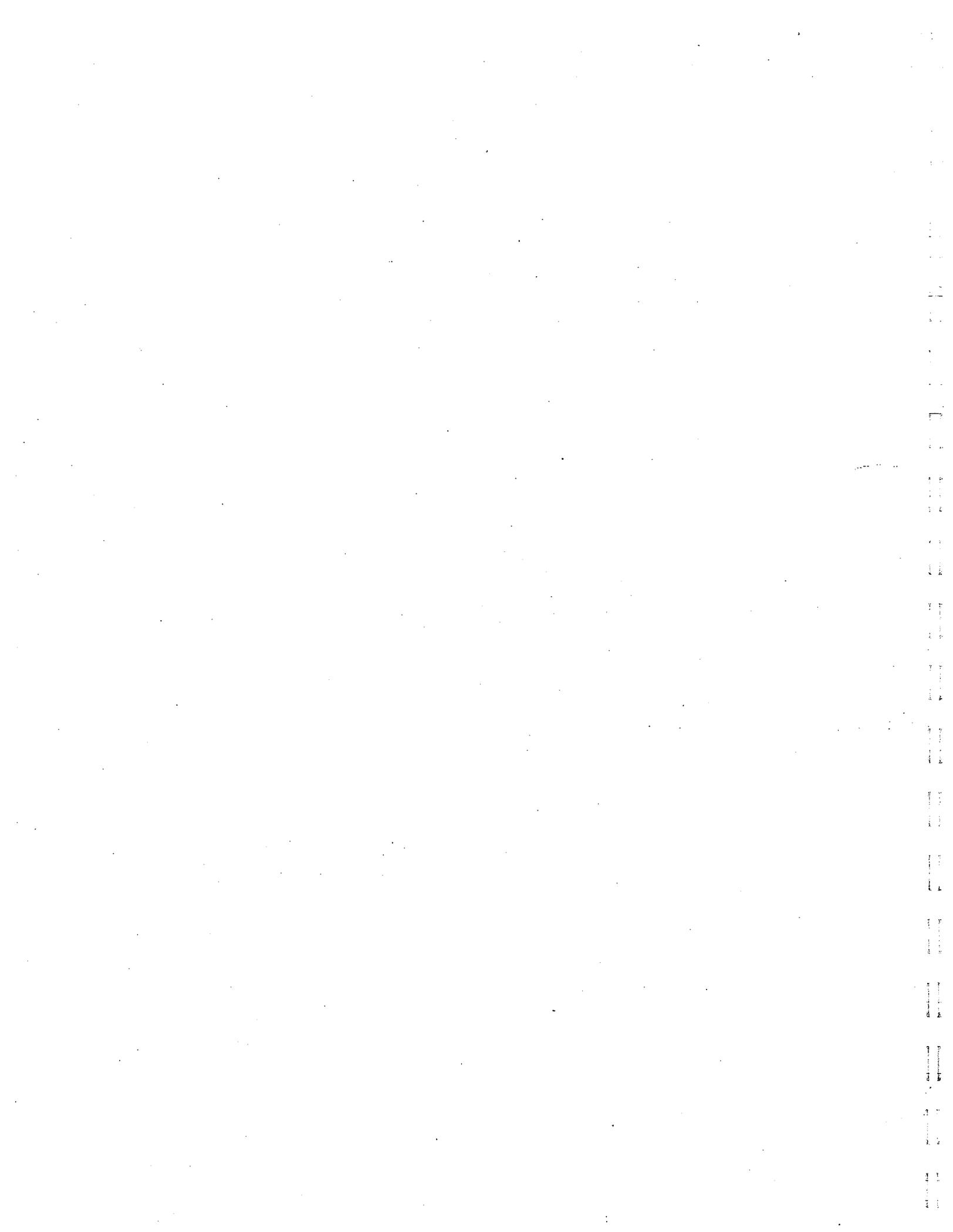
A 55-foot-high or 60-foot-high fixed-span bridge (above MHW) would limit navigation for vessels to a height of 60 to 65 feet above the water line with the use of tides. This restriction would impact the Manson derricks which currently provide lifting service to Delta Marine Industries (DMI). The 55 foot high fixed span would also impact a few resident sailboats but the 60 foot high span would eliminate the impact to sailboats.

Further discussion with Delta Marine Industries indicated that a bridge 62 to 63 feet above mean high water would be acceptable to DMI.

Vertical height restrictions of 90 feet (above MHW) are imposed by the distribution power lines serving Boeing which are located one block south of the 14th/16th Avenue Bridge. This height restriction essentially eliminates the potential for very large power sailers (i.e., with masts greater than 90 feet) to use the waterway upriver of the bridge.

**Chapter
Three:**

**Vessel Traffic
Trends**



CHAPTER THREE

VESSEL TRAFFIC TRENDS

Overview of Vessel Traffic

Vessel traffic passing through the 14th/16th Avenue Bridge Reach of the Duwamish Waterway falls primarily into the following categories:

- tugs moving alone or with barges/derricks,
- barges/derricks
- fishing vessels
- recreational vessels with moorage at South Park Marina or the Duwamish Yacht Club, and
- motor yachts moving to and from Delta Marine Industries,

No ocean freighters use this stretch of the waterway due to the limited dimensions of the channel. In addition, there are no existing active cargo facilities located in this reach of the Duwamish River.

As can be seen in Table 5 and Figures 2 and 3, vessel traffic requiring an opening of the 14th/16th Avenue South Street bridge has declined markedly from 1989 and 1990 to the present. In 1989 and 1990, there were 1,726 and 1,704 openings, respectively. In 1991 and 1992, openings decreased to 1,228 and 1,228. In 1993, openings fell further to 877 occurrences.

All vessel traffic categories experienced a decrease in activity but the greatest decline was in tugs (and their tows). This category fell from a high of 805 transits in 1990 to just 114 in 1993 due to two primary factors. First, the closing of the Monsanto plant in 1991 reduced the number of tug/barges in the area by approximately 200 operations per year. Second, the Duwamish was dredged in 1990 requiring several hundred tug and barge operations.

In addition to the decline in tug/barge traffic, sailboats declined from a high of 802 operations in 1989 to 567 in 1993 (primarily due to the poor weather in 1993) and fishing vessels declined from a high of 195 operations in 1991 to 114 in 1993 (the reason for this decrease is unknown).

The following section of this report discusses each of these types of vessels that currently use or could use the stretch of the Duwamish Waterway above the 14th/16th Avenue South Bridge in detail.

Figure 3

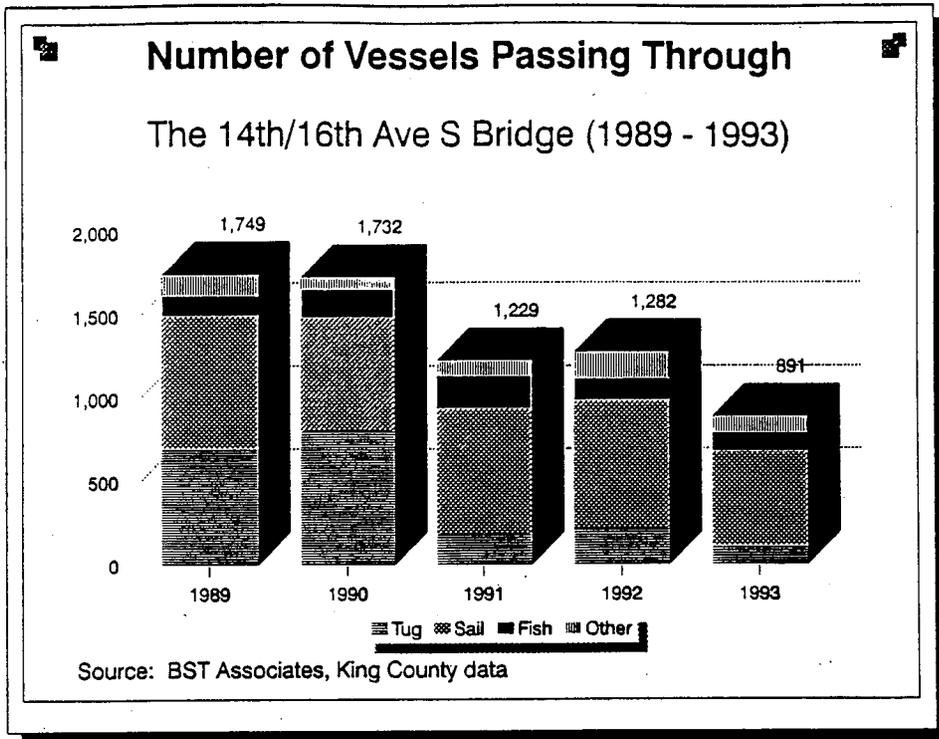


Figure 4

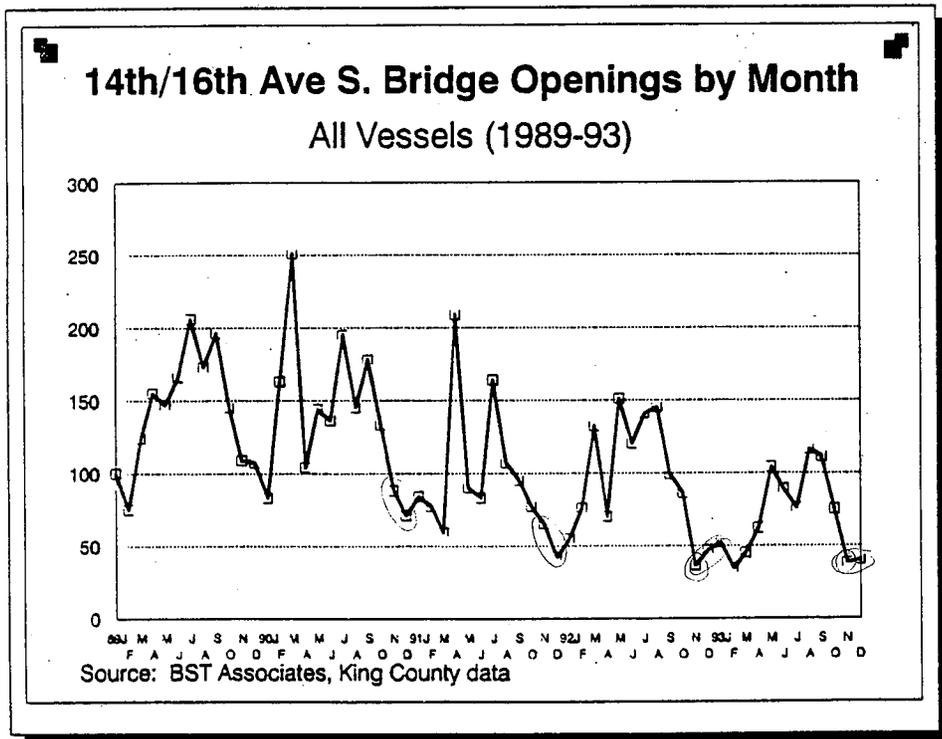


Table 5

<i>Vessels requiring a Bridge Opening by Type and Year</i>					
TYPE	1989	1990	1991	1992	1993
TUG	704	805	183	214	114
SAIL	802	687	759	777	567
FISH	120	168	195	131	114
OTHER					
M/V	70	25	12	33	46
PASSENGER	0	0	0	1	0
PILOT	0	1	0	0	0
FIRE	4	2	2	2	0
SUB-TOTAL	74	28	14	36	46
NOT SPECIFIED	10	13	13	9	16
SUB-TOTAL	10	13	13	9	16
BRIDGE TEST	16	3	64	61	20
SUB-TOTAL	16	3	64	61	20
TOTAL	1,726	1,704	1,228	1,228	877
Percent by Vessel Type	1989	1990	1991	1992	1993
TUG	40.8%	47.2%	14.9%	17.4%	13.0%
SAIL	46.5%	40.3%	61.8%	63.3%	64.7%
FISH	7.0%	9.9%	15.9%	10.7%	13.0%
OTHER	0.0%	0.0%	0.0%	0.0%	0.0%
M/V	4.1%	1.5%	1.0%	2.7%	5.2%
PASSENGER	0.0%	0.0%	0.0%	0.1%	0.0%
PILOT	0.0%	0.1%	0.0%	0.0%	0.0%
FIRE	0.2%	0.1%	0.2%	0.2%	0.0%
SUB-TOTAL	4.3%	1.6%	1.1%	2.9%	5.2%
NOT SPECIFIED	0.6%	0.8%	1.1%	0.7%	1.8%
BRIDGE TEST	0.9%	0.2%	5.2%	5.0%	2.3%
Source: BST Associates using King County Bridge Tender logs					

Tugs

Because there are no existing cargo facilities on the upper stretch of the Duwamish channel tugboats pass through the 14th/16th Avenue South bridge for a limited number of reasons:

- moving dredging equipment,
- delivering lifting equipment to DMI, and
- taking barges upriver for storage.

Figure 5

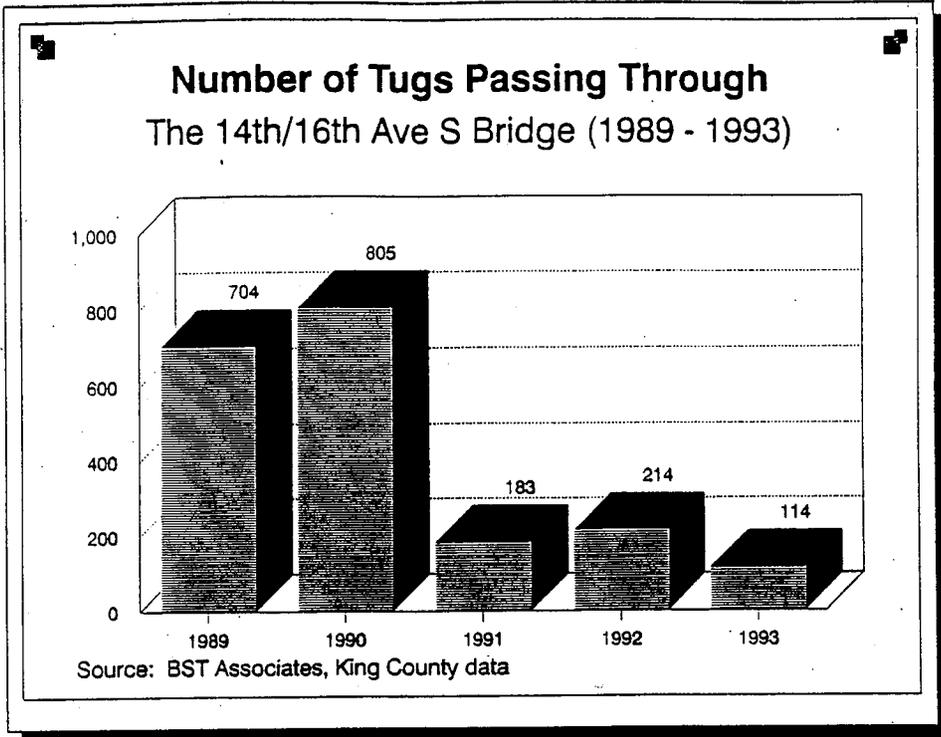
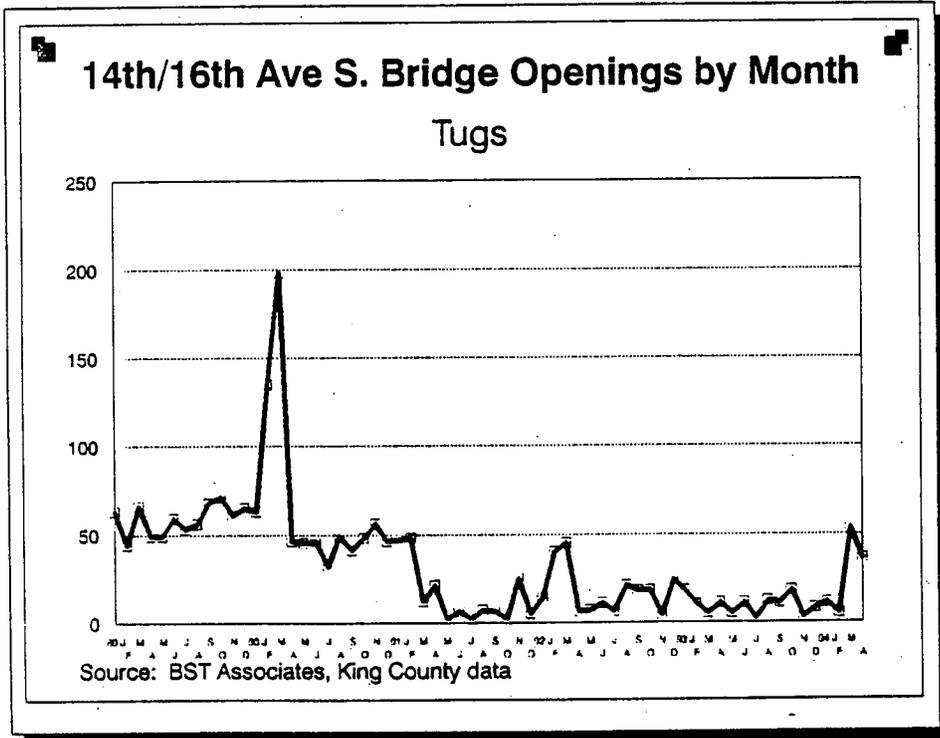


Figure 6



With very few exceptions, tugboats would not encounter a problem with vertical clearance with a 55-foot or 60-foot high bridge span (above MHW). Few of the tugboats that operate in the region have a highest fixed point of more than 55 feet, and many of the taller tugs tend to have collapsible masts which allow a reduced highest point (up to 20 feet reduction in height). In addition, this stretch of the River is difficult to serve with larger tugs and thus is generally served by smaller harbor tugs.

Table 7, which is located at the end of the chapter, presents the dimensions and operator of all of the tugboats for which the 14th/16th Avenue South bridge opened between January of 1989 and May of 1994. A total of 64 different tugboats have required the bridge to open over the last 5 + years. Of these 64 tugs, 59 have highest fixed points of less than 55 feet, while only four have highest fixed points higher than 55 feet. The Iver Foss, which accounted for 96 of the 134 transits by higher profile tugs, has a collapsible mast, providing a vertical profile approximately 45 feet in height.

The remaining 38 trips by height constrained tugs accounted for 1.9% of the tug calls in this section of the River. Discussions with tug operators revealed that these impacted transits are not the norm and that any activity in this reach of the River can be completed using other equipment.

Foss dispatchers indicated that the Barbara and Phillip Foss, which do not have collapsible masts, would not normally transit this reach of the River. Transits by these larger tugs only represented 2.7% of Foss's total bridge passages during the study period. Tug service could be provided to this reach of the River by other tugs that would not have a height constraint if a new bridge were constructed.⁹

The Crowley dispatch office, contacted as a part of the study, said that they do not now serve this reach of the River but would not anticipate any difficulties with the fixed bridge spans if service were initiated.

Barges are discussed in the following section.

Cargo Barges

The bridge tender's logs do not generally report the name of the barge (or derrick) being towed by the tugboat. In order to evaluate the potential impact on barges, BST Associates undertook a detailed assessment of U.S.-flag barge equipment operating in the States of Washington and Alaska.

⁹ Telephone conversation with Foss Dispatch office, date July 17, 1994

In Washington and Alaska, there are a total of 509 U.S.-owned barges, including 382 dry cargo barges and 127 liquid cargo barges. All of these vessels have a light (unloaded) draft of less than 15 feet, and would therefore not be limited by water depth from using the upper reach of the Duwamish when empty.

Of the entire inventory of dry cargo barges, 361 barges have a height less than 55 feet (94.5%), 3 have a height between 55 and 59 feet, 7 have a height between 60 and 64 feet and only 2 have heights above 65 feet. The height of 11 of the remaining barges is unknown but is assumed to be in the above ranges.

Of the entire inventory of liquid cargo barges, 124 barges have a height less than 55 feet (97.6%), 1 has a height between 60 and 64 feet and none have heights above 65 feet.

As discussed above, with a fixed span at 55 feet above MHW, the controlling height is approximately 60 feet at MLW. Extreme tides could be used but this practice would be limited by the draft (loaded) of the barge. The 55-foot-high bridge could accommodate 95.3% of the dry cargo and 97.6% of the liquid barge inventory. With a fixed span of 60 feet MHW, the controlling height is 65 feet which would accommodate 97.1% of dry cargo and 100% of the liquid cargo barge inventory.

Further evaluation of the higher barges reveals that it would be extremely unlikely that they would transit this reach of the River due to their draft and beam restrictions. As a result, none of the US-flag cargo barges operating in the PNW that could conceivably utilize the River would be impacted by a fixed span of 55 to 60 feet above MHW. Therefore, even though there are no existing cargo operations in this reach of the River, cargo operations would be possible using most of the barges in the US-flag fleet that operate in the PNW.

However, this evaluation of barges is based upon the highest structural profile, which does not include a crane on board. An evaluation of cargo barges is presented below.

Table 6

<i>Number of U.S.-Owned Barges Active in the PNW by Type and Clearance</i>			
Type	Clearance	Number of Barges	Percent
Dry Cargo	Air Draft < 55'	361	94.5%
	Air Draft 55' to 59'	3	0.8%
	Air Draft 60' to 64'	7	1.8%
	Air Draft 65' +	2	0.5%
	Not Specified	9	2.4%
	Total	382	
Liquid Cargo	Air Draft < 55'	124	97.6%
	Air Draft 55' to 59'	0	0.0%
	Air Draft 60' to 64'	1	0.8%
	Air Draft 65' +	0	0.0%
	Not Specified	2	1.6%
	Total	127	

Source: BST Associates, USCOE data

Container Freight Barge Operations

The Duwamish Waterway has always been a major site for small freighter and barge operations. However, all of this activity is focussed downstream of the 14th/16th Avenue South Bridge. As discussed above, smaller freighters generally would not be able to access the upper reaches of the Duwamish due to beam and water depth restrictions. However, if the above mentioned constraints did not prohibit them, vertical height restrictions imposed by the fixed spans under consideration would not preclude their access. Most smaller freighters have a height profile of less than 60 feet.

Most of the barge traffic in the Duwamish serves the Southeast (SE) or Western Alaskan markets. The barge industry serving Alaska can be differentiated into two segments for the purposes of this report - those that carry cranes on board and those that do not carry cranes on board.

First, there are high volume scheduled barge operators such as Alaska Marine Lines (AML) which dominates the SE Alaska market. AML serves major ports such as Juneau, Ketchikan, Sitka, Skagway, among others, which are large enough to support acquisition of a crane. As a consequence, AML does not need to carry a crane on board their barges. These barges are typically loaded four or five containers high and could pass under either fixed span bridge under consideration. [In addition, there is no need for a crane in the Hawaii and Canadian coastal barge markets.]

Second, there are barges that serve the more remote cities and towns of Western Alaska or that provide service as charter operators. These barge firms which include Northland and Samson (among others) frequently carry a crane on board because they must load and unload containers in smaller

communities where this equipment is not available. The profile of the crane can be in excess of 100 feet above the water line. These barge operators would be precluded from operating under either fixed span alternative unless they set the crane after passing the bridge.

With this perspective in mind, there are three key market related factors which are impacting the Alaskan market. First, there is significant competition for the Western and SE Alaskan cargo markets from other locations including numerous services with terminals on the Lake Washington Ship Canal and Lake Union. These firms include Alaska Coastal Transport, Western Pioneer, Sunmar, and Alaska Outport Transport. All of these firms serve the smaller Alaskan communities and none of them would be precluded from entering the Upper Duwamish by the fixed spans under consideration if they chose to relocate, which is considered highly unlikely. Second, these markets have become extremely competitive because of the great increase in bottomfish activity in the Bering Sea and to a lesser extent the Gulf of Alaska. As these markets began to increase, Sealand began to call directly at Kodiak and Dutch Harbor and APL continued service through its terminal in Dutch Harbor. This forced a reduction in cargo moving by barge and small coastal freighter from Puget Sound and an increase of feeder service from these smaller communities to Kodiak and Dutch Harbor. However, the bottomfish industry has recently experienced a decline in productivity due to overfishing and the pollock harvest seasons have been sharply curtailed. As a consequence the cargo throughput to these communities has declined precipitously. There is little long-term potential for the fisheries sector to return to its recent historic size. Oil revenues which account for approximately 87% of Alaskan state revenues (and which fund a large percentage of state and local capital improvement projects) are projected by the State of Alaska to be flat or decline slightly through the year 2010. In addition, some communities such as Sitka and Wrangell are facing significant economic downturns as forest products manufacturers shut down operations.

The bottom line of these market factors is that there will be little or no growth in the barge industry serving Alaska and therefore no need for new terminals even if land became available in the upper reach of the Duwamish. It should also be recognized that there are substantial waterfront industrial lands in Bellingham, Anacortes, Everett, Tacoma, Olympia, Port Angeles and Grays Harbor that are actively being marketed to the shipping community. The potential for barge service requiring a crane on board in the Upper Duwamish area is considered extremely remote.

The following section evaluates the marine construction industry.

Construction Barges

The same database used for cargo barges also reveals the characteristics of some (but not all) of the tug and barge equipment used by the construction companies (see the following table). None of listed equipment would have a constraint transiting either of the fixed spans. However, some of the lifting equipment is not available from this database.

Many of the largest lifting derricks of the Manson Company have a reported maximum height of 90 to 95 feet. This height includes the spuds on the barge in a vertical position.

Manson is one of a handful of company's on the West Coast of the U.S. that provide large general purpose equipment serving pile driving, heavy lift, dredging, and other waterfront construction services. The other PNW company in this segment of the market is General Construction. Manson's equipment is sized to meet the typical needs of all harbors that it serves. The spuds (that are the highest controlling point of the equipment) are sized to serve a port facility with water depth of 55 feet plus 15 foot tidal variation plus 15 feet of access above the water line to the top of the barge and 5 feet of penetration into the sediment. This requires spuds being approximately 90 to 95 feet in height which is the stated height of the company's largest equipment. According to Manson officials, spuds are usually 6 to 8 feet into the water during transit so adjusted height requirement with spuds is 82 to 87 feet (not including a clearance allowance factor).

When taken out, the fixed height of the A-frame (which is not adjustable) is approximately 70 to 80 feet, which would not be capable of transiting either of the fixed spans under consideration. Manson derricks generally draw 8 to 10 feet of water so it would be possible to take advantage of lower tides which would reduce the profile to 65 to 70 feet.

A height restriction of 55 to 60 feet above MHW would preclude use of the waterway by Manson's larger equipment. Manson's usage characteristics can be documented by studying the movement of the 4 company tugs (i.e. Gladys M, Jeffery M, Harry M and Kimberly). From 1989 through May of 1994, Manson barges/derricks passed through the 14th/16th Avenue South Bridge approximately 22 round trips or approximately 4 times per year. Frequently, two tugs pass through the bridge with a barge or derrick, leave the derrick upriver, pass through the bridge without a tow and then return to pickup the barge. In total Manson tugs passed through the Bridge 85 times during this time frame. Manson's use of this reach of the River includes dredging and occasional picks for DMI and less frequent picks for other waterfront users.

Manson firmly believes that in order to maintain the industrial character of the River, access by all vessels up to 100 feet in height is required. This

would accommodate all Manson equipment with the spuds up. Manson officials also believe that future waterfront development will necessitate additional heavy picks which will require their type of equipment.

These issues and potential solutions to provide access for dredging equipment and for heavy lift equipment is discussed in greater detail in the final chapter.

Table 7

<i>Vertical Height Characteristics of Selected Manson Heavy Lift Derricks</i>		
<i>Name</i>	<i>Operator</i>	<i>Reported Highest Fixed Point</i>
Haakon	Manson	90'
Manson 24	Manson	95'
Derrick 6	Manson	90'
Derrick 8	Manson	90'
Valkyrie	Manson	95'
Scandia	Manson	95'
Viking	Manson	90'
Norseman	Manson	90'
Vasa	Manson	93'
Hagar	Manson	90'
Derrick 3	Manson	90'

Source: BST Associates, Manson Company brochures

Fishing Vessels

Fishing vessels vary in size, length and height depending on the type of gear installed and the type of vessels. However, few large vessels (over 60 feet in length) have transited the upper reaches of the Duwamish for ten years or more. In the early 1980s, when SeaFreeze operated a cold storage facility in Slip 6, larger vessels did transit this reach of the River. As indicated above, after Boeing acquired SeaFreeze, the cold storage facility was closed and there is now no reason for large fishing vessels to come upriver past the 14th/16th Avenue South Bridge.

The fishing vessel traffic that remains on this reach of the River consists almost exclusively of purse seiners which were constructed at DMI returning for maintenance. DMI has constructed several hundred fiberglass purse seiners which have remained in the area, being primarily engaged in the Alaska salmon industry.

These vessels are currently limited to 58 feet in length. According to Marco Shipyards, the average height of these vessels is approximately 59 feet (including antenna) which could pass at MLW under either fixed span alternative using the tides. As discussed above, the 55-foot high (MHW) span allows transit by vessels up to 60 feet in height at MLW including allowance for 2.5 feet air draft clearance. In addition, the highest parts of the vessel are usually antennas and other peripheral gear, and on some vessels, the top ten feet consists of a flexible whip antenna. Since these vessels return infrequently (i.e., approximately once per year), working the tides would not present a problem.

Figure 7

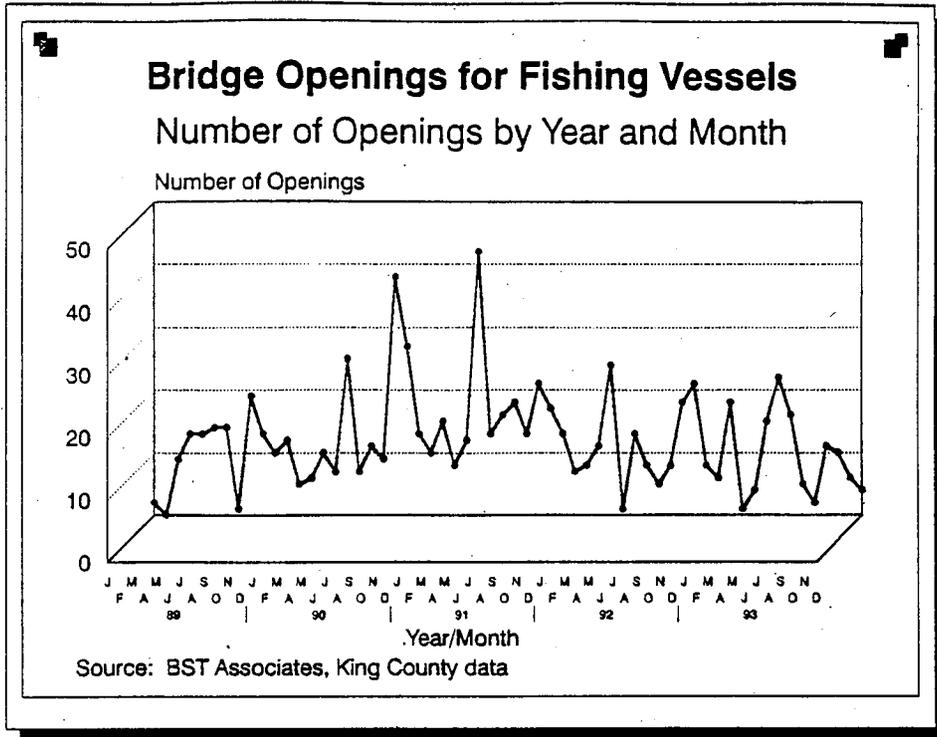
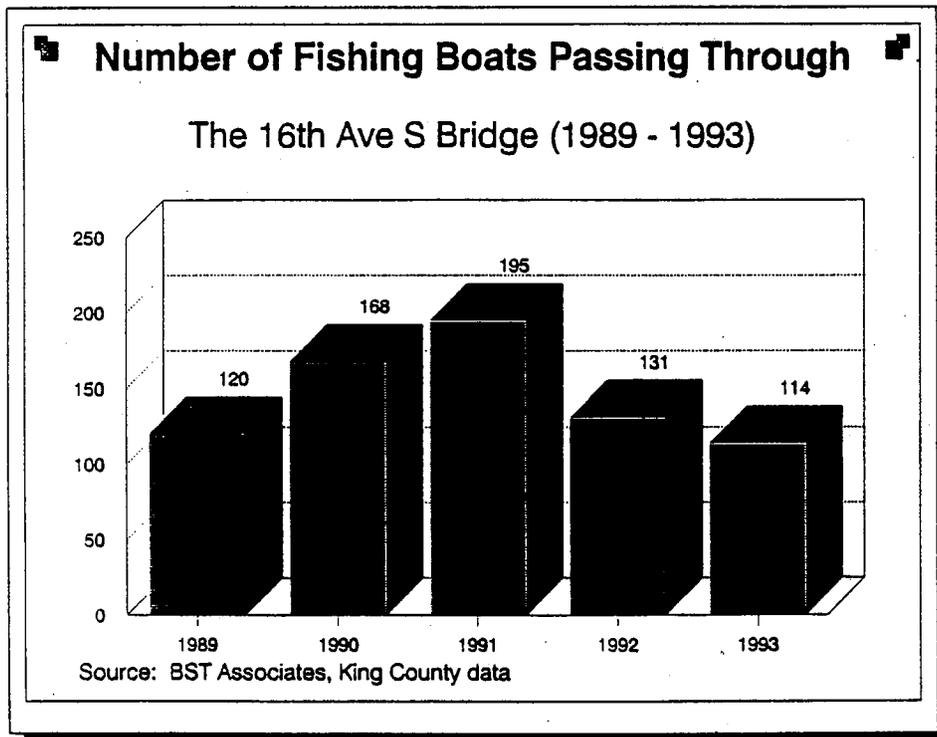


Figure 8



Recreational Vessels - Resident Sailboats

Sailboat Vessel Characteristics

In order to understand the use of this reach of the River by sailboats, it is instructive to evaluate the characteristics of the entire King County sailboat population. There are 3,312 sailboats in King County, according to registered and documented vessel reports. Only 206 vessels (6.2% of the total) are longer than 45 feet. These vessels could have a height restriction if a fixed span were constructed. This impact is discussed below.

Table 8 also shows that there are nearly 25,000 power boats in King County, none of which would experience a difficulty crossing the proposed fixed spans. There are 1,085 power boats greater than 45 feet in length or more than 5 power boats for each sailboat in this length range.

During the past five years there have been 3,591 bridge openings at 14th/16th Avenue South Bridge for sailboats. Bridgetenders recorded the name of the sailboat in 2,667 of the openings. These openings were associated with 267 vessels. However, 218 of these vessels had 10 or fewer openings over the five year span.

There are 49 remaining vessels that had more than 10 openings in the five year period. Only 9 boats had 50 or more openings during the five year period, which is 5 or more trips per year on average (assuming 2 openings per trip).

These vessels range in length from 27 feet to 41 feet in length. Sailboats longer than approximately 35 feet could encounter problems with a 55-foot fixed-span bridge at 14th/16th Avenue South. The following table lists the dimensions (e.g. length, beam, and draft) of one of the most popular boats of one manufacturer (Hunter Marine). As shown, the longest vessel with a mast height less than 55 feet is the 33.3 foot model, while the 36.0 foot model would be six feet too tall to pass under the span at MHW. Draft limitations in the channel do not present a problem for any of the sailboats listed in this table.

For a sailboat to have draft problems with the 15-foot channel in the upper Duwamish it would most likely be an ocean racing vessel, which is much longer than those listed here and which are rare in this region.

Mast height data presented below is measured to the top of a clean mast and does not take into account any gear installed at the top of the mast. Typically a VHF antenna and windex are mounted to the top of a sailboats mast, increasing the height by a foot or more. The VHF antenna is the larger of the two items, and is somewhat flexible. The windex is four to six inches high, and is not flexible.

Table 8

**Typical Heights Above Water Line For Sailboats
(all figures in feet)**

Length	Beam	Draft	Mast Height ¹	Height to Length
29.5	10.5	4.0	45.8	1.55
32.0	11.3	4.3	53.0	1.66
33.3	10.9	4.5	53.4	1.60
36.0	12.8	4.8	61.6	1.71
37.5	12.8	4.9	59.0	1.57
40.2	13.4	4.8	62.8	1.56
42.5	14.0	4.9	60.3	1.42

¹ Distance above waterline
Source: BST Associates, Hunter Marine

Figure 9

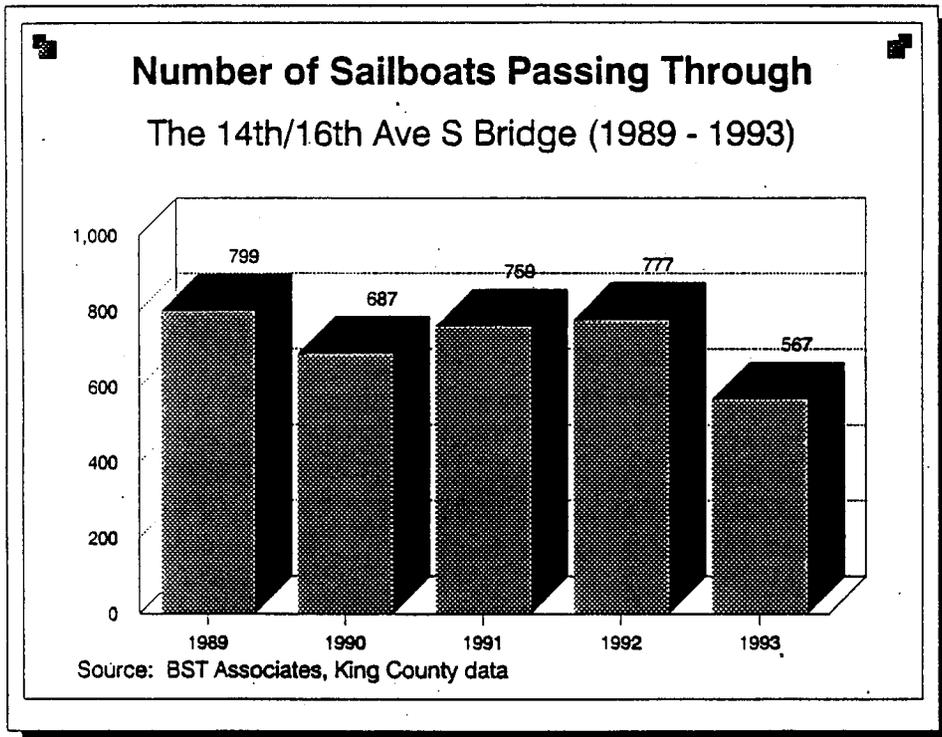


Figure 10

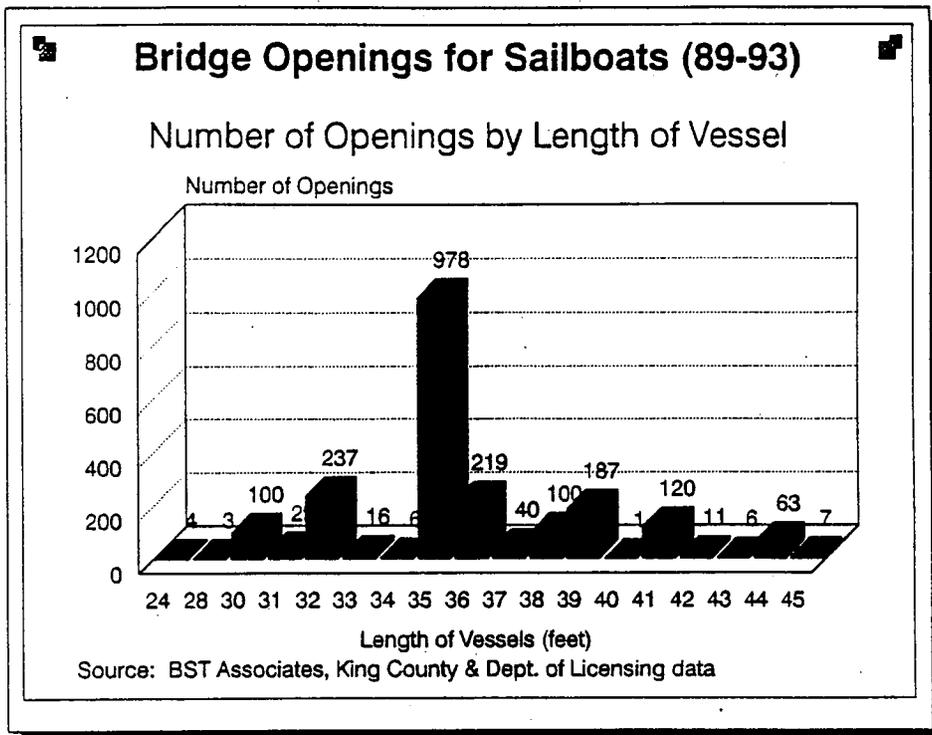
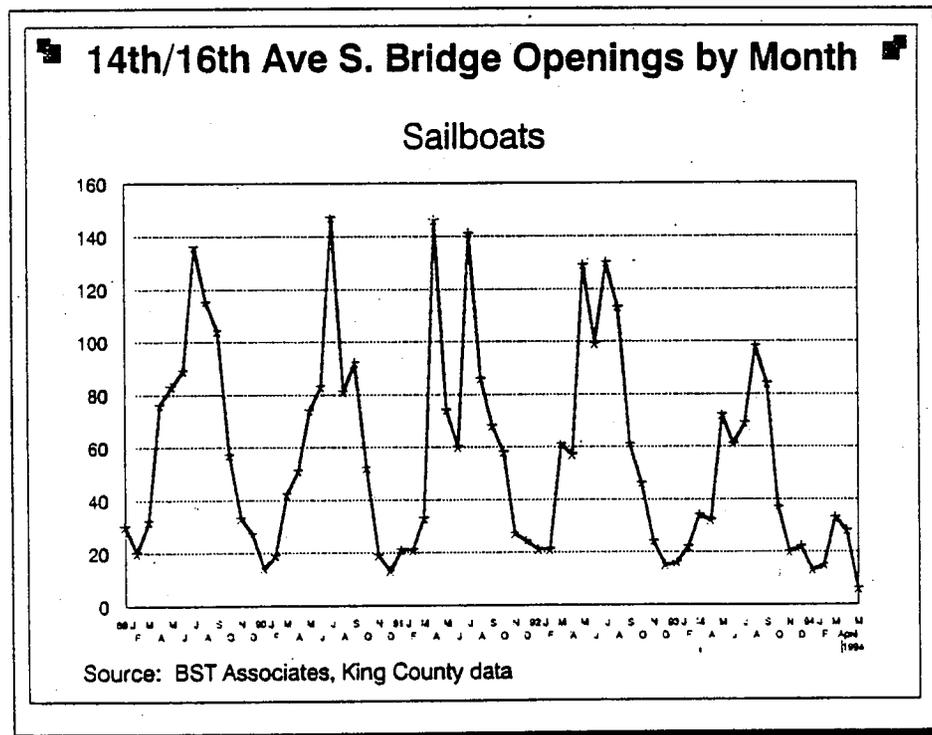


Figure 11



Marinas in Upper Duwamish

As mentioned above, there are two pleasure craft marinas located on the Duwamish River above the 14th/16th Avenue Bridge: South Park Marina and Duwamish Yacht Club.

South Park Marina

At South Park Marina, one of two marinas on the upper Duwamish, the largest vessel is a 58-foot sailboat with 63-foot mast. The remainder of the approximately 150 boats are well under 50 feet in length and would not be constrained by a fixed bridge of 55 or 50 feet, according to the Marina owner.

As discussed above, the owner of South Park Marina (Mr. Guy Crow) has stated that the fixed-span limits under consideration would not impact the marina. The largest sailboat could transit the 60-foot-high bridge at MLW and the loss of a sailboat tenant could be replaced easily with a power boat user.

Duwamish Yacht Club

The Duwamish Yacht Club is predominantly used by power boats. Of the 107 tenants, there are currently only 11 sailboats and 96 power boats. Of the sailboats, 7 would experience a height impact at 55 feet and none would have an impact at 60 feet. However, the nature of the height restriction also depends upon vessel usage characteristics.

Users range from frequent (weekly sailors) to infrequent sailors (few times a year). Using the tides would be acceptable for infrequent sailors but onerous for more frequent sailors at the lower 55-foot height limit. This is due to the limited distribution of tides on a daily (and annual) basis in combination with the present limitations on all bridge openings, which are limited during the peak vehicular times (i.e., 6:30 to 8:00 a.m. in the morning and 3:30 to 5:00 p.m. in the evening). This combination constrains the use of tides for frequent users.

However, discussions with the sailboat representative of Duwamish Yacht Club indicated that a fixed span at 60 feet above MHW would accommodate all existing users.¹⁰

¹⁰ Brian Guptil, tenant and representative of sailboat users

Recreational Vessels - Motor Yachts

As discussed above, Delta Marine Industries historically has been a builder of fishing vessels (e.g. limit seiners), and still engages in the repair of such vessels. However, the fisheries sectors in Alaska and Washington have been seriously and negatively impacted by environmental constraints (i.e., loss of habitat and environmental constraints) and by changes in the marketplace with new international competition from other wild harvested salmon and the dramatic growth of raised salmon. As a result, the construction of fishing vessels has declined precipitously. According to some experts in the business, there are no fishing boats being built anywhere in the region currently, due to the combined forces of fishing restrictions and low prices. For the foreseeable future DMI will not likely construct new fishing boats, although this could change in the longer term future due to international marketing opportunities.

FRP (fiberglass reinforced plastic) is the leading construction material for vessels in the PNW, and is the type of construction used by Delta Marine. FRP accounts for 718 of the 1,141 vessels built in Seattle since 1970. The peak year for vessel construction in Seattle was 1979, the year in which a total of 121 documented vessels were built, including 79 fiberglass vessels. After that year, however, the market dropped precipitously, to a low in 1985 of 18 vessels, then back up to 46 vessels in 1990. The market dropped again in 1992, though, to a new historic low of 14 vessels, seven of which were fiberglass boats.

PNW builders (including DMI) have begun to diversify into the mega-yacht industry. A recent industry listing of mega-yacht builders by Showboats International (September 1994 Issue - see Appendix for a copy) lists 66 manufacturers. Of this total, 12 (18%) are from this region, including the area from the Columbia River to Lower Mainland British Columbia. The list includes :

- Admiral Marine Works (Port Townsend) builds custom composite yachts from 60 to 200 feet in length. Admiral recently built the M/V Evviva, which is 162 feet in length which is presently the largest of any PNW yachts.
- Christen Shipyards (Vancouver, WA) builds fiberglass ocean-going motoryachts from 110 feet to 150 feet long.
- Cooper & Queenship (Albion, BC) builds custom yachts from 70 to 125 feet in length.
- Crescent Beach Boatbuilders (Hamilton, BC) builds fiberglass vessels from 100 to 115 feet in length.
- Delta Marine (Seattle, WA) builds fiberglass motoryachts from 50 feet to 150 feet in length.
- Heisley Marine (Portland, OR) builds fiberglass yachts from 50 to 90 feet in length.

- Nordlund Boat Company (Tacoma, WA) builds high-tech custom motoryachts 60 to 110 feet in length.
- North Coast Yachts (Tacoma, WA) recently completed 111-foot and 131-foot long yachts.
- Puglia Shipbuilding Inc (Tacoma, WA) builds steel hull/aluminum superstructure megayachts, its largest vessel to date is the 150 foot long Samantha Lin.
- Sovereign Yacht (Seattle, WA at 8th Avenue South on the Duwamish - just downstream of the 14th/16th Avenue South Bridge) builds motor and sailing yachts up to 110 feet in length.
- West Bay SonShip (Delta, BC) builds yachts from 52 to 120 feet in length with capacity to build to 160 feet in length.
- Westport Shipyard (Westport, WA) builds fiberglass yachts from 70 to 130 feet in length.

In 1991, there were 206 megayachts on order (defined as vessels in excess of 90 feet in length.) The market fell precipitously in 1992 to 149 orders due to a worldwide recession. In 1993, orders rebounded slightly to 156 orders according the Showboat International Magazine. However, the overall market still lags behind 1991.

The megayacht business includes two distinct segments: motoryachts and power sailors. Power sailors have declined consistently as a percentage of the entire market and now represent less than 25% of the entire market. Motor yachts represent the remaining 77% of the market.

The largest segment of the sailboat market is the range from 100 to 149 feet in length. Only 4 of the vessels on order are greater than 150 feet in length (only 2.4% of the total market). Likewise, motor yachts are also most attractive in the 100- to 149-foot range, with 24 greater than 150 feet in length (15.4% of the total market).

Table 9

<i>Megayachts Market on Order - 1993</i>			
Category	Number	% Group	% Total
Sail			
90-99 ft	7	22.2%	5.1%
100-119 ft	14	38.9%	9.0%
120-149 ft	10	27.8%	6.4%
150 ft +	4	11.1%	2.6%
Total	36	23.1%	23.1%
Power			
90-99 ft	20	16.7%	12.8%
100-119 ft	42	35.0%	26.9%
120-149 ft	33	28.3%	21.8%
150 ft +	24	20.0%	15.4%
Total	120	76.9%	76.9%
Total	156		

Source: Showboats International, January 1994, Pages 109 to 112

The vessels recently constructed by PNW yards fall into the low end to middle end of the market. The Onika and Beth-A-Belle are part of the 110-foot high speed series constructed by Delta Marine. These vessels have a height of approximately 50 feet including the antenna, draw approximately 6 feet of water and weigh approximately 107 tons. As mentioned above, Delta is constructing a 131-footer that will weigh approximately 260 tons, and a 151 foot long vessel that will weight 385 tons. DMI reported that it has built vessels between 105 and 127 feet that weighed 350 to 427 tons.

The Countach (recently built by North Coast yachts) has a length of 111 feet, height of 50 feet including the antenna, draws approximately 7 feet of water and weighs 210 tons.

The Blacksheep, built by Westport Shipyard, has a length of 112 feet, height of 30 feet with antenna, draws 6 feet of water and weighs 90 tons.

The Evviva built by Admiral Marine has a length of 161 feet, height of 55 feet with antenna, draws 8 feet of water and weighs approximately 200 tons.

These vessels are representative of the existing technology regarding length, height and weight. Neither fixed bridge span under consideration would represent an obstacle for these types of yachts.

As discussed above, large sailboats are a much smaller part of the megayacht business. The only large power sailer that has been built in the PNW is the 110 foot long Venturosa built by Sovereign Yachts which is located on the Duwamish at 8th Avenue South just downriver of the 14th/16th Avenue South Bridge.

This vessel has two masts; one 136 feet high and the other 96 feet high above the water line. The constraint to the height of this vessel was the West Seattle Freeway bridge which is 140 feet above MHW. However, Sovereign is only restricted by the West Seattle bridge whereas Delta Marine is restricted by the Seattle City Light power transmission cables which limit vessel height to 90 feet. Under this constraint DMI would not be able to construct a power sailer and step the mast at their facility. The mast would have to be stepped downriver of the 14th/16th Avenue South Bridge. This potential impact is discussed in greater detail in the following chapter.

Other Vessels

There are several other types of vessels that have sporadically or could potentially use this reach of the Duwamish, including fireboats, passenger vessels (not discussed above) and military vessels (i.e., minesweepers). These vessels are discussed below.

Fireboats

The Seattle Fire Department is responsible by agreement for firefighting on the upper Duwamish River. The department operates two boats, the Chief Seattle and the Alki, which have vertical clearances of 33' and 34', respectively, and draw no more than nine feet of water. The highest fixed points on the fireboats are the nozzles mounted on top of the wheelhouses, which telescope down to the 34' height.

The department would be pleased with a 55-foot high bridge, which would give the fireboats a more comfortable margin than is now available when passing through the bridge at higher tides. However, the fireboats are called up to that stretch of the river so seldom that the current lack of clearance margin has not been a major problem.

Minesweepers

Delta Marine Industries has bid (unsuccessfully) on Navy minesweeper construction contracts in the recent past, and does not want a fixed bridge to preclude them from pursuing this line of business in the future. These ships are generally constructed of fiberglass and have shallow drafts (e.g. 10 feet fully loaded), so vertical clearance is an important consideration.

Conversations with the General Arrangements Group (Navy ship design department responsible for the top-side configuration of vessels) provided information on the topside arrangement of the newest minesweepers in use by the Navy. These vessels are the MCM1, the newest class of minesweeper, and the MHC51 class, the previous model.

The MHC51, the older of the vessel types, is constructed of fiberglass and has a highest fixed point 70 feet above waterline. This highest fixed point consists of antenna masts, while the highest fixed point on the superstructure is the roof of the main deck. The main deck is located 8 meters (26.25 feet) over the baseline of the vessel, which in turn is 2.5 meters (8.25 feet) over the waterline, and is approximately 8 feet high. Therefore the highest fixed point on the superstructure on this model of minesweeper is approximately 43 feet above waterline.

The MCM1 is the newest model of minesweeper in the Navy's fleet. This vessel features a fiberglass hull 224 feet long, a beam of 38 feet, and a maximum loaded draft of only 10 feet. The highest fixed point on this ship, like the MHC51, is made up of antennas (95 feet above waterline), while the highest fixed point on the superstructure is 41 feet above waterline. This vessel displaces 920 tons of water (light) and 1,075 tons (fully loaded). These vessels could be built at DMI with final topside assembly downriver at a partner's shipyard. For example, DMI was considering teaming with Martinac Shipyard of Tacoma to build minesweepers.

Washington State Ferries and Other Passenger Boats

The proposed fixed spans would allow transit by all of the WSDOT ferries that could transit the River's depth. This would include the smallest 13 of the ferries which draw 15 feet or less. At a maximum, these ferries have a highest fixed point of 62.2 feet and could pass under the 60 foot high span at or slightly above MLW.

In addition to the State boats, vessels such as the *Goodtimes*, *Spirit of Puget Sound* and other passenger vessels which operate in Puget Sound could transit the fixed spans.

Table 10

Washington State Ferries Vessel Characteristics						
#	Name	Net Reg Ton	Length	Beam	Highest Fixed Point	Draft
1	EXPRESS-TYEE	98	88.0	33.0	38.0	8.0
2	KALAMA	99	112.0	24.7	-	7.0
3	SKAGIT	99	112.0	24.7	-	7.0
4	HIYU	338	162.0	63.0	50.0	11.3
5	OLYMPIC	308	207.6	62.0	45.0	9.2
6	RHODODENDREN	425	225.9	63.0	39.0	10.0
7	QUINAULT	1030	256.2	73.9	50.0	13.2
8	NISQUALLY	1013	256.2	73.9	50.0	13.2
9	KLICKITAT	957	256.2	73.9	50.0	13.2
10	ILLAHEE	1031	256.2	73.9	50.0	13.2
11	TILLIKUM	1017	310.0	73.1	62.2	15.0
12	EVERGREEN STATE	1388	310.0	73.1	62.2	15.0
13	KLAHOWYA	1017	310.0	73.1	62.2	15.0
14	SEALTH	1749	328.5	78.5	69.0	15.8
15	ISSAQUAH	1749	328.5	78.5	69.0	15.8
16	CATHLAMET	1749	328.5	78.5	69.0	15.8
17	CHELAN	1749	328.5	78.5	69.0	15.8
18	KITTITAS	1749	328.5	78.5	69.0	15.8
19	KITSAP	1749	328.5	78.5	69.0	15.8
20	YAKIMA	1214	382.2	73.2	68.6	16.6
21	HYAK	1214	382.2	73.2	68.6	16.6
22	KALEETAN	1214	382.2	73.2	68.6	16.6
23	ELWHA	1214	382.2	73.2	68.6	16.6
24	WALLA WALLA	1198	440.0	87.0	83.0	18.0
25	SPOKANE	1198	440.0	87.0	83.0	18.0

Notes: All vessels are steel construction
Source: BST Associates, USCOE data

Summary Conclusions

The fixed spans under consideration would have a limited impact on vessels transiting this reach of the River. Tugs and barges, construction barges, fishing vessels, large motor yachts, and a variety of other vessels (including

fire boats and passenger vessels among other types) would not be restricted under either of the fixed spans under consideration.

Larger sailing vessels that are moored in the two marinas could be impacted with the 55 foot high span but would not be impacted by the 60-foot-high span.

Power sailers, which could have a mast height of up to 145 feet, would be precluded from transiting this reach of the River by the power distribution lines which cross the River approximately one block south of the 14th/16th Avenue Bridge. These lines restrict vertical access to 90 feet or less.

The next chapter evaluates the impacts of the fixed spans on waterway users.

Figure 13

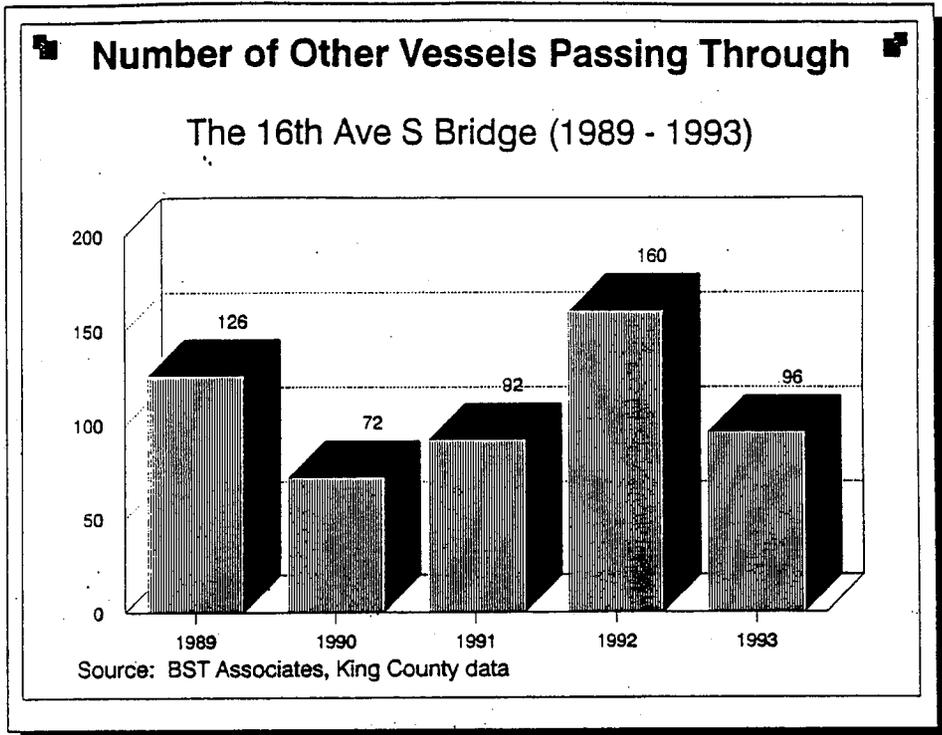


Figure 14

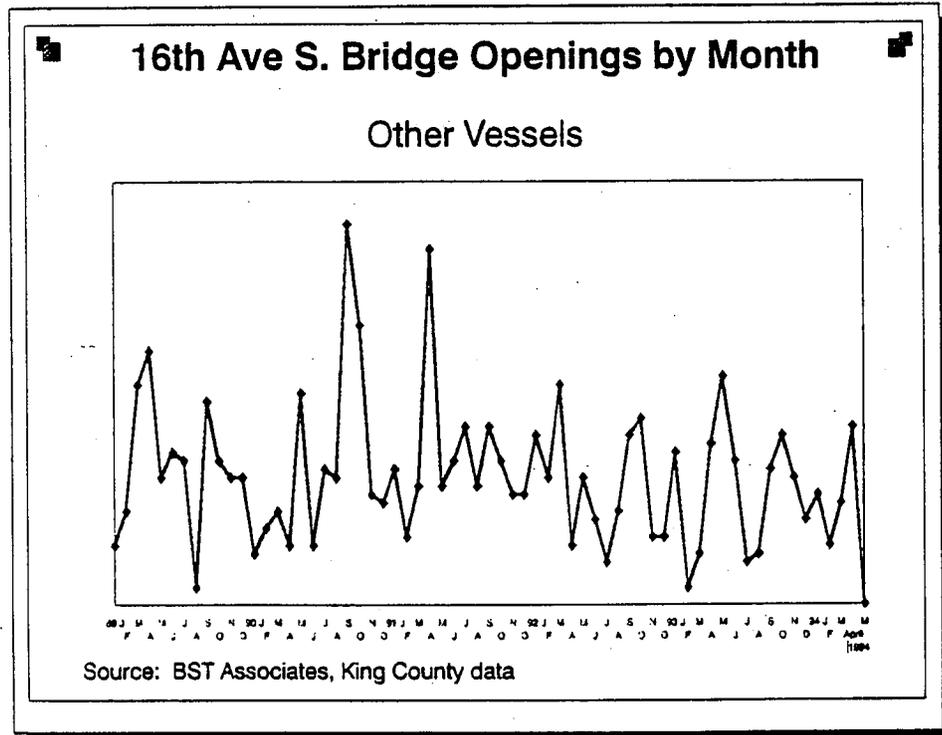


Table 11
Tugs For Which The 16th Ave S Bridge Opened
January 1989 - May 1994

VESSEL	COUNTY	LENGTH	BEAM	HFP	OPERATOR DESCRIPTION	BASEI	STATE
Highest Fixed Point Below 55 Feet							
1 POLAR SCOUT	1	39.2	14.1	15.0	NORTHLAND SERVICES, INC.	SEATTLE	WA
2 GLACIER BAY	6	268	57.3	16.0	BRIX MARITIME BARGING	SEATTLE	WA
3 F.P. HUBBLE	1	55	17.5	20.0	OLYMPIC TUG & BARGE	PRUDHOB BAY	WA
4 MERIDIAN	104	59.1	21.2	23.0	CROWLEY MARINE SERVICES	SEATTLE	WA
5 NORENE II	16	61.9	17.2	24.0	HURLEN CONSTRUCTION CO.	SUQUAMISH	WA
6 ERIK T	2	54	15.1	24.5	TATE TOWBOAT CO.	SEATTLE	WA
7 WANDA S	66	55.9	20.1	25.0	ISLAND TUG & BARGE	SEATTLE	WA
8 KIMBERLY	16	65	18.5	25.0	MANSON CONSTRUCTION	JUNEAU	AK
9 SILVER BAY I	5	63.4	20.8	25.0	SILVER BAY LOGGING, INC.	SEATTLE	WA
10 WEST POINT	6	62	22	25.0	WESTERN TOWBOAT COMPANY	SEATTLE	WA
11 HELENS	132	67	18	25.0	ISLAND TUG & BARGE	PORT ANGELES	WA
12 MYRTLE FOSS	5	70	22.8	25.0	FOSS MARITIME COMPANY	LONG BEACH	WA
13 CATHERINE FOSS	107	73.5	25	27.0	FOSS MARITIME COMPANY	SEATTLE	WA
14 GAILS	51	88	27	28.0	ISLAND TUG & BARGE	SEATTLE	WA
15 PATRICIA S	27	65	18	28.0	ISLAND TUG & BARGE	SEATTLE	WA
16 SOVEREIGN	4	66	21	28.0	FREMONT TUG CO.	PORTLAND	OR
17 TOM WHITE	4	57.1	18	28.8	BRIX MARITIME CO.	SEATTLE	WA
18 CAROL FOSS	76	92	24.6	29.0	FOSS MARITIME COMPANY	TACOMA	WA
19 SHANNON FOSS	150	90	24.6	29.0	FOSS MARITIME COMPANY	TACOMA	WA
20 JOSHUA T	4	58	15.3	29.6	TATE TOWBOAT CO.	SUQUAMISH	WA
21 HARRY M	25	92.4	30	30.0	MANSON CONSTRUCTION CO.	SEATTLE	WA
22 DUNCAN FOSS	40	72	24	30.0	FOSS MARITIME COMPANY	SEATTLE	WA
23 ELMER M	19	64	24	30.0	MANSON CONSTRUCTION CO.	SEATTLE	WA
24 GLADYS M	12	69.4	19.6	30.0	MANSON CONSTRUCTION CO.	SEATTLE	WA
25 DONNA FOSS	15	72	24	30.0	FOSS MARITIME COMPANY	JUNEAU	WA
26 CASEY MARIE	39	70	24	30.0	KELLY RYAN, INC.	SEATTLE	WA
27 DEBORAH FOSS	34	72	24	30.0	FOSS MARITIME COMPANY	SEATTLE	WA
28 ASTORIA	2	93	40	30.0	GENERAL CONSTRUCTION	SEATTLE	WA
29 TOM WHITE	65	65	19	31.0	J.T.C. INC.	SEATTLE	WA
30 DANIELLE	1	64	26.6	31.0	MANKE LUMBER COMPANY	SHELTON	WA
31 DANIEL FOSS	2	98.1	32	31.6	FOSS MARITIME COMPANY	ANCHORAGE	WA
32 SHELLEY FOSS	234	90	30	32.0	FOSS MARITIME COMPANY	SEATTLE	WA
33 JAMES T QUIGG	2	65	21.3	34.0	OLYMPIC TUG & BARGE	SEATTLE	WA
34 WESTRAC	11	76	28.2	35.0	WESTERN TOWBOAT COMPANY	SEATTLE	WA
35 TIGER	70	90.3	27.1	35.0	BRIX MARITIME BARGING	BELLINGHAM	WA
36 RICHARD FOSS	52	110	30.5	35.0	FOSS MARITIME COMPANY	TACOMA	WA
37 DELANCO	2	98	24	36.0	WRIGHTS MARINE TOWING, INC.	SEATTLE	WA
38 SHELTER ISLAND	13	87	22.4	36.0	SALMON BAY BARGE LINE, INC.	SEATTLE	WA
39 CLAUDIA FOSS	100	80	25	38.0	FOSS MARITIME COMPANY	TACOMA	WA
40 BRYNN FOSS	6	100	36	38.0	FOSS MARITIME COMPANY	TACOMA	WA
41 WEDELL FOSS	122	100	36	38.0	FOSS MARITIME COMPANY	SEATTLE	WA

VESSEL	COUNT	LENGTH	BEAM	HFP	OPERATOR DESCRIPTION	BASE	STATE
42 NEPTUNE	2	110	31.2	38.0	DANN TOWING CO.	SEATTLE	FL
43 MARTHA FOSS	51	80	27	38.0	FOSS MARITIME COMPANY	SEATTLE	WA
44 STONE MOUNTAIN	2	96	24.9	39.7	SELEY CORPORATION	KEICHIKAN	AK
45 PACHENA	2	112	25	40.0	MANKE TUGBOAT CO.	SEATTLE	WA
46 DAVID FOSS	31	77.2	26.3	40.0	FOSS MARITIME COMPANY	SEATTLE	WA
47 EDITH FOSS	22	77.2	26.3	40.0	FOSS MARITIME COMPANY	SEATTLE	WA
48 DOUBLE EAGLE	60	104	22.6	40.0	D & V BOAT COMPANY, INC.	SEATTLE	WA
49 POLAR WIND	6	67.4	22.2	40.0	NORTHLAND SERVICES, INC.	SEATTLE	WA
50 APOLLO	2	87	29	40.0	CROWLEY MARINE SERVICES,	SEATTLE	CA
51 EXPRESS	19	125	25.1	43.0	KENCO MARINE SERVICES, INC.	SEATTLE	WA
52 ALAPUL	12	105	31.1	43.0	BRIX MARITIME BARGING	SEATTLE	WA
53 SAN FRANCISCO	1	169.1	34.3	44.0	GOLDEN GATE BRIDGE	LARKSPUR	CA
54 SANDRA FOSS	11	111.5	34	45.0	HIGHWAY AND TRANS. DIST.	SEATTLE	WA
55 PACIFIC EAGLE	2	93	27.6	45.0	FOSS MARITIME COMPANY	SAN FRANCISCO	WA
56 ANDREW FOSS	2	107	38	48.0	SEA COAST TOWING	BELLINGHAM	WA
57 HENRY FOSS	10	100	36	48.0	FOSS MARITIME COMPANY	TACOMA	WA
58 POLAR STAR	2	125	24	48.0	FOSS MARITIME COMPANY	SEATTLE	WA
59 ARTHUR FOSS	8	107	38	48.0	NORTHLAND SERVICES, INC.	BELLINGHAM	WA
60 INTEGRITY	2	166	38	54.0	FOSS MARITIME COMPANY	PETERSBURG	WA
Highest Fixed Point Above 55 Feet							
1 SOVEREIGN	6	185	38.1	63.0	GENERAL MARINE SERVICES	ANCHORAGE	AK
2 BARBARA FOSS	30	126	34	64.0	FOSS MARITIME COMPANY	SEATTLE	WA
3 PHILLIPS FOSS	2	120	31	64.0	FOSS MARITIME COMPANY	SEATTLE	WA
4 IVER FOSS	96	98	32	65.0	FOSS MARITIME COMPANY	SEATTLE	WA

Source: BST Associates, King County data, USCOE data

Table 12
Distribution of Recreational Vessels
in King County
(all figures in feet)

Type of Vessel	<20	20 TO 24	25 TO 29	30 TO 34	35 TO 39	40 TO 44	45 TO 49	50+	TOTAL
Sailboats									
Registered	517	485	523	350	245	130	45	31	2326
Documented	0	3	50	255	333	215	72	58	986
Total	517	488	573	605	578	345	117	89	3312
%	15.6%	14.7%	17.3%	18.3%	17.5%	10.4%	3.5%	2.7%	100.0%
Cumulative %	15.6%	30.3%	47.6%	65.9%	83.4%	93.8%	97.3%	100.0%	
Non-Sailboats									
Registered	15519	2976	1376	919	682	572	197	290	22531
Documented	3	6	182	519	611	532	274	324	2451
Total	15522	2982	1558	1438	1293	1104	471	614	24982
%	62.1%	11.9%	6.2%	5.8%	5.2%	4.4%	1.9%	2.5%	100.0%
Cumulative %	62.1%	74.1%	80.3%	86.1%	91.2%	95.7%	97.5%	100.0%	
Total	16036	3461	1899	1269	927	702	242	321	24857
Registered	3	9	232	774	944	747	346	382	3437
Documented	16039	3470	2131	2043	1871	1449	588	703	28294
%	56.7%	12.3%	7.5%	7.2%	6.6%	5.1%	2.1%	2.5%	100.0%
Cumulative %	56.7%	69.0%	76.5%	83.7%	90.3%	95.4%	97.5%	100.0%	
Percent Sailboats	3.2%	14.1%	26.9%	29.6%	30.9%	23.8%	19.9%	12.7%	11.7%
Percent Non-Sailboats	96.8%	85.9%	73.1%	70.4%	69.1%	76.2%	80.1%	87.3%	88.3%
	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Source: BST Associates using data from the Coast Guard and State of Washington

Table 13
Bridge Openings Required by Sailboats

Details of Passages of Named Sailboats

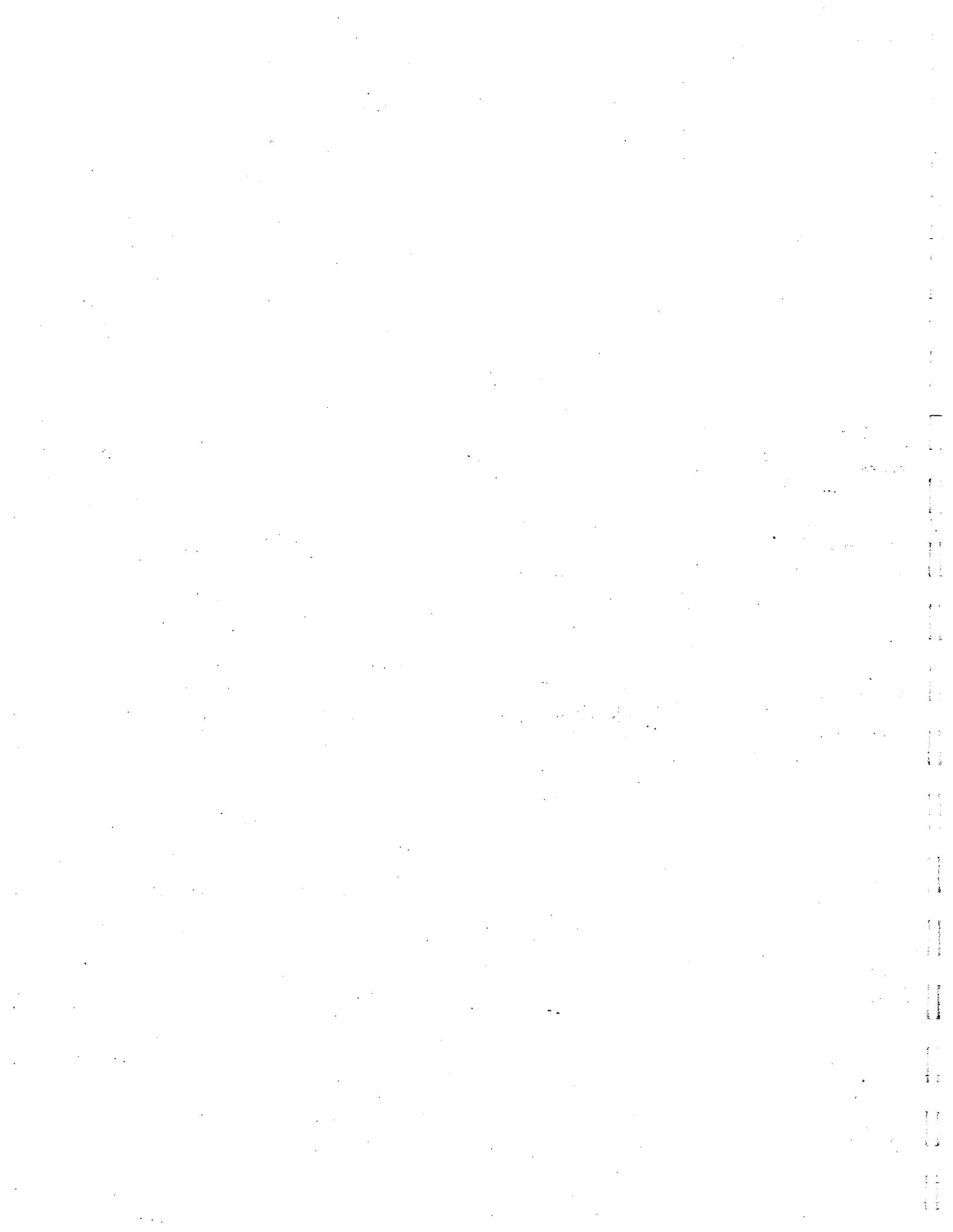
	1989	1990	1991	1992	1993	TOTAL
159	0	1	0	0	0	1
39	1	0	0	0	0	1
41	1	0	0	0	0	1
36	0	1	0	0	0	1
40	0	0	0	1	0	1
36	0	0	0	1	0	1
39	0	0	0	1	0	1
41	0	0	1	0	0	1
44	0	1	0	0	0	1
36	0	1	0	0	0	1
42	0	0	0	0	1	1
44	0	0	0	1	0	1
196	0	0	0	0	0	0
36	0	0	0	0	2	2
36	0	0	0	1	1	2
36	0	0	2	0	0	2
43	3	0	2	0	0	5
43	0	0	0	0	1	1
35	0	2	0	0	0	2
45	4	0	0	0	0	4
32	0	0	0	1	0	1
49	0	1	3	0	0	4
30	0	1	2	1	0	4
42	0	4	0	0	0	4
35	0	4	0	0	0	4
32	4	0	0	0	0	4
39	0	0	4	0	0	4
42	0	2	0	2	0	4
33	4	0	1	1	0	6
31	0	0	0	0	6	6
47	5	0	0	2	0	7
48	0	2	4	1	0	7
45	7	0	0	0	0	7

Note: Details are provided for those sailboats listed in bridge tender's logs for which matches were found in W.A. State vessel registration data.

38	54	TOUCHE	0	0	7	1	0	8
36	56	WIND SONG	0	0	0	0	0	8
31	51	CHEROKEE	8	0	0	2	0	10
32	47	BLUE FEATHER	3	7	1	0	0	11
32	49	QAYAQ	0	0	11	0	0	11
36	46	VERITY	4	2	2	3	0	11
38	45	SUNBAR	0	0	0	0	11	11
35	44	ALBATROSS	0	0	0	0	12	12
44	43	WIND ROSE	0	0	8	4	1	13
45	40	WINDSWEEP	12	4	0	0	0	16
42	34	GRAND SLAM	14	7	0	0	0	21
38	33	STARLIGHT	0	0	0	22	0	22
31	32	LEITMOTIF	0	0	3	15	5	23
34	31	SAPPHIRE	0	0	1	11	13	25
32	29	FOOTLOOSE	20	7	0	0	0	27
36	25	SKARIETT	17	16	0	0	0	33
36	22	DIVER DOWN	8	12	14	0	0	34
32	23	SEA BREEZE	11	3	7	5	8	34
42	21	CHECHAKO	0	0	0	28	7	35
39	20	BARBARA B	0	0	21	12	2	35
36	19	SPIRIT	7	8	13	11	4	43
44	17	PERELANDRA	0	14	10	16	8	48
33	16	SILENT PARTNER	0	0	21	13	14	48
41	15	EOS II	0	0	6	43	0	49
30	14	BLUEBIRD	26	20	1	0	3	50
38	11	KEEMA	0	43	27	0	0	70
41	10	DENOUEMENT	17	11	11	9	26	74
38	9	IVY ROSE	21	36	14	14	2	87
30	8	C-OTTER	21	23	23	8	8	88
36	6	NEREID	1	0	0	42	57	100
27	4	OUTRAGEOUS	2	28	45	23	17	115
39	3	SECOND WIND	4	36	33	39	29	141
29	2	DOLPHIN	58	34	46	14	0	152

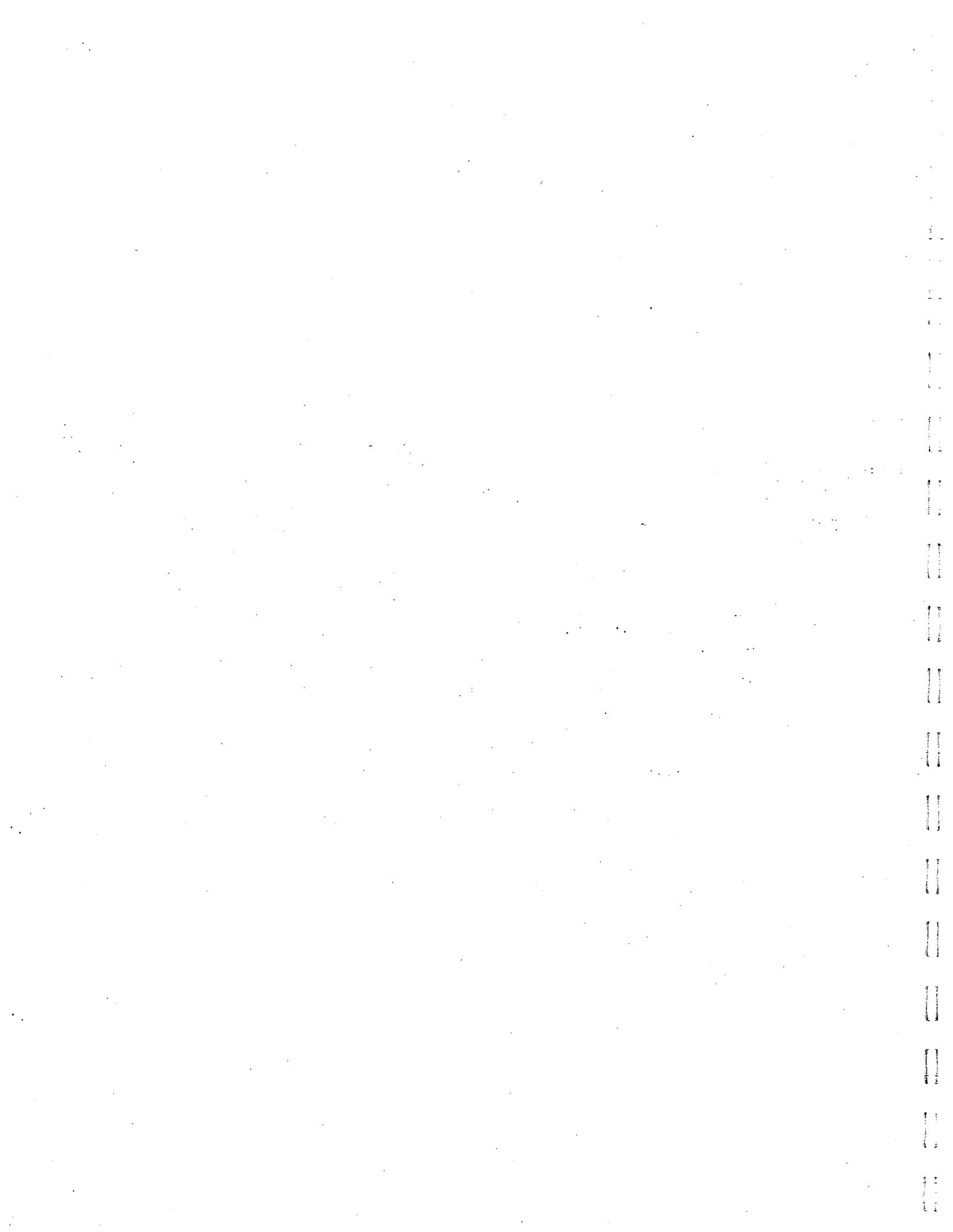
Note: Details are provided for those sailboats listed in bridge tender's logs for which matches were found in WA State vessel registration data.

Source: BST Associates using data from the Coast Guard and State of Washington



**Chapter
Four:**

**Discussion of
Potential Impacts
to Existing and
Potential Future
Users**



CHAPTER FOUR

DISCUSSION OF POTENTIAL IMPACTS TO EXISTING AND POTENTIAL FUTURE USERS

The only existing users that would be impacted by height restrictions are larger sailboats, Manson, and Delta Marine. The impact to Delta Marine appears to be twofold: impact to the height of some vessels that might be constructed or repaired at DMI and the inability to lift heavier vessels by Manson's derricks which cannot transit the bridge.

In addition, there is a potential (however remote) that other users might want to use this reach of the River for cargo operations. Potential future uses of the River are also evaluated in this chapter.

Large Sailboat - Potential Impacts & Solutions

As discussed above, large sailboats with mast heights of 55 to 60 feet are relatively rare in the upper reach of the Duwamish River. Only 12 of the existing 278 vessels moored in the two upriver marinas are sailboats accounting for only 4.3% of the total vessel population. Other sailboats have occupied moorage in these facilities in the past but the overall distribution of vessels has always been dominated by power boats.

In addition, sailboat transits of the bridge in this stretch of the River are typically very low, with less than 2 outings per year (requiring bridge openings) for 81.6% of the sailboats. Smaller sailboats attempt to transit without opening the bridge whenever possible. Only 9 sailboats required bridge openings on 5 or more outings per year.

Discussions with the South Park marina owner and the sailboat representative of the Duwamish Yacht Club indicated that minimal impact would be experienced by frequent sailboat users under the 60-foot-high bridge alternative. This alternative would allow transit by vessels with masts up to 65 feet high using tides. This would accommodate all existing sailboats. The 55-foot-high-span alternative would constrain use by larger sailboats.

Both the South Park Marina and the Duwamish Yacht Club are full. There is waiting list at South Park Marina and there is an established market to sell memberships at the Duwamish Yacht Club. In the unlikely event that height became a constraint, additional tenants could be easily found that would not be height constrained.

Delta Marine Industries - Potential Impacts to Vessels Constructed at DMI

As discussed above, DMI has constructed several hundred 700 fishing boats that return for annual or less frequent service. None of these vessels would be constrained by either the 55- or 60-foot-high fixed spans. The largest power seiners have a height of 59 feet with antenna and could easily use the tidal cycle to transit the spans.

DMI has begun construction of megayachts. These vessels need to be able to pass under the bridge after construction and for annual maintenance and/or upgrades. Power megayachts are typically double- or triple-deck vessels with a maximum height of 55 feet to 60 feet including all gear. These vessels could also transit the fixed spans under consideration using tides at MLW. In order to provide a safety margin, DMI officials suggested a fixed height of 62 to 63 feet above MHW.

Height restrictions occur for megayachts in other areas of the world where bridges are common such as the Gulf Intercoastal Waterway, where bridges are limited to 65 feet above MHW, and in Miami, where bridges are limited to 40 feet above MHW. Other limits, such as the height of the owner's covered moorage, also present restrictions. Some PNW builders are designing vessels to travel from Lake Union to Puget Sound without opening the Fremont or Ballard bridges which requires a limit of 41 feet at MHW.

As a result of the existing established heights of these vessels and because design solutions exist, height restrictions for power yachts built by DMI would be minimized for a bridge 62 to 63 feet above MHW.

DMI officials have indicated that they are also considering plans to build a power sailer approximately 130 feet long. Using the Venturosa as an example, this type of vessel would have a mast height of 130 to 140 feet above water. However, the power lines and TV cables just south of the 14th/16th Avenue South bridge would preclude transit by any vessel with a mast over 90 feet above the water line. As a consequence, if DMI builds a power sailer it will have to step the mast downstream of the bridge. This is common practice in Europe and by at least one manufacturer in the US (Palmer Johnson in Sturgeon Bay, Wisconsin). The estimated cost to step a mast in the Puget Sound area is approximately \$25,000 in and out (or \$50,000 total), which is minimal compared to the price (\$5 to \$25 million) for these vessels. If DMI builds a power sailer it will be required to step the mast downstream of the bridge whether or not the fixed spans are constructed. The profile of vessel without the masts is 25 to 30 feet above the water line, which would not be constrained by either fixed span under consideration.

DMI would not experience an impact to either power or sail megayachts transiting a fixed span bridges of 62 to 63 feet according to DMI officials. However, there would be an impact to DMI from lifting the vessels from the yard into the water (and vice versa) which is discussed below.

Delta Marine Industries - Potential Impacts to Lifting of Constructed Vessels

DMI has a stiff-leg derrick that is rated at 125 tons. This equipment is capable of lifting all of DMI's fishing vessels. DMI has used Manson's derricks to lift megayachts into and out of the water. DMI claims that the lifting equipment should be rated at approximately 400 tons or more to handle the largest vessels that could be manufactured at their facility.

During the past two years, Manson reportedly positioned two of its largest derricks together to make a lift at DMI of approximately 400 tons. Manson's equipment would not be able to move upstream of either the fixed 55- or 60-foot fixed-span alternatives. No other floating derricks with this lifting capacity exist that could transit these bridge alternatives.

The following sections evaluate a 400 ton lifting capacity which meets minimum lifting requirements. Additional lifting capacity may be required and should be evaluated in greater detail in future planning and design efforts.

Launching Alternatives - Acquiring or Renting Lifting Equipment

ABAM Engineers, Inc was asked to evaluate alternative methods of launching the larger vessels at DMI. Using 130 foot length and 400-ton displacement as the criteria, ABAM looked at the following options/methods of launching the vessels.

1. **Straddle Carrier** - This alternative would require construction of PARALLEL finger piers extending a minimum of 120 feet into the river in order to place a vessel in the water. A straddle carrier capable of handling the size vessels anticipated to be built by Delta Marine are available for purchase. Renting the straddle carriers does not appear to be an option due to the limited market for and singular use of such a custom built machine. The permits required to construct the new fixed facilities may, however, be difficult to obtain.
2. **Barge-Mounted Crawler Cranes** - This alternative requires two barges outfitted with a Manitowoc 4100W "Ringer" crane on each barge. The barges will require some modification for stability and the installation of positioning equipment. The "4100 Ringers" would require site erection, as their masts would be too high to

pass under the proposed fixed bridge. This option is considered viable. However, the equipment may not be available "on demand."

3. Single Crawler Crane on Land - A Manitowoc "4600 Ringer" crane is capable of launching the vessels. The existing bulkhead structure will require strengthening to support the 60-foot-diameter "Ringer" and considerable area would be impacted during the erection/dismantling period. Permits should not be a problem as the modifications would be behind the bulkhead. As with Method 2, this option is a viable means of launching vessels but such a crane may not be available "on demand."
4. Mobile Crawler Crane - A mobile crawler crane, Transi-Lift LTL 900 (manufactured by Neil F. Lampson, Inc. of Kennewick, WA,) is capable of performing the required launches. The LTL 900 can operate at 90-foot radius that minimizes the behind-the-bulkhead runway strengthening. The Transi-Lift LTL 900 is capable of moving while carrying maximum load. Crane availability "on demand" is good at present time.
5. Mobile Crawler Crane - Two mobile crawler cranes, Transi-Lift LTL 350 (manufactured by Neil F. Lampson, Inc. of Kennewick, WA,) lifting in tandem are capable of performing the required launches. The LTL 360s, while more readily available on demand than the LTL 900, are less costly to mobilize, but would require more behind-the-bulkhead runway preparation. If the LTL 350s were purchased outright, the main component of the LTL 350 is a Manitowoc 4100W crawler crane which is quite versatile for other lifting needs or rentals. The LTL 350 is also designed for mobility while carrying maximum load.

Based upon conversations with crane suppliers and ABAM's estimates of modifications to the wharf, barges, etc., the following "order of magnitude" costs for the options listed above were calculated:

The costs provided in the following table are in 1994 dollars and include a 20 percent contingency. Rent per launch rates include mobilization and demobilization and operation costs. Costs associated with relocating boats, floats, shipyard equipment, dredging, or other costs that occur with the present launch method are likewise not included. Used equipment may be available at lower purchase prices than those indicated.

There is the potential to place one or two captive derricks in this reach of the River. However, the utilization of these derricks would be low. The estimated cost of a derrick like the Haakon is \$2 million. Two vessels of this size would be required to provide 400 ton lifting capability.

**Cost Estimates for Alternative
Provision of 400 Ton lifting Capability at DMI**

Option	Estimated Cost
Option 1	
Purchase Straddle Carrier	\$3,300,000
Rent Straddle Carrier	N/A
One time facility development	\$800,000
Option 2	
Rent Two 4100 Ringers on barges	\$550,000 per launch
Option 3	
Rent 4600 Ringer (on land)	\$380,000 per launch
(Purchase price is \$4,800,000)	
One time facility modification cost	\$550,000
Option 4	
Rent LTL 900 (on land)	\$600,000 per launch
(Purchase price is \$4,300,000)	
One time facility modification cost	\$250,000
Option 5	
Rent Two LTL 350 (on land)	\$380,000 per launch
(Purchase price is \$1,900,000 ea = \$3,800,000)	
One time facility modification cost	\$550,000
Source: ABAM Engineers, Inc	

Launching Alternatives - Constructing a Marine Railway or Shiplift

ABAM Engineers also evaluated the feasibility of a marine lift or shiplift at the Delta Marine Property on the Duwamish Waterway. The same design vessel specifications were used (i.e., 400-ton deadweight, 30-foot beam, 11-foot draft, and approximately 180-foot overall length). ABAM considered two types of shipway facilities, a marine railway and a "Syncrolift" type shiplift.

Delta Marine's existing waterfront yard on the Duwamish (see attached site plan, Figure 1) is small when compared with other sites in the Puget Sound area with similarly sized shipways. There is an existing floating dock that would have to be moved or reconfigured to make room for the shipway. There are also other waterfront facilities, including repair shops, storage, and laydown areas and a small office building that may have to be relocated to accommodate a new shipway. It should be noted, however, that the repair shop buildings are mobile structures. It appears that these buildings as well as the areas designated for parking, storage, and laydown are moved from time to time depending upon the space required for different operations.

Delta Marine's primary yard and facilities are located further upland at West Marginal Way and South 96th Street. The orientation of the haul-out facilities considered here have been aligned with South 96th Street to permit direct transfer of boats to and from the main yard.

Complete soundings for the area between the Duwamish channel and the existing sheetpile bulkhead are currently not available. Inspection of a U.S. Army Corps of Engineers soundings chart for the area indicates that some dredging will be required for either scheme that we have considered. Dredge depth is largely driven by the tide elevation at docking or float out. For the purposes of this study, we have chosen an operating high tide of +9 MLLW. Inspection of tide tables for the Seattle area reveals that this tide provides a minimum of one launching or docking window of 2 to 3 hours per month. Choice of a lower tide would provide more useable time at the cost of increased dredging.

Marine Railway

Marine railways can be either side haul or end haul in configuration. ABAM evaluated an end-haul railway because of site geometry limitations. A side-haul railway would have to take off from the edge of the existing bulkhead and reach the required depth before the pierhead line. This results in a railway that is too steep to be practical. An end-haul railway can take off from a point well behind the bulkhead and provide for a shallow slope (see marine railway site plan and section, Figures 2 and 3). This configuration does require excavation behind the bulkhead, which may be either open cut or sheetpile shored, depending upon space limitations. For the purposes of this study, we have assumed that the new excavation would be done with sheetpiles because the site is rather small.

Basic components of a marine railway consist of rails and support system, carriage and cradle, and winch system. We have calculated concept-level costs for the system based on the following:

- 100-pound rails founded on timber piles with timber pile caps and tie beams.
- Carriage and cradle fabricated from salvaged railroad rolling stock, modified to suit the size and configuration of typical ships.
- New winch system, including controls and rigging, sized to pull a 400-ton ship up 1-3/4:12 ship way at 5 to 10 feet per minute.

Construction of a large portion of the marine railway system would have to be done underwater; cost of construction would be high. Our concept-level estimate includes these factors. The estimated cost to build a marine railway at DMI is approximately \$2.1 million.

Shiplift

A shiplift consists of two finger piers with a series of hoists on each pier that lift a central platform on which the ship is docked. The hoists have load cells and synchronous controls that enable them to raise and lower the ship and platform while maintaining it level. The system is similar to a marine railway in that the ship rests in a cradle that can be rolled off the platform and on to an upland transfer system when the platform is raised to the correct elevation. A schematic arrangement is shown in Figures 4 and 5.

Shiplift systems are typically proprietary, sized for a maximum vessel tonnage and typical dimensions. The type of system we have considered for this report is a "Syncrolift" as manufactured by Syncrolift, Inc. in Miami, Florida. Our concept-level cost estimate is for a shiplift to meet the following specifications.

- 40- by 150-foot platform dimensions (design ship will overhang slightly)
- 400-ton maximum lifting capacity

ABAM located the shiplift on the site in such a manner as to limit the amount of excavation behind the existing bulkhead, but in order to keep new construction behind the existing pierhead line some additional excavation is required. Hoists, controls, and rigging are included in the manufacturer's cost for the "Syncrolift" system, but costs for the support platform and concrete finger piers are additional. The shiplift is estimated to cost \$2.9 million at this site.

Probable cost of construction for the two concepts are presented in Table 15. Estimated costs are \$2.1 million and \$2.9 million for the marine railway and shiplift system, respectively. Cost of any upland transfer system that may be required are not included in these estimates. Cost of relocating the existing floating dock, if required, is also not included. The estimates include a 25 percent markup for taxes and engineering/administration as well as an additional 25 percent for conceptual level of details. Additional engineering data and analysis will be required to establish a budget level estimate of cost.

Based upon discussions with DMI, a shiplift capable of lifting 200' LOA x 50' width with an 800-1000 ton capacity would be acceptable. The optimal location of the shiplift would be at the southern edge of the City Light property currently under long-term lease by DMI. DMI is negotiating to buy this property. These additional size requirements would increase the cost of providing the shiplift. However, the amount of the cost increase is currently unknown.

Conclusions and Recommendations

The two boat lift systems presented here will meet the functional needs. The marine railway system appears to have a slight cost advantage. However, the railway system encroaches significantly more on the limited waterfront work area and may limit access to this area from South 96th Street. It appears that user preference (such as space and access requirements, upland transfer arrangements, ease of operation, etc.) will determine which system may be the most appropriate for this application. At this point, it appears that either system could be feasible, however, user input and more detailed engineering analysis will be required to determine which might be the best solution.

Table 15

BUDGET-LEVEL COST ESTIMATES MARINE RAILWAY	
Sheetpiling	\$300,000
Dredging/Excavation	80,000
Timber Piling	130,000
Pile Caps, Rails, and Gravel Base	110,000
Winch/Controls	400,000
Carriage	125,000
Cradles/Rigging	200,000
Subtotal	1,345,000
Engineering, Taxes, and Administration (25%)	336,250
	1,681,250
Contingency (25%)	420,313
Total	\$2,101,563
 SHIPLIFT 	
Sheetpiling	\$280,000
Dredging, Excavation, and Gravel Base	60,000
Finger Piers	250,000
Synchronous Lift System	800,000
Platform/Lift Construction	280,000
Cradles/Rigging	200,000
Subtotal	1,870,000
Engineering, Taxes, and Administration (25%)	467,500
	2,337,500
Contingency (25%)	584,375
Total	\$2,921,875
Note: The above estimates are in 1994/95 dollars.	

To put the above cost estimates in perspective, it is instructive to evaluate the value of DMI's property. The County may wish to compare facility

upgrade mitigation costs with acquisition and relocation of DMI. The relocation site would ideally be located near the current plant but on the downstream side of the 14th/16th Avenue South bridge. Because the firm employs 250 workers at relatively high-paying jobs the county would not want to move the firm too far from the current site, so a site on the Duwamish River would be preferred. One possible site that fits this criteria is the former Marine Power property located on East Marginal Way upstream of the 1st Avenue South bridge. This property is listed by the King County Assessor as being owned by the Port of Seattle. The following table compares Assessor's data for the Delta Marine property with that for the Marine Power property.

Table 16

<i>Comparison of Assessor's Data Delta Marine Industries Property and Marine Power & Equipment Property</i>		
	Delta Marine	Marine Power
Square Feet	419,668	320,000
Assessed Value		
Land	\$2,937,700	\$1,280,000
Buildings	\$2,300,000	\$5000
Total	\$5,237,700	\$1,285,000
Number of Buildings	6	1
Date of Valuation	2/24/94	?
Parcel Number	562420-0021	?
Zoning	MH	IG2U
Source: BST Associates, King County Assessor		

Acquisition and relocation costs could cost \$6.5 million or more. Upgrading the facility by provision of lifting equipment would range from \$2.1 million to \$4.8 million depending on the alternative. From a cost basis, upgrading by provision of a marine railway (or shiplift) appears to be the preferred compared with acquisition and relocation. In addition, the Marine Power site would not be large enough to meet DMI's space requirements.

Dredging

Dredging occurs every one or two years upriver of the 14th/16th Avenue South Bridge. Manson, which is a potential candidate for dredging, would not be able to bring its equipment past the new fixed spans. In recent years, dredging has been a Small Business Setaside by the USCOE and Manson has been excluded from this contract.

However, there are other firms that have been involved in dredging that could pass the new fixed span under either alternative. A.H. Powers dredging equipment and American Construction both utilize equipment that would easily pass under the fixed spans without the spuds in place. Moving the spuds on A.H. Powers equipment is estimated to cost an additional \$10,000 per dredging occurrence, which is a small percentage of the estimated annual \$250,000 dredging contract.

Future Cargo or Industrial Operations

There has been a general concern stated by Manson officials (among other proponents of unlimited vertical access) that upriver properties may become cargo terminals or industrial in character and again require higher vessel access.

Upon review of cargo terminal and industrial land trends, it appears highly unlikely that this reach of the River would experience a height restriction problem for cargo operations.

Industrial Land Development

As discussed above, this industrial area is dominated by Boeing, which owns approximately 603 acres located primarily on the east of the River. One site is also located on the west side of the River, namely the South Park Site. Boeing officials expect that their use of this property will be stable throughout the future. They also do not expect any need for additional heavy lift operations to occur.

There has been little interest in waterfront industrial property in the Duwamish over the past 15 years. As a recent City of Seattle study¹¹ asserted:

"The 1979 Industrial Area Background Report noted that manufacturing had managed to hold its own in acreage from 1969 to 1974 (in the South Duwamish area). The current findings indicate a loss of approximately 22 acres (or 5%) devoted to manufacturing over the past 5-6 years. Vacant land in the 1974-76 period was estimated at 111 acres, and land assembly was found to pose a problem for development. With the recent decrease in available land this remains a concern. At the same time, land with vacant units was reported in 1974-76 to be approximately 16 acres. The gain of an additional 13 acres with vacant units found in the 1992 land use survey is noteworthy."

According to realtors that specialize in industrial waterfront sales the market is very flat, with little interest from buyers to use waterfront

¹¹ Industrial Land Base Study, City of Seattle September 1993

property throughout the Seattle area. This is a result of concerns about environmental problems in sediments or uplands on existing sites such as the Monsanto or Jorgensen properties. In addition, there is no demand for waterfront property from buyers in this area. For example, Boeing acquired Slip 6 but has no need for the waterfront facilities, and the upland portion of the Monsanto property may be leased to a container storage/repair firm without the need for waterfront access. In the northern part of the Duwamish Industrial area the Seaboard Lumber property was purchased by Grayline, which is planning to develop a bus maintenance center, again with no need for waterfront access.

The only waterfront development occurring in Seattle is major terminal development by the Port of Seattle. As a result it is unlikely that any user will start up water-oriented activities in the upriver properties.

Summary Conclusions

Large sailboats that reside in this reach of the River would be able to transit the 60-foot-high fixed-span alternative. The larger vessels would be constrained by the 55-foot-high option.

Construction of megayacht power sailers with masts in excess of 90 feet would not be possible in this reach of the River because the electrical lines just south of the 14th/16th Avenue South bridge limit the vertical height on the waterway to 90 feet above MHW. An alternative would be to construct these vessels and step the mast downstream of the bridge.

Non-sail megayachts and fishing vessels that are constructed and receive annual maintenance at DMI would not be impacted by either fixed span alternative.

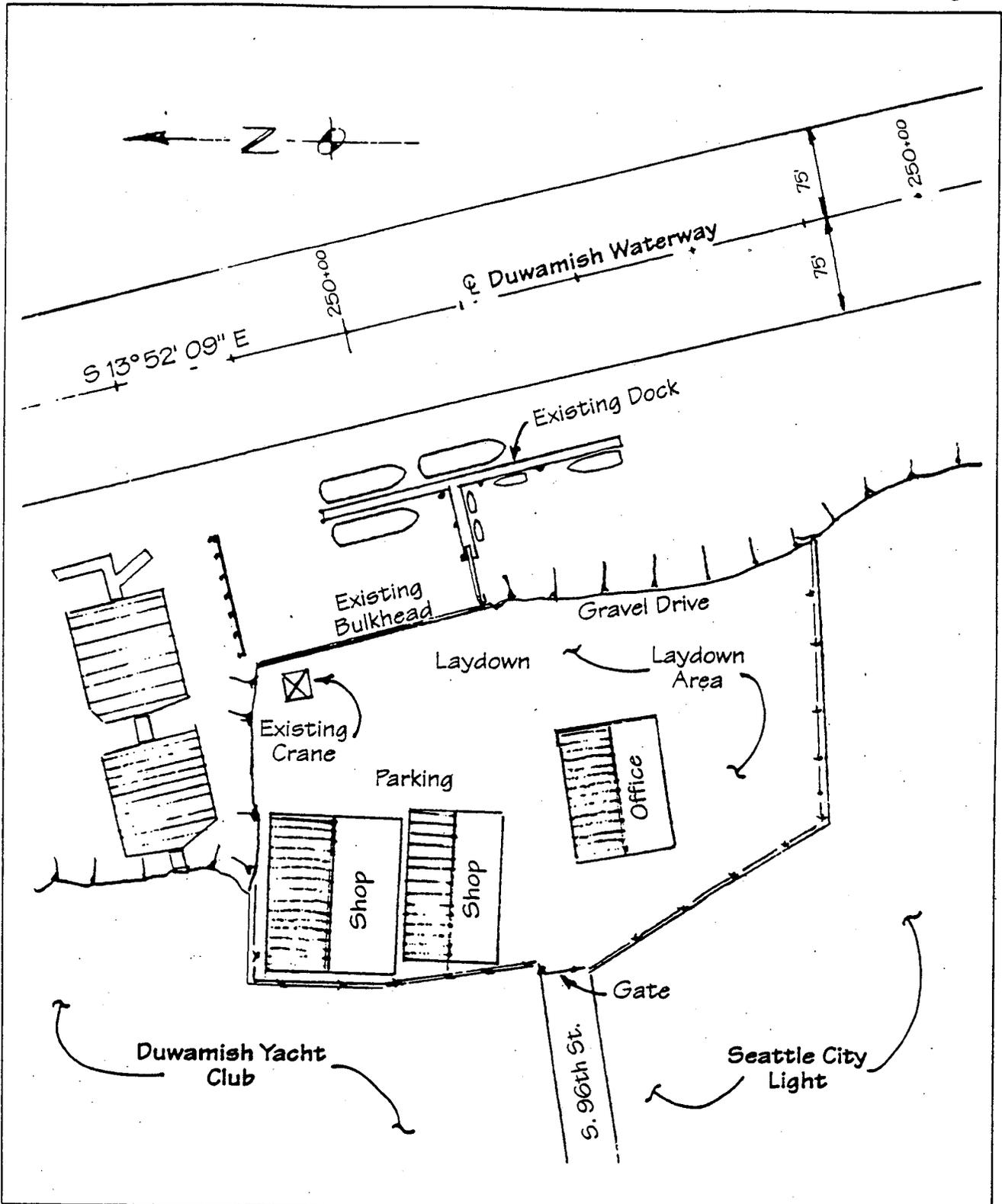
Dredging in the upriver area is usually conducted by smaller dredging companies that would not be impacted by the fixed spans.

The only impact from the fixed span is a limitation on Manson's ability to move upriver of the bridge. Manson's largest derricks, which require 90 feet of vertical airspace, are used to lift DMI's large power yachts. Alternatives for launching DMI's vessels include acquisition or rental of large cranes or construction of a launching facility (i.e., marine lift or shiplift). These facilities have an estimated cost of between \$2.1 and \$4.8 million. The marine lift and shiplift appear to offer the best alternative at an estimated cost of \$2.1 to \$2.8 million.

These costs are considerably less than acquisition of the DMI property and relocation to a site downstream of the Bridge, which is estimated to cost \$6.5 million or more, and still would not fully accommodate DMI.

DMI owners have indicated that a shiplift (capable of 800 to 1000 ton lifting capacity) would meet their requirements.

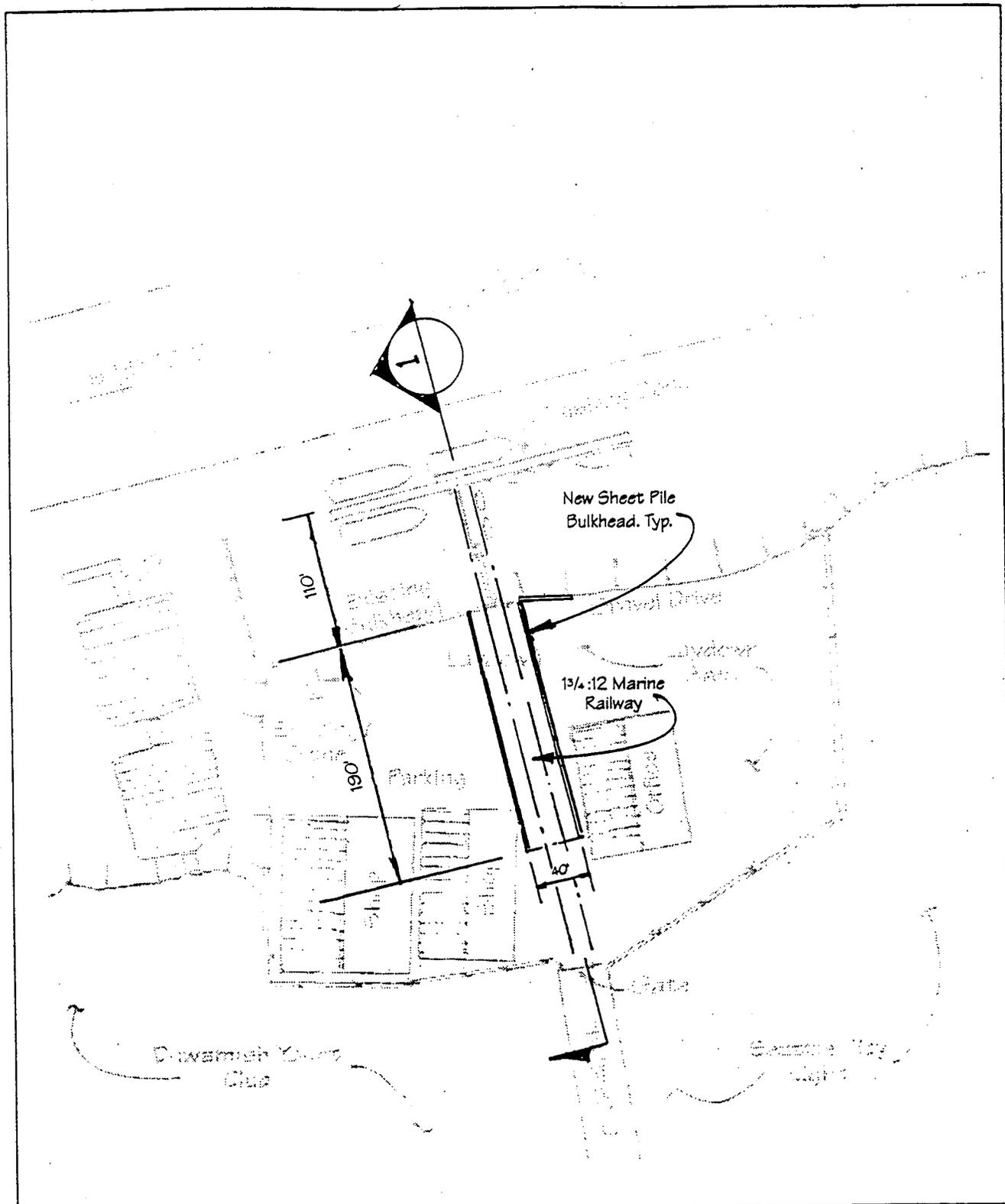
Figure 15



ABAM
A MEMBER OF THE BERGER GROUP
33301 Ninth Avenue South
Federal Way, Washington 98003
(206) 952-6100

Boat Lift Feasibility Study
Site Plan - Existing
1" = 100'

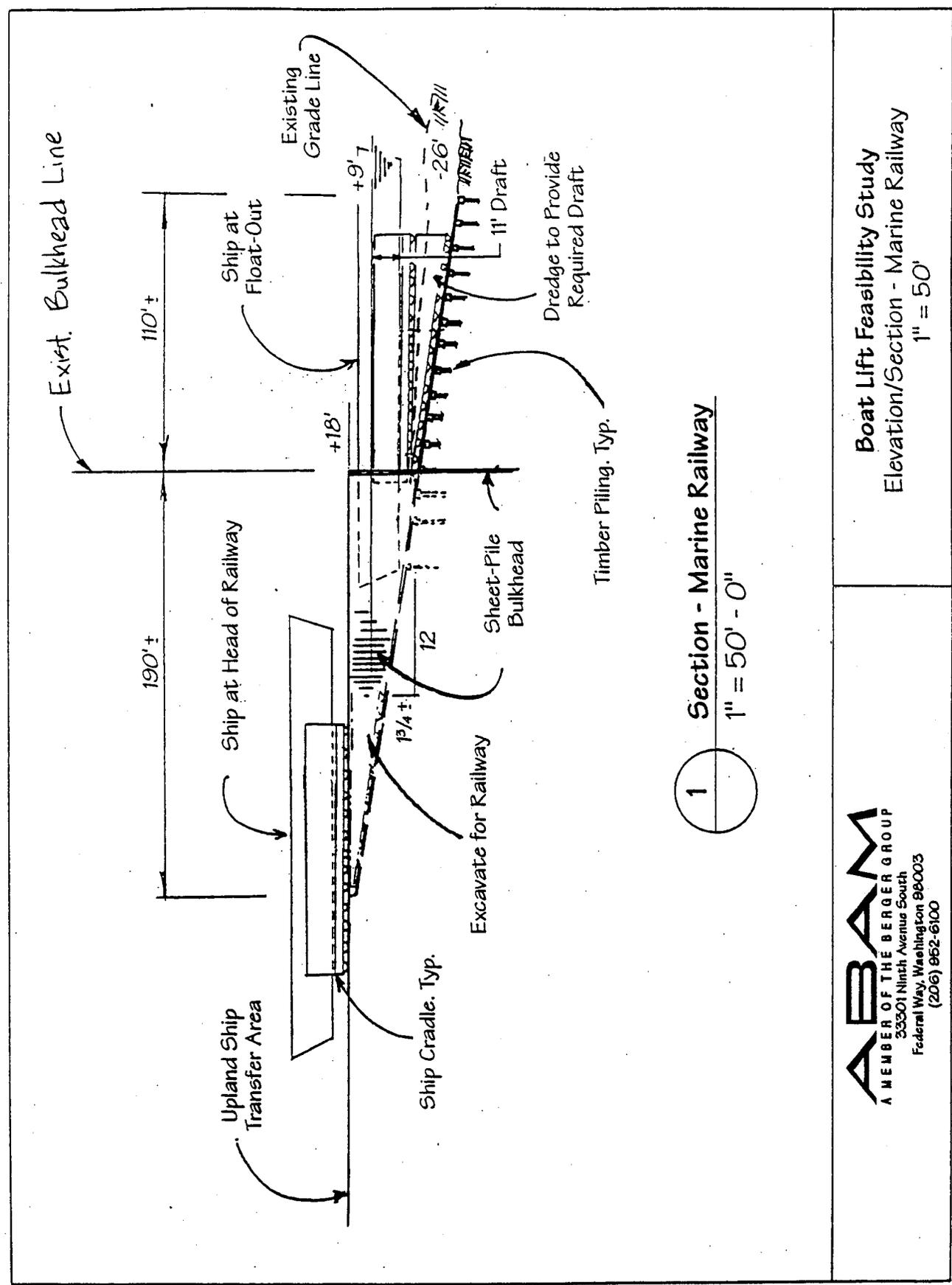
Figure 16



ABAM
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33301 North Avenue South
Federal Way, Washington 98003
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Boat Lift Feasibility Study
Site Plan - Marine Railway
1" = 100'

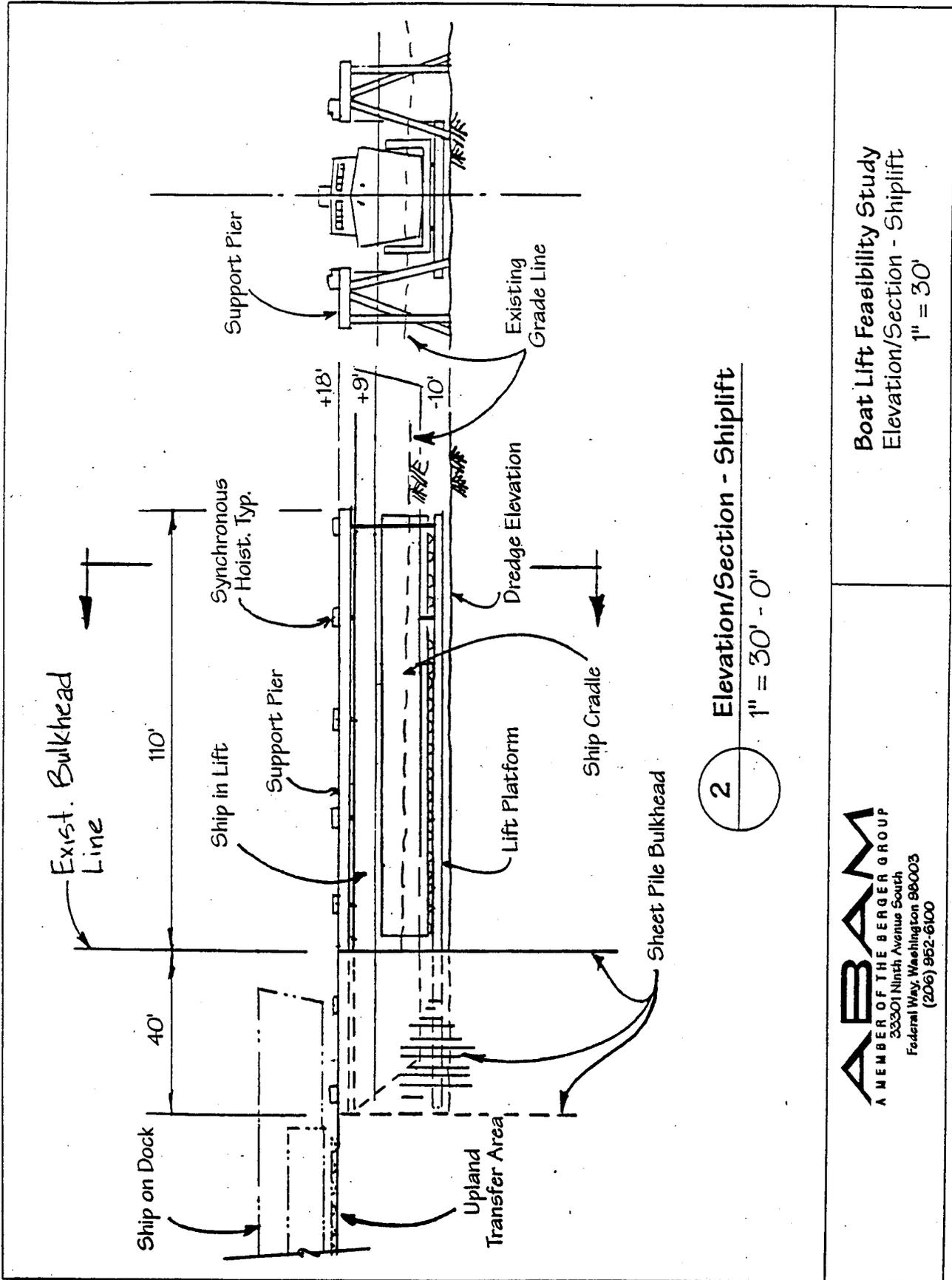
Figure 17



Boat Lift Feasibility Study
Elevation/Section - Marine Railway
1" = 50'

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Figure 19



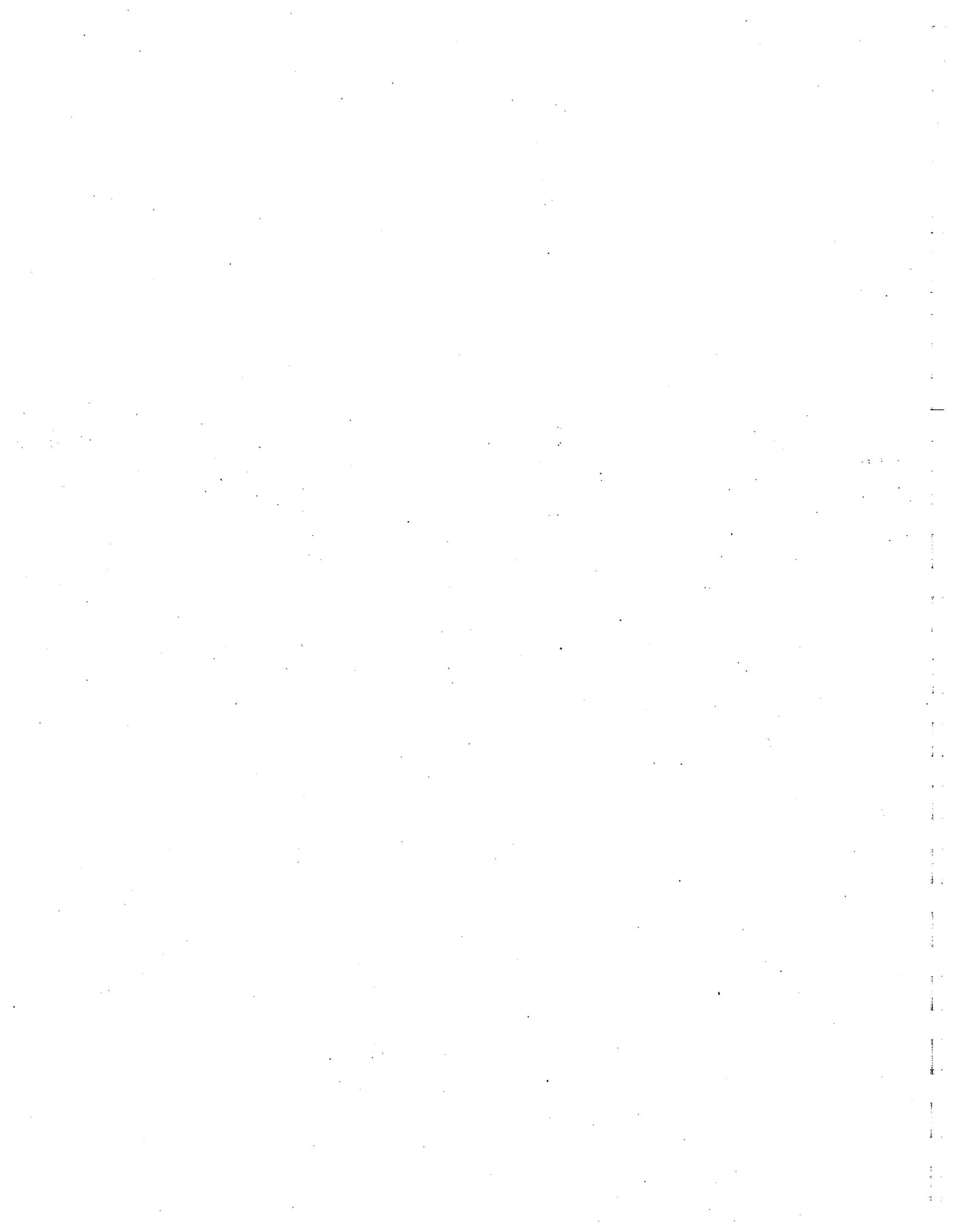
2 Elevation/Section - Shiplift
1" = 30' - 0"

Boat Lift Feasibility Study
Elevation/Section - Shiplift
1" = 30'

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**Chapter
Five:**

Upland Issues



CHAPTER FIVE UPLAND ISSUES

Executive Summary

In addition to waterway user impacts, there may also be impacts on upland uses and circulation patterns as a result of the various bridge alternatives. This chapter evaluates the "land side - community" issues related to the 14th/16th Avenue South bridge alternatives. Fernandes Associates was retained by BST Associates to identify preliminary community issues by conducting interviews with community leaders and business representatives. Community meetings were not part of Fernandes Associates' scope of work.

There was unanimous agreement among the community and business interviewees that the three replacement alternatives were unacceptable because of their intrusion on or near property now occupied. There was corresponding agreement that the rehabilitation alternative with a fifty-year life was preferred, with the understanding that traffic, even at a reduced volume, could flow during construction.

Project Approach

Using available background reports, Fernandes Associates summarized the major issues and prepared a matrix summarizing the impacts of each alternative on a number of variables. The assigned impacts were roughly weighted according to a one to three scale. The variables and assigned weights were reviewed by Sverdrup engineers and King County staff.

Fernandes Associates then developed a list of interviewees by contacting neighborhood planning staff and leaders in the South Park community and obtaining names of people to be interviewed. A list of all the businesses along 14th Avenue South was obtained and several business representatives were interviewed. At each interview the consultant went over the names of people interviewed and added any new names not already on the list. At the conclusion of the interview period, it appeared that there were no major omissions.

The consultant showed interviewees the drawings for the bridge alternatives as contained in the Design Report. Some wanted to discuss and review the contents of the Design Report and the matrix, and obtained copies of both.

Background

Since the mid-1980's, King County and the City of Tukwila have recognized the need to rehabilitate the 14th/16th Avenue South bridge. As discussed previously in this report, Sverdrup Corporation concluded that the bridge needs repair or replacement within the next ten years. The King County Design Report prepared by Sverdrup Corporation in April of 1994, provides four engineering alternatives for repairing and replacing the 14th/16th Avenue South bridge. The April 1994 report follows three other engineering reports also prepared by Sverdrup Corporation, which included an operational investigation of the existing bridge mechanical and electrical systems, a life cycle cost analysis comparing bridge rehabilitation versus replacement, and the alternative alignment and bridge type study.

Alternatives For Replacing Or Repairing Bridge

The alternatives under consideration by Sverdrup Corporation included:

- one repair option - repairing and retaining the existing bridge, and
- three replacement alternatives: fifty-five foot and hundred-foot-high fixed bridges and a movable bridge with no height restrictions.

At the preliminary design level, it appears that each of the replacement alternatives could entail encroachment on or near land currently owned or occupied by businesses or residents in the South Park area. Building a replacement bridge parallel to and longer than the existing bridge as proposed in the Design Report would require property acquisition.

The drawings of each replacement alternative (presented at the end of the Chapter) show the amounts of additional land that would be required with a new bridge. The lengthwise extensions on the eastside of the River are designed to be built on Boeing property. The extensions on the westside of the River are designed to be built on, above or near existing businesses on 14th Avenue South, the main north/south arterial through South Park's business district. Since the drawings have not been superimposed on existing land use or property maps it is difficult to determine the exact impacts on each property. It must also be emphasized that the layouts presented by Sverdrup are at a preliminary level of detail and could be modified extensively during detailed design. The following discussion is based upon the preliminary drawings provided by Sverdrup Corporation.

The 55 foot high bridge and the movable bridge alternatives would cross Dallas and Sullivan streets, cutting into or directly in front of some businesses now at the foot of the bridge. On the south side, the bridge alternatives are on Boeing property and the First Interstate Bank, which is leased from Boeing. The 100 foot high bridge would extend south on 14th Avenue South to Donovan Street, affecting properties on both sides of the

street for two and one half blocks. On the north side, the bridge is designed to extend on 16th Avenue South within yards of East Marginal Way.

The impacts of each alternative are summarized on the matrix in the next two pages. The impacts included in the matrix include relative cost, natural environment, built environment, navigation constraints, transportation circulation, institutional impacts, land ownership, duration and community and business impacts.

Community And Business Issues

Historic Preservation

The bridge is an historic structure listed in the National Register of Historic Places and is inventoried as part of the King County Historic Sites Survey (as per Joan Robinson, Archaeological Consultant, letter to William Vlcek, King County Division of Roads and Engineering, 1/22/93). The bridge was built in 1931 with a Scherzer Rolling Lift Bascule structure and is the only one of its type in the State. The identification of the bridge as an historic structure has both institutional and community implications.

The institutional implication is that as a structure listed in the National Register of Historic Places, federal permits under Section 106 of the National Historic Preservation Act are required to replace the bridge (Joan Robinson letter 1/22/93).

The bridge is considered by the community to be a significant landmark of historic importance. There was strong sentiment in favor of preserving the bridge through rehabilitation. The community voiced concern about what would happen to the existing bridge if replaced with a new bridge: whether it would be torn down or retained but abandoned as a useable roadway.

Integration Of Bridge Rehabilitation Into Neighborhood Land Use And Transportation Design

Some community representatives indicated that discussions of land use and transportation design for the South Park area included transforming the bridge into a two-lane, bicycle and pedestrian friendly, boulevard-type of structure. They wanted to see these types of residents' ideas incorporated into a resolution of the 16th Avenue South bridge.

Other community representatives said that they had discussed a reduction in the number of lanes of traffic on the bridge and/or re-routing of trucks not destined for South Park but which used the bridge and 14th Avenue

South as a north/south thoroughfare. Some residents had ideas on the alternate routes and arterials that might be considered and expressed keen interest in having such ideas incorporated into eventual bridge designs.

Some of those interviewed expressed concern that the Design Report conclusions about the durability of the bridge were based on existing traffic volumes and characteristics but many residents and business occupants hoped to change the existing traffic patterns. They envisioned reduced traffic flow over the bridge and the elimination of truck traffic destined for destinations other than South Park. They expected that the engineering assessment of the durability of the bridge and its life span might be extended with reduced traffic flow and a reduction in the number of large trucks. They wanted to see alternate traffic volumes and types incorporated into projections of the life span of the bridge. They suggested this might influence the projected life of the rehabilitation option.

The replacement bridge designs on the South Park side of the River could have an impact on the east/west traffic flow. The 100 foot bridge would significantly affect the intersection at Cloverdale Street and the traffic flow onto and from Cloverdale Street, a major east/west arterial. South Park businesses and residents depend on Cloverdale for transportation by bus, car or truck to and from other parts of Seattle and its disruption causes concern.

Impacts On South Park Business

The three bridge replacement alternatives are designed parallel to and west of the existing bridge, on land currently owned by Boeing and other businesses. The bridge alternatives are designed to be longer than the existing bridge, running on or along 14th Avenue South, which is the main arterial running north/south through the heart of the South Park business district. The 100 foot alternative would have the most significant impact on the majority of the business district from the bridge past Cloverdale Street down to Donovan Street. The 55-foot-high and the movable bridge alternatives would not consume as much of the business property but nevertheless would impact some properties significantly.

The community expressed strong support for the retention of their businesses and opposition to having a new bridge impact their businesses or business district. Many saw the business district as a yet undeveloped resource and one they hoped would be developed in the future as part of the neighborhood plan.

It should be noted that there also are some residences interspersed among the business properties that would be equally impacted.

Right-Of-Way Property Acquisition

As designed, each of the replacement alternatives would require right-of-way acquisition from property owners. All property owners potentially impacted by this project were very troubled by the prospect of their properties being acquired for a new bridge. One prominent owner, Boeing, stated that since the mid nineteen-eighties they had discussed resolutions to the bridge problems with local governments and were willing to work cooperatively in order to fit their land use and development plans with those of local governments. After waiting several years for a decision on the bridge, Boeing went ahead with its plans and now has specific uses and plans for its properties north and west of the bridge. At this point, Boeing stated that the County would have to condemn its property in order to acquire it for the bridge.

Inter-Jurisdictional Coordination

The majority of South Park and the area impacted by the replacement alternatives falls within the City of Seattle. Several interviewees expressed the need for a resolution to the bridge to be coordinated with the City of Seattle, King County Planning and the Washington State Department of Transportation since such coordination apparently had not taken place in the development of alternatives for the bridge.

Some suggested that the replacement alternatives were inconsistent with the Seattle Comprehensive Plan and particularly the "Urban Village" concept. They felt that the intrusion of the bridge into the heart of the South Park business district was inconsistent with the urban village concept which suggests a neighborhood business center to support a neighborhood.

The residents indicated that the preservation of their neighborhood was linked to the preservation of the business district and the retention of the traffic flows west of 14th Avenue South. They argued that the replacement alternatives would destroy their business district to varying extents.

Environmental Justice Issues

South Park residents stated that they have a long history of struggles with local governments attempting to site unpopular public facilities in their neighborhood. They feel their neighborhood has been an environmental dumping ground and the needs and concerns of the residents have been ignored. They pointed out that the residents are now well organized and poised to scrutinize and do battle with the potential location of any unwanted facilities or disruption to their neighborhood.

Many residents and business owners were concerned that planning and design of the bridge had been carried out without input from the

community. They stated that if the County had consulted them ahead of time, the County could have spent money on feasible alternatives to repair the existing bridge rather than on the replacement alternatives which conflict with the needs and goals of the community.

Some residents reflected that land values, particularly for businesses on 14th Avenue South, were likely to plummet with the replacement alternatives that run parallel to or on the main street. They stated that even with speculation that the County is considering building a new bridge that would consume land now owned by them is a major deterrent to future investment and property values. They recommended that the County come to a speedy decision on the bridge so that businesses could go ahead with their plans and long-term investments.

Recommended Next Steps

This set of recommendations was not solicited from the community but represents Fernandes Associate's best judgment at this time.

- Evaluate bridge alternatives from a broader perspective that includes at a minimum land use, transportation and economic development.
- Collaborate with the City of Seattle Planning Department, Seattle Office of Neighborhoods, Seattle Engineering, King County Planning, City of Tukwila and the Washington State Department of Transportation on approaches to resolving the bridge issue.
- Work with the community and local businesses on a comprehensive vision for the area and solicit from them ideas on how the bridge designs might fit into an overall scheme.

People Contacted

Dr. Eric Anderson, business owner, South Park Chiropractor
Elma Borbe, Seattle Department of Construction and Land Use
Penny Cocking, South Park Resident, Duwamish Valley Neighborhood
Preservation Coalition
George Cook, resident and President, South Park Community Club
Elsie Crossman, Seattle Planning Department
Charlie Cuniff, ECCOS, Environmental Coalition of South Seattle
Luci Elle, Crime Prevention Center, 14th Ave. S. business
Encarnacion Garcia, Owner, Jalisco Restaurant, 14th Ave. S.
Joshua Goldfinger, King County Planning Department
R. K. "Puni" Hokea, Director of Human Resources, Sea Mar Community
Health Center, 14th Ave. S. business
Laurie Kovack, Georgetown Community Coalition
Dave McCormick, WSDOT District I
Ron Lewis, Seattle Planning Department
Stan Locke, Seattle Department of Neighborhoods
Sal Garcia, Owner, Mexi-Mart Food and Video, 14th Ave. S. business
Dennis Meyer, Seattle Planning Department
Dick Mohr, Kidder Matthews & Segner Inc., business Real Estate
Tim O'Brien, Historic Preservationist, Georgetown resident, Duwamish
Valley Neighborhood Preservation Coalition
Aaron Passow, Resident and President, South Park Crime Prevention
Center
Mark Petersen, Long Painting, South Park business
Pony Express, Lucy, 14th Avenue South business
Dorothy Schubert, South Park business owner and resident
Russell Segner, Kidder Mathews & Segner, Inc., Real Estate and Greater
Duwamish Alliance
Saul Silva, Finance Director, Jalisco Restaurant, 14th Ave. S. business
Vernon Umetsu, Tukwila Planning Department
Velma Veloria, Washington State Representative and Greater Duwamish
Alliance
Jeff Zahir, Manager, Corporate Planning, The Boeing Company, 14/16th
Ave. S. property owner

Table 17
14TH/16TH AVENUE SOUTH BRIDGE - IMPACT MATRIX

IMPACTS	REHAB. EXIST. BRIDGE	REPLACEMENT 55 FOOT BRIDGE	REPLACEMENT 100 FOOT BRIDGE	REPLACEMENT BASCULE BRIDGE
COSTS				
Construction	1	1	2	3
Repair & maintenance	3	1	1	2
Bridge oper. problems	2	1	1	2
ENVIRONMENT				
Contaminated sediment	1	2	2	3
BUILT ENVT.				
Historic preserv.	1	3	3	3
Construct. impacts on exist. bridge	2	2	2	3
Vulnerability to ship impact	3	2	1	2
NAVIGATION				
Clearance	1	3	2	1
TRANSPORTATION				
Roadway stds.	3	1	1	1
Traffic disruption during construction	3	1	1	1
Bridge grade	2	3	3	2
Relocation/re-routing existing intersect/ arterials	1	1	3	1
Safety & congestion	3	2	2	2
Traffic Dis- ruption due to openings	3	1	1	3

KEY: Negative Impacts: 1-Lowest 2-Medium 3-Highest

Table 18
14TH/16TH AVENUE SOUTH BRIDGE - PRELIMINARY IMPACT MATRIX

	REHAB EXIST. BRIDGE	REPLACEMENT 55 FOOT BRIDGE	REPLACEMENT 100 FOOT BRIDGE	REPLACEMENT BASCULE BRIDGE
INSTITUTIONAL				
Permits	1	3	2	2
LAND				
Right of Way Acquisition	0	3	3	3
DURATION				
Construction	1	2	2	3
COMMUNITY AND BUSINESS				
Historic preservation 1	3	3	3	
Land Use & Transportation Business District	1	3	3	3
Inter-jurisdictional Coordin.	1	2	3	2
Environmental Justice	1	3	3	3

KEY: Negative Impacts: 1-Lowest 2-Medium 3-Highest

Figure 20

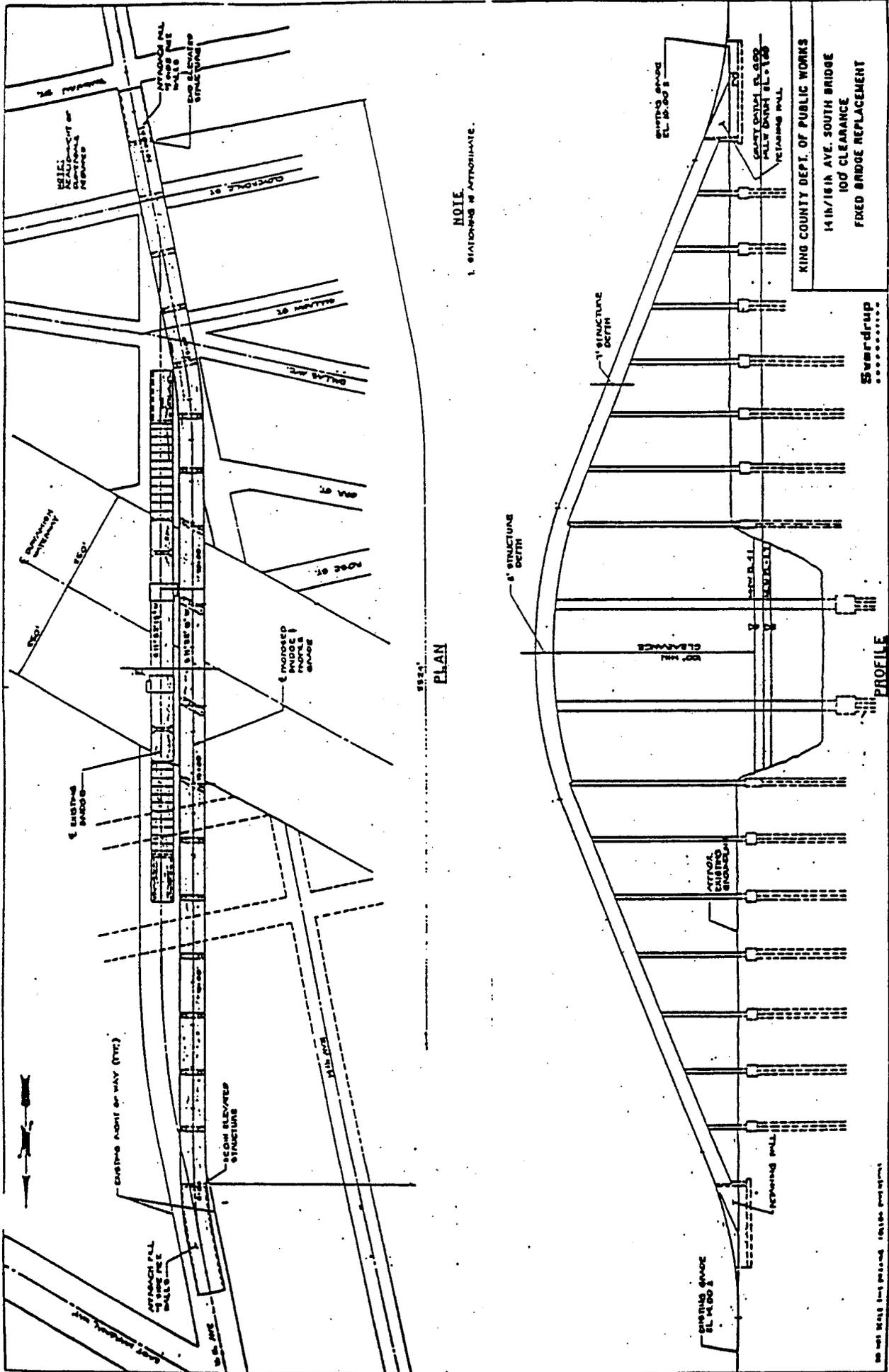


Figure 21

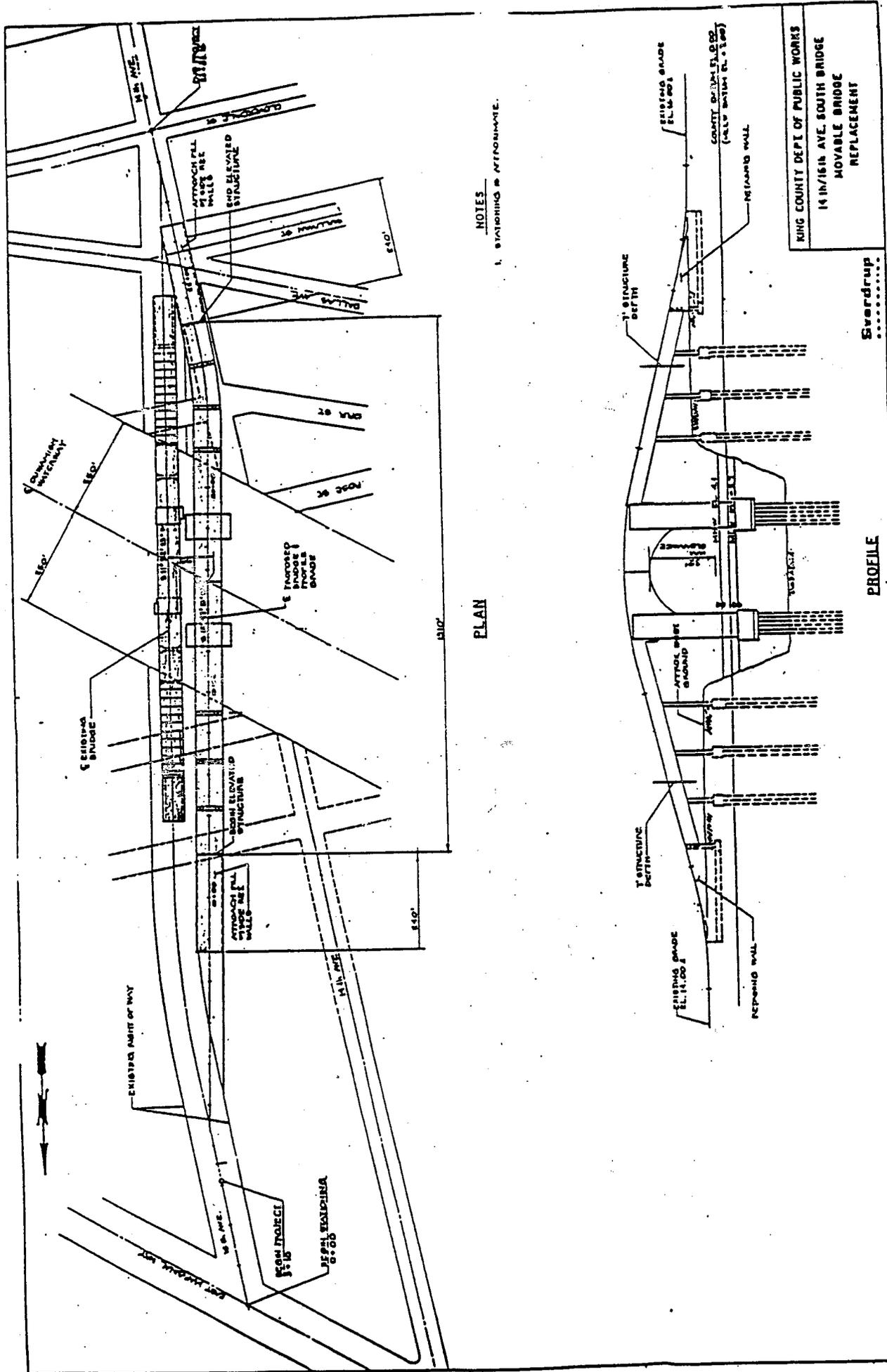
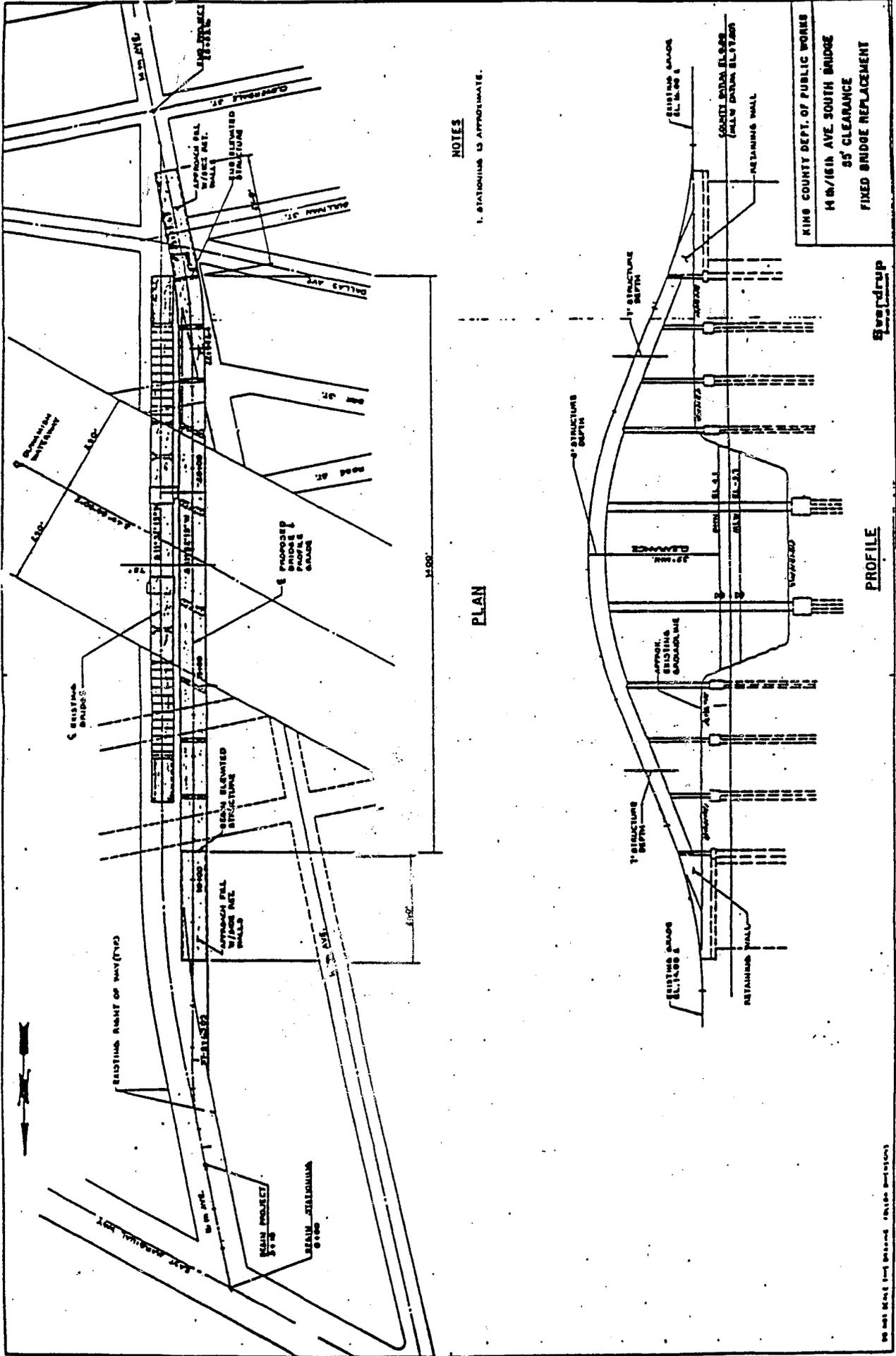


Figure 22



NOTES

1. STATIONING IS APPROXIMATE.

PLAN

PROFILE

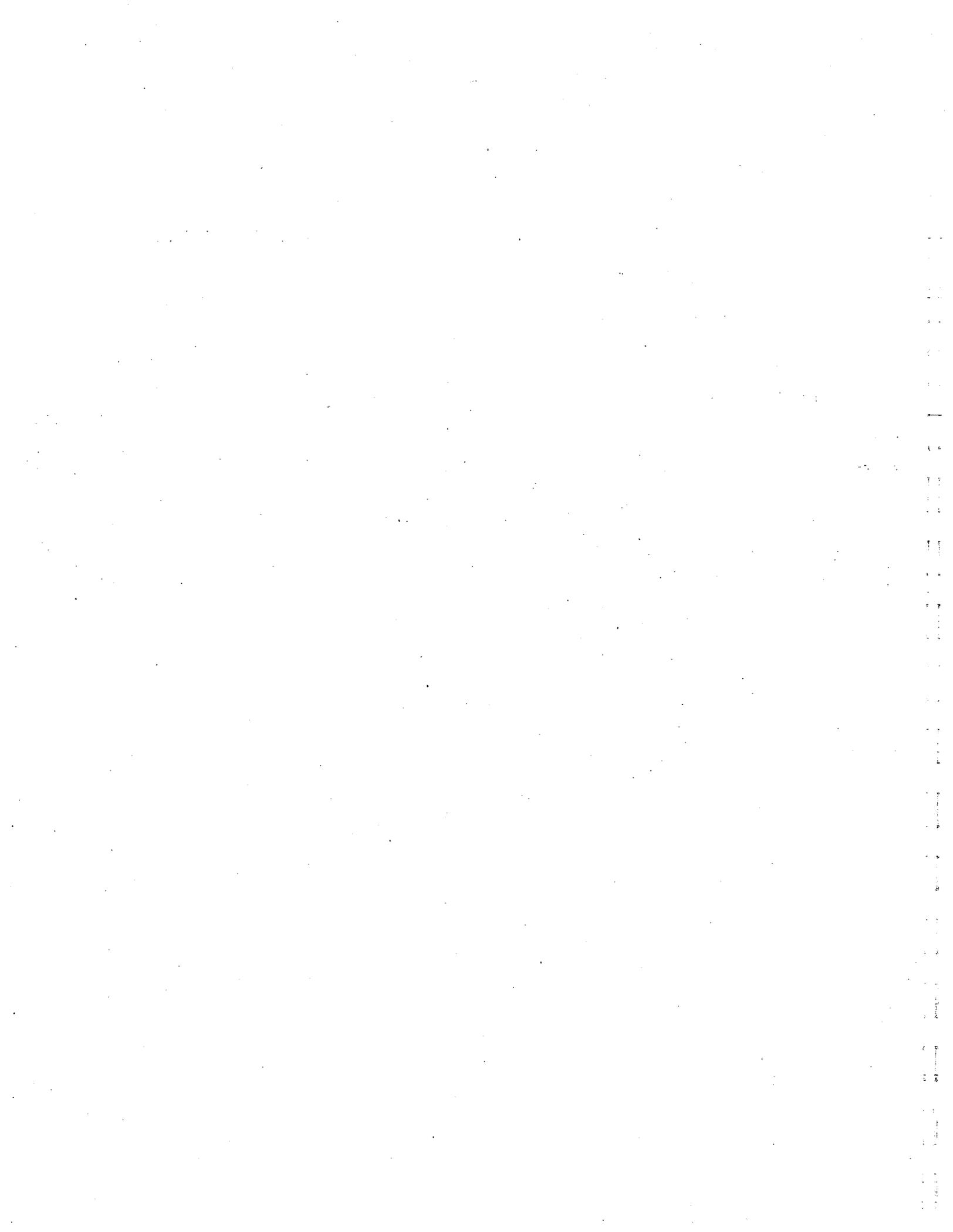
KING COUNTY DEPT. OF PUBLIC WORKS
 14th/16th AVE SOUTH BRIDGE
 95' CLEARANCE
 FIXED BRIDGE REPLACEMENT

Swedrup
 Structural Engineers

NO. 1011 10/11/10 10:00 AM 10/11/10 10:00 AM

**Chapter
Six:**

**Conclusions &
Recommendations**



CHAPTER SIX

CONCLUSIONS & RECOMMENDATIONS

Constructing a fixed span bridge 60 feet above MHW would pose minimal impacts to waterway users if mitigation is undertaken. Potential upland impacts (i.e., property acquisition and changed circulation patterns) could also occur, however, these issues can probably be further refined and minimized in detailed engineering. The conclusions and recommendations of the report are summarized below.

Vertical Height Constraints

A 55-foot-high or 60-foot-high fixed-span bridge (above MHW) would limit navigation for vessels to a height of 55 to 60 feet above the water line with the use of tides. Using the tides is a common practice throughout the world and would, with few exceptions, pose little hardship for waterway users.

Other existing structures also impact the waterway. Vertical height restrictions of 90 feet (above MHW) are imposed by the distribution power lines serving Boeing and which are located one block south of the 14th/16th Avenue Bridge. This height restriction essentially eliminates the potential for very large power sailers (i.e., with masts greater than 90 feet) to transit the waterway upriver of the 14th/16th Avenue South Bridge.

Waterway User Impacts

The fixed spans under consideration would have a limited impact on most vessels that have historically or could potentially transit this reach of the River. Tugs and barges, construction barges, fishing vessels, large motor yachts, and a variety of other vessels (including fire boats and passenger vessels et al) could freely transit under either of the fixed spans under consideration. Of specific interest, the consultant found that neither fishing vessels nor mega yachts built at DMI and returning for annual maintenance would be precluded from transiting the proposed bridges. Both of these types of vessels have a structural profile that is less than 60 feet. Further discussions with DMI officials indicated that they could accept a fixed span 62 to 63 feet above MHW. The main constraints to navigation are discussed below.

Impacts to Sailing Vessels

Larger sailing vessels that are moored in the two upriver marinas could be impacted with the 55-foot-high span but would not be impacted by the 60-foot-high span. As discussed in the report, large sailboats with mast heights of 55 to 60 feet are relatively rare in the upper reach of the Duwamish River.

Only 12 of the existing 278 vessels moored in the two upriver marinas are sailboats, accounting for only 4.3% of the total vessel population. Other sailboats have occupied moorage in these facilities in the past but the overall distribution of vessels has always been dominated by power boats.

In addition, sailboat transits of the bridge in this stretch of the River are typically very low, with less than 2 outings per year (requiring bridge openings) for 81.6% of the sailboats. Smaller sailboats attempt to transit without opening the bridge whenever possible. Only 9 sailboats required bridge openings for 5 or more outings per year.

Discussions with both the owner of South Park Marina and the sailboat representative of the Duwamish Yacht Club affirmed that sailboats would not be impacted with a bridge 60 feet above MHW. Both the South Park Marina and the Duwamish Yacht Club are full. There is waiting list at South Park Marina and there is an established market to sell memberships at the Duwamish Yacht Club. In the unlikely event that height became a constraint, additional tenants could be easily found that would not be height constrained.

Impacts to Sailing Yachts

Megayacht sailboats can have a mast height of 145 feet above the waterline, which is the vertical height restriction imposed by the West Seattle Freeway bridge. Sovereign Yachts which is located on 8th Avenue South on the Duwamish (i.e., downstream of the 14th/16th Avenue South Bridge), built a sailboat yacht with a 136 foot high mast (above the water line).

DMI has stated its interest in constructing these types of vessels. However, due to the vertical constraints of the Boeing distribution power lines which cross the River approximately one block south of the 14th/16th Avenue Bridge, the masts on these vessels would need to be stepped (i.e., placed or mounted) downstream of the Bridge. Stepping masts downstream of bridges occurs in Sturgeon Bay, Wisconsin and in Europe.

The vertical profile of these vessels without the mast would allow them to easily transit either of the bridges under consideration. As a result, the proposed fixed spans would not pose any additional constraints on transits of large sailing yachts than those that already exist.

Impacts to Delta Marine's Vessel Launching

DMI has a stiff-legged derrick mounted in the yard which is capable of launching company-built purse seiners. These vessels weigh up to 90 tons. However, larger mega yachts exceeding 100 tons require barge mounted crane launching at the present time. Manson's largest derricks (i.e., the Haakon et al) which currently provide lifting service to Delta Marine Industries (DMI), would be unable to pass the bridge. Manson's equipment requires a vertical height of 90 feet. Alternative methods for launching DMI's vessels include acquisition or rental of large cranes or construction of a launching facility (i.e., marine lift or shiplift). These facilities have an estimated cost of between \$2.1 and \$4.8 million. The marine lift and shiplift appear to offer the best alternative, at an estimated cost of \$2.1 to \$2.8 million. DMI officials recommend a shiplift sized 200' LOA x 50' and with a lifting capacity of 800 to 1000 tons would best meet their needs. This size shiplift could cost more than \$2.8 million. Full costing should be undertaken prior to bridge design.

The costs of mitigation are considerably less than acquisition of the DMI property and relocation to a site downstream of the Bridge, which is estimated to cost \$6.5 million or more.

Impacts to Manson

Manson has sized its equipment to meet the average requirements of West Coast ports. As a result, its lifting derricks require a vertical clearance of approximately 90 feet. In the past, Manson's transits into the upper reaches of the Duwamish River have included providing lifting services for DMI and other clients and for dredging.

Dredging in the upriver area is usually conducted by smaller dredging companies that would not be impacted by the fixed spans. Manson has had the dredging contract in the past but has not qualified in recent years because the contract has been limited to small businesses. The fixed spans under consideration would accommodate most of the dredging equipment used in the area including the U.S. Army Corps of Engineers equipment and that of smaller dredging firms.

Lifts for other upriver clients have not occurred for several years. Interviews with property owners indicate that there is no longer a need for Manson's lifting services. The only remaining contract that Manson has is with DMI. Evaluating the bridge tenders logs indicates that Manson has averaged 4 round trips per year during the past 5 years. At an estimated \$10,000 per lift, this loss of access amounts to approximately \$40,000 per year. Company officials indicated that there is not enough business in the upper reaches of the Duwamish to warrant modifying the equipment.

Other Navigation Impacts

Manson officials (among others) are concerned that the fixed span will preclude other businesses from locating in this area. Interviews with property owners and realtors knowledgeable about the area indicate that there is little current interest in waterfront facilities in this reach of the River. The distance from the mouth of the Duwamish is perceived as too distant and there are concerns over the condition of the sediments at existing slips including those at Boeing and Monsanto.

However, if these facilities were utilized in the future as waterfront terminals, they would still be able to accommodate virtually all vessels active in the PNW with the fixed-bridge structures under consideration. A review of vessel characteristics reveals that virtually all vessels active in the PNW that accommodate freight or passengers and that could navigate the upriver reach of the Duwamish (i.e., considering draft and beam as well as air draft restrictions) would be able to transit the proposed 55-foot or 60-foot-high fixed spans.

There are only three exceptions that may require increased vertical access. First, sailboats with masts greater than 60 feet, as discussed above. Second, derricks with vertical structures greater than 60 feet, also discussed above. Third, container cranes mounted on barges which are limited to serving remote Alaskan communities that do not have cranes available onshore. As discussed in the main report, service to these communities is stable and there is no need for additional barge-mounted crane service. This is a result of declines in fish harvesting and processing in western Alaska and because of new services by SeaLand and TOTE that have created feeder services from more remote communities to Dutch Harbor and Kodiak.

As a result, it is unlikely that any of the vacant waterfront facilities in this reach of the River will require vertical air draft greater than 60 feet above water.

Upland Impacts

At the preliminary design level, it appears that each of the replacement alternatives could entail encroachment on or near land currently owned or occupied by businesses or residents in the South Park area. Building a replacement bridge parallel to and longer than the existing bridge as proposed in the Design Report would also require property acquisition.

The drawings of each replacement alternative show the amounts of additional land that would be required with a new bridge. The lengthwise extensions on the eastside of the River are designed to be built on Boeing property. The extensions on the west side of the River are designed to be built on, above, or near existing businesses on 14th Avenue South, the main north/south arterial through South Park's business district. Since the drawings have not been superimposed on existing land use or property

maps it is difficult to determine the exact impacts on each property. It must also be emphasized that the layouts presented by Sverdrup are at a preliminary level of detail and could be modified extensively during detailed design.

There was unanimous agreement among the community and business interviewees that the three replacement alternatives were unacceptable because of their intrusion on or near property now occupied. There was corresponding agreement that the rehabilitation alternative with a fifty-year life was preferred, with the understanding that traffic, even at a reduced volume, could flow during construction.

RECOMMENDATIONS

This set of recommendations represents the consultants' best judgment.

Navigation Impacts

Request permission from the U.S. Coast Guard to construct a fixed span bridge 62 to 63 feet above MHW.

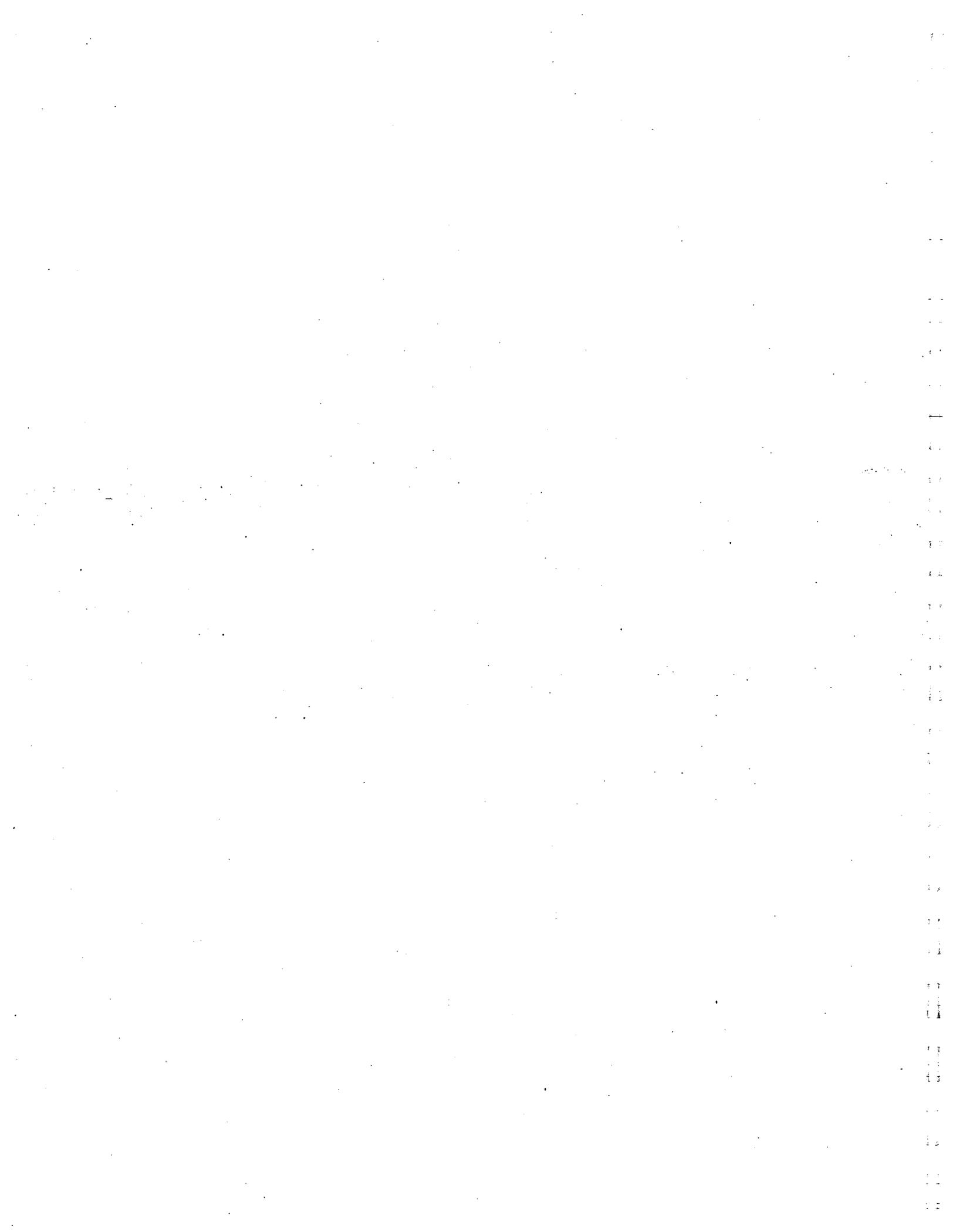
Provide mitigation to Delta Marine Industries in the form of a marine railway or shiplift. These concepts should be refined with additional input from DMI.

Upland Impacts

Evaluate bridge alternatives from a broader perspective that includes at a minimum land use, transportation and economic development.

Collaborate with the City of Seattle Planning Department, Seattle Office of Neighborhoods, Seattle Engineering, King County Planning, City of Tukwila and the Washington State Department of Transportation on approaches to resolving the bridge issue.

Work with the community and local businesses on a comprehensive vision for the area and solicit from them ideas on how the bridge designs might fit into an overall scheme.



Appendix

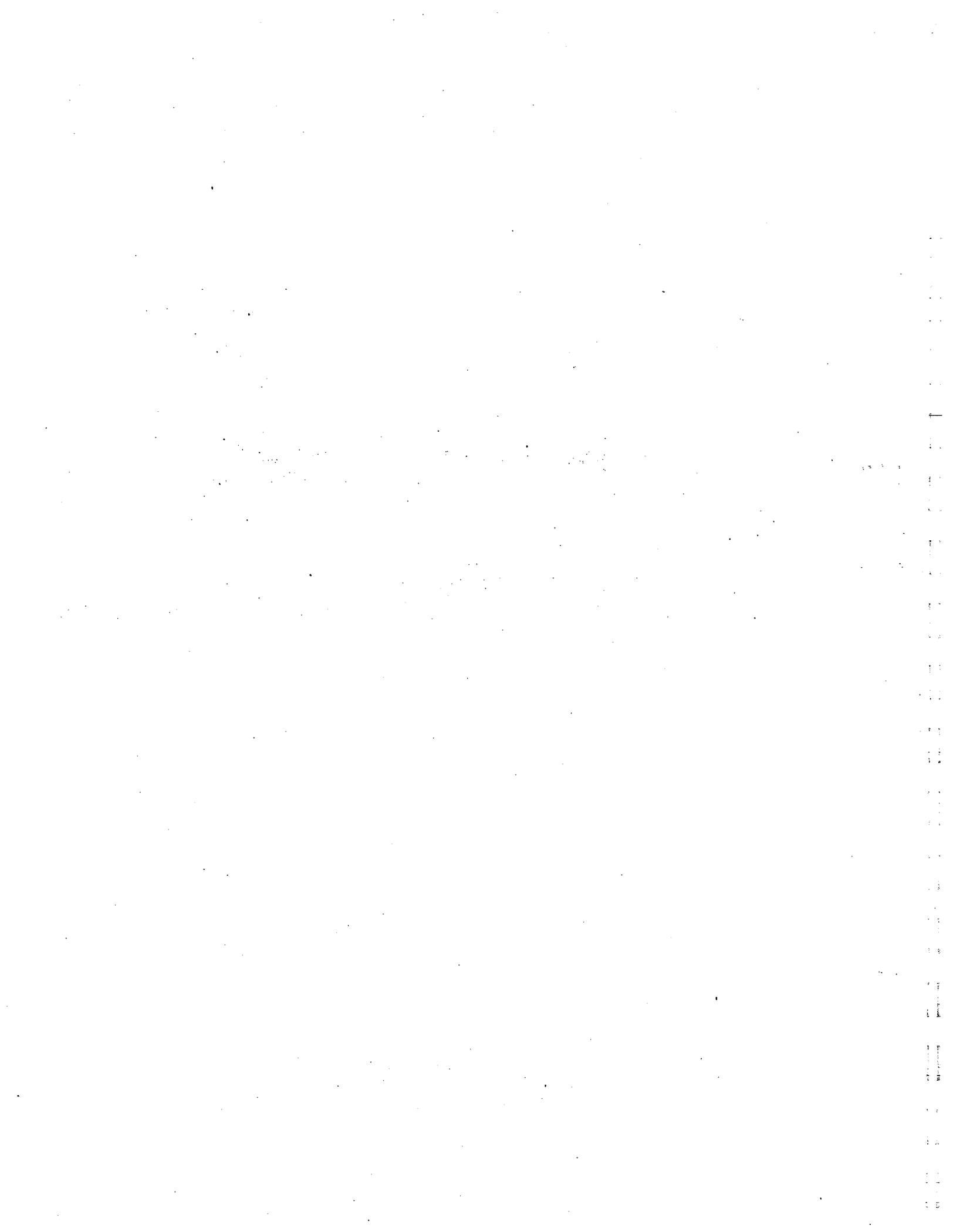


Table A-1
Tidal Influence at 8th Avenue South
Daily Lows in 1993

Month	Day	55 Foot @ LL	55 Foot @ HL	55 Foot @ ML	60 Foot @ LL	60 Foot @ HL	60 Foot @ ML
Jan	1	60.9	54.7	57.8	65.9	59.7	62.8
	2	59.9	55.5	57.7	64.9	60.5	62.7
	3	58.7	56.5	57.6	63.7	61.5	62.6
	4	57.6	57.2	57.4	62.6	62.2	62.4
	5	58.7	55.6	57.1	63.7	60.6	62.1
	6	59.7	54.1	56.9	64.7	59.1	61.9
	7	60.7	53.0	56.8	65.7	58.0	61.8
	8	61.4	52.5	56.9	66.4	57.5	61.9
	9	61.9	52.4	57.1	66.9	57.4	62.1
	10	62.0	52.6	57.3	67.0	57.6	62.3
	11	61.8	53.1	57.4	66.8	58.1	62.4
	12	61.4	53.5	57.5	66.4	58.5	62.5
	13	60.0	54.1	57.0	65.0	59.1	62.0
	14	60.7	54.6	57.6	65.7	59.6	62.6
	15	59.8	55.1	57.4	64.8	60.1	62.4
	16	58.7	55.7	57.2	63.7	60.7	62.2
	17	57.5	56.2	56.8	62.5	61.2	61.8
	18	56.7	56.2	56.4	61.7	61.2	61.4
	19	57.3	54.9	56.1	62.3	59.9	61.1
	20	57.9	53.7	55.8	62.9	58.7	60.8
	21	58.6	52.7	55.7	63.6	57.7	60.7
	22	59.3	52.1	55.7	64.3	57.1	60.7
	23	60.0	52.0	56.0	65.0	57.0	61.0
	24	60.5	52.1	56.3	65.5	57.1	61.3
	25	61.0	52.5	56.7	66.0	57.5	61.7
	26	61.2	53.0	57.1	66.2	58.0	62.1
	27	61.2	53.8	57.5	66.2	58.8	62.5
	28	60.8	54.6	57.7	65.8	59.6	62.7
	29	60.0	55.6	57.8	65.0	60.6	62.8
	30	60.0	56.6	58.3	65.0	61.6	63.3
	31	58.9	57.5	58.2	63.9	62.5	63.2
Feb	32	58.3	57.5	57.9	63.3	62.5	62.9
	33	59.0	56.0	57.5	64.0	61.0	62.5
	34	59.5	54.5	57.0	64.5	59.5	62.0
	35	60.0	53.3	56.6	65.0	58.3	61.6
	36	60.4	52.5	56.5	65.4	57.5	61.5
	37	60.7	52.5	56.6	65.7	57.5	61.6
	38	60.8	52.8	56.8	65.8	57.8	61.8
	39	60.8	53.5	57.1	65.8	58.5	62.1
	40	60.5	54.1	57.3	65.5	59.1	62.3
	41	60.0	54.8	57.4	65.0	59.8	62.4
	42	59.3	55.5	57.4	64.3	60.5	62.4
	43	60.0	56.1	58.0	65.0	61.1	63.0
	44	58.5	56.6	57.6	63.5	61.6	62.6
	45	57.6	57.1	57.3	62.6	62.1	62.3
	46	57.5	56.6	57.0	62.5	61.6	62.0
	47	57.7	55.5	56.6	62.7	60.5	61.6
	48	58.0	54.4	56.2	63.0	59.4	61.2
	49	58.2	53.4	55.8	63.2	58.4	60.8
	50	58.5	52.6	55.6	63.5	57.6	60.6
	51	59.0	52.3	55.6	64.0	57.3	60.6
	52	59.5	52.4	55.9	64.5	57.4	60.9
	53	59.9	52.9	56.4	64.9	57.9	61.4
	54	60.2	53.6	56.9	65.2	58.6	61.9
	55	60.2	54.5	57.4	65.2	59.5	62.4
	56	59.9	55.7	57.8	64.9	60.7	62.8
	57	59.4	56.8	58.1	64.4	61.8	63.1
	58	58.0	60.0	59.0	63.0	65.0	64.0

Source: BST Associates using data from TIDE Model

Month	Day	55 Foot @ LL	55 Foot @ HL	55 Foot @ ML	60 Foot @ LL	60 Foot @ HL	60 Foot @ ML
Mar	59	59.0	58.5	58.7	64.0	63.5	63.7
	60	59.7	57.4	58.5	64.7	62.4	63.5
	61	60.1	56.2	58.1	65.1	61.2	63.1
	62	60.1	54.9	57.5	65.1	59.9	62.5
	63	60.0	53.8	56.9	65.0	58.8	61.9
	64	59.8	53.1	56.4	64.8	58.1	61.4
	65	59.7	52.9	56.3	64.7	57.9	61.3
	66	59.6	53.4	56.5	64.6	58.4	61.5
	67	59.4	54.2	56.8	64.4	59.2	61.8
	68	59.2	55.0	57.1	64.2	60.0	62.1
	69	58.8	55.8	57.3	63.8	60.8	62.3
	70	58.3	56.5	57.4	63.3	61.5	62.4
	71	57.7	57.2	57.4	62.7	62.2	62.4
	72	57.8	57.0	57.4	62.8	62.0	62.4
	73	58.3	60.0	59.2	63.3	65.0	64.2
	74	58.7	56.3	57.5	63.7	61.3	62.5
	75	58.9	55.5	57.2	63.9	60.5	62.2
	76	58.9	54.7	56.8	63.9	59.7	61.8
	77	58.9	54.0	56.4	63.9	59.0	61.4
	78	58.8	53.3	56.0	63.8	58.3	61.0
	79	58.7	52.9	55.8	63.7	57.9	60.8
	80	58.7	52.9	55.8	63.7	57.9	60.8
	81	58.8	53.4	56.1	63.8	58.4	61.1
	82	58.9	54.2	56.5	63.9	59.2	61.5
	83	58.8	55.3	57.1	63.8	60.3	62.1
	84	58.6	56.6	57.6	63.6	61.6	62.6
	85	58.1	58.0	58.1	63.1	63.0	63.1
	86	59.4	57.5	58.4	64.4	62.5	63.4
	87	60.5	56.7	58.6	65.5	61.7	63.6
	88	61.2	60.0	60.6	66.2	65.0	65.6
	89	61.5	55.8	58.6	66.5	60.8	63.6
Apr	90	61.4	54.9	58.1	66.4	59.9	63.1
	91	60.9	54.1	57.5	65.9	59.1	62.5
	92	60.1	53.6	56.9	65.1	58.6	61.9
	93	59.4	53.5	56.4	64.4	58.5	61.4
	94	58.7	54.0	56.3	63.7	59.0	61.3
	95	58.2	54.8	56.5	63.2	59.8	61.5
	96	57.8	55.8	56.8	62.8	60.8	61.8
	97	57.3	56.7	57.0	62.3	61.7	62.0
	98	57.5	56.8	57.2	62.5	61.8	62.2
	99	58.3	56.4	57.3	63.3	61.4	62.3
	100	58.9	55.9	57.4	63.9	60.9	62.4
	101	59.4	55.4	57.4	64.4	60.4	62.4
	102	59.9	60.0	59.9	64.9	65.0	64.9
	103	60.1	54.9	57.5	65.1	59.9	62.5
	104	60.2	54.4	57.3	65.2	59.4	62.3
	105	60.1	54.0	57.0	65.1	59.0	62.0
	106	59.8	53.6	56.7	64.8	58.6	61.7
	107	59.4	53.3	56.4	64.4	58.3	61.4
	108	59.0	53.4	56.2	64.0	58.4	61.2
	109	58.5	53.8	56.2	63.5	58.8	61.2
	110	58.0	54.7	56.4	63.0	59.7	61.4
	111	57.6	55.9	56.7	62.6	60.9	61.7
	112	57.3	57.1	57.2	62.3	62.1	62.2
	113	58.8	56.6	57.7	63.8	61.6	62.7
	114	60.3	56.0	58.2	65.3	61.0	63.2
	115	61.5	55.5	58.5	66.5	60.5	63.5
	116	62.4	54.9	58.6	67.4	59.9	63.6
	117	62.8	60.0	61.4	67.8	65.0	66.4
	118	62.6	54.4	58.5	67.6	59.4	63.5
	119	62.1	54.0	58.0	67.1	59.0	63.0

Source: BST Associates using data from TIDE Model

Month	Day	55 Foot @ LL	55 Foot @ HL	55 Foot @ ML	60 Foot @ LL	60 Foot @ HL	60 Foot @ ML
May	120	61.1	53.8	57.5	66.1	58.8	62.5
	121	60.0	53.9	56.9	65.0	58.9	61.9
	122	58.8	54.3	56.6	63.8	59.3	61.6
	123	57.8	55.1	56.4	62.8	60.1	61.4
	124	56.8	56.1	56.5	61.8	61.1	61.5
	125	57.2	56.1	56.6	62.2	61.1	61.6
	126	58.1	55.5	56.8	63.1	60.5	61.8
	127	58.9	55.0	56.9	63.9	60.0	61.9
	128	59.6	54.6	57.1	64.6	59.6	62.1
	129	60.2	54.2	57.2	65.2	59.2	62.2
	130	60.6	54.0	57.3	65.6	59.0	62.3
	131	61.0	53.7	57.4	66.0	58.7	62.4
	132	61.1	60.0	60.6	66.1	65.0	65.6
	133	61.1	53.6	57.3	66.1	58.6	62.3
	134	60.9	53.5	57.2	65.9	58.5	62.2
	135	60.5	53.5	57.0	65.5	58.5	62.0
	136	59.9	53.7	56.8	64.9	58.7	61.8
	137	59.1	54.2	56.6	64.1	59.2	61.6
	138	58.1	55.0	56.6	63.1	60.0	61.6
	139	57.1	56.2	56.7	62.1	61.2	61.7
	140	57.6	56.2	56.9	62.6	61.2	61.9
	141	59.1	55.4	57.2	64.1	60.4	62.2
	142	60.6	54.7	57.7	65.6	59.7	62.7
	143	61.9	54.2	58.0	66.9	59.2	63.0
	144	62.8	53.9	58.3	67.8	58.9	63.3
	145	63.3	53.7	58.5	68.3	58.7	63.5
	146	63.3	60.0	61.7	68.3	65.0	66.7
	147	62.9	53.7	58.3	67.9	58.7	63.3
	148	62.1	53.8	57.9	67.1	58.8	62.9
	149	60.9	54.1	57.5	65.9	59.1	62.5
150	59.6	54.5	57.1	64.6	59.5	62.1	
Jun	151	58.2	55.2	56.7	63.2	60.2	61.7
	152	56.9	56.1	56.5	61.9	61.1	61.5
	153	57.0	55.7	56.4	62.0	60.7	61.4
	154	58.0	54.8	56.4	63.0	59.8	61.4
	155	58.8	54.1	56.5	63.8	59.1	61.5
	156	59.6	53.6	56.6	64.6	58.6	61.6
	157	60.3	53.3	56.8	65.3	58.3	61.8
	158	60.8	53.1	57.0	65.8	58.1	62.0
	159	61.2	53.1	57.2	66.2	58.1	62.2
	160	61.5	53.1	57.3	66.5	58.1	62.3
	161	61.7	60.0	60.8	66.7	65.0	65.8
	162	61.6	53.3	57.4	66.6	58.3	62.4
	163	61.3	53.5	57.4	66.3	58.5	62.4
	164	60.7	53.9	57.3	65.7	58.9	62.3
	165	59.9	54.5	57.2	64.9	59.5	62.2
	166	58.7	55.4	57.1	63.7	60.4	62.1
	167	57.4	56.4	56.9	62.4	61.4	61.9
	168	57.7	56.1	56.9	62.7	61.1	61.9
	169	59.0	54.9	56.9	64.0	59.9	61.9
	170	60.4	53.9	57.1	65.4	58.9	62.1
	171	61.5	53.4	57.5	66.5	58.4	62.5
	172	62.5	53.1	57.8	67.5	58.1	62.8
	173	63.1	53.2	58.1	68.1	58.2	63.1
	174	63.2	53.4	58.3	68.2	58.4	63.3
	175	63.0	60.0	61.5	68.0	65.0	66.5
	176	62.4	53.8	58.1	67.4	58.8	63.1
	177	61.5	54.3	57.9	66.5	59.3	62.9
	178	60.3	54.8	57.5	65.3	59.8	62.5
	179	59.0	55.4	57.2	64.0	60.4	62.2
	180	57.5	56.0	56.8	62.5	61.0	61.8

Source: BST Associates using data from TIDE Model

Month	Day	55 Foot @ LL	55 Foot @ HL	55 Foot @ ML	60 Foot @ LL	60 Foot @ HL	60 Foot @ ML
Jul	181	56.7	56.1	56.4	61.7	61.1	61.4
	182	57.5	54.9	56.2	62.5	59.9	61.2
	183	58.3	53.9	56.1	63.3	58.9	61.1
	184	59.0	53.2	56.1	64.0	58.2	61.1
	185	59.7	52.8	56.3	64.7	57.8	61.3
	186	60.3	52.7	56.5	65.3	57.7	61.5
	187	60.9	52.8	56.8	65.9	57.8	61.8
	188	61.3	53.0	57.1	66.3	58.0	62.1
	189	61.5	53.3	57.4	66.5	58.3	62.4
	190	61.6	53.8	57.7	66.6	58.8	62.7
	191	61.5	60.0	60.7	66.5	65.0	65.7
	192	61.0	54.4	57.7	66.0	59.4	62.7
	193	60.3	55.1	57.7	65.3	60.1	62.7
	194	59.2	56.0	57.6	64.2	61.0	62.6
	195	57.9	56.9	57.4	62.9	61.9	62.4
	196	57.9	56.4	57.2	62.9	61.4	62.2
	197	58.9	55.0	57.0	63.9	60.0	62.0
	198	59.9	53.8	56.9	64.9	58.8	61.9
	199	60.8	53.1	57.0	65.8	58.1	62.0
	200	61.6	52.9	57.3	66.6	57.9	62.3
	201	62.1	53.1	57.6	67.1	58.1	62.6
	202	62.4	53.6	58.0	67.4	58.6	63.0
	203	62.3	54.1	58.2	67.3	59.1	63.2
	204	61.9	54.7	58.3	66.9	59.7	63.3
	205	61.2	60.0	60.6	66.2	65.0	65.6
	206	60.3	55.4	57.8	65.3	60.4	62.8
	207	59.2	55.9	57.6	64.2	60.9	62.6
	208	58.0	56.5	57.2	63.0	61.5	62.2
	209	57.0	56.7	56.8	62.0	61.7	61.8
	210	57.4	55.5	56.4	62.4	60.5	61.4
	211	57.8	54.3	56.1	62.8	59.3	61.1
Aug	212	58.3	53.4	55.9	63.3	58.4	60.9
	213	58.9	52.9	55.9	63.9	57.9	60.9
	214	59.4	52.7	56.1	64.4	57.7	61.1
	215	60.0	52.9	56.4	65.0	57.9	61.4
	216	60.4	53.2	56.8	65.4	58.2	61.8
	217	60.8	53.7	57.2	65.8	58.7	62.2
	218	61.0	54.4	57.7	66.0	59.4	62.7
	219	60.9	55.2	58.1	65.9	60.2	63.1
	220	60.6	60.0	60.3	65.6	65.0	65.3
	221	60.0	56.1	58.1	65.0	61.1	63.1
	222	59.1	57.1	58.1	64.1	62.1	63.1
	223	58.0	57.9	57.9	63.0	62.9	62.9
	224	58.8	56.6	57.7	63.8	61.6	62.7
	225	59.4	55.2	57.3	64.4	60.2	62.3
	226	59.9	54.1	57.0	64.9	59.1	62.0
	227	60.3	53.3	56.8	65.3	58.3	61.8
	228	60.6	53.1	56.9	65.6	58.1	61.9
	229	60.9	53.4	57.2	65.9	58.4	62.2
	230	61.1	54.1	57.6	66.1	59.1	62.6
	231	61.0	54.8	57.9	66.0	59.8	62.9
	232	60.7	55.6	58.2	65.7	60.6	63.2
	233	60.2	56.3	58.3	65.2	61.3	63.3
	234	59.5	60.0	59.8	64.5	65.0	64.8
	235	58.7	56.9	57.8	63.7	61.9	62.8
	236	57.8	57.4	57.6	62.8	62.4	62.6
	237	57.8	56.8	57.3	62.8	61.8	62.3
	238	58.1	55.8	56.9	63.1	60.8	61.9
	239	58.2	54.8	56.5	63.2	59.8	61.5
	240	58.3	53.9	56.1	63.3	58.9	61.1
	241	58.4	53.2	55.8	63.4	58.2	60.8
	242	58.6	53.0	55.8	63.6	58.0	60.8

Source: BST Associates using data from TIDE Model

Month	Day	55 Foot @ LL	55 Foot @ HL	55 Foot @ ML	60 Foot @ LL	60 Foot @ HL	60 Foot @ ML
Sep	243	58.9	53.2	56.0	63.9	58.2	61.0
	244	59.2	53.6	56.4	64.2	58.6	61.4
	245	59.5	54.3	56.9	64.5	59.3	61.9
	246	59.7	55.2	57.4	64.7	60.2	62.4
	247	59.7	56.2	58.0	64.7	61.2	63.0
	248	59.5	57.3	58.4	64.5	62.3	63.4
	249	59.0	58.4	58.7	64.0	63.4	63.7
	250	58.3	60.0	59.2	63.3	65.0	64.2
	251	59.4	57.4	58.4	64.4	62.4	63.4
	252	60.1	56.3	58.2	65.1	61.3	63.2
	253	60.5	55.2	57.9	65.5	60.2	62.9
	254	60.6	54.3	57.4	65.6	59.3	62.4
	255	60.4	53.6	57.0	65.4	58.6	62.0
	256	60.1	53.4	56.8	65.1	58.4	61.8
	257	59.9	53.9	56.9	64.9	58.9	61.9
	258	59.7	54.7	57.2	64.7	59.7	62.2
	259	59.5	55.6	57.6	64.5	60.6	62.6
	260	59.2	56.5	57.8	64.2	61.5	62.8
	261	58.7	57.3	58.0	63.7	62.3	63.0
	262	58.1	58.0	58.1	63.1	63.0	63.1
	263	58.5	57.5	58.0	63.5	62.5	63.0
	264	56.8	60.0	58.4	61.8	65.0	63.4
	265	58.9	56.1	57.5	63.9	61.1	62.5
	266	59.2	55.4	57.3	64.2	60.4	62.3
	267	59.3	54.7	57.0	64.3	59.7	62.0
	268	59.2	54.1	56.6	64.2	59.1	61.6
	269	59.0	53.5	56.3	64.0	58.5	61.3
	270	58.7	53.2	56.0	63.7	58.2	61.0
	271	58.5	53.4	55.9	63.5	58.4	60.9
	272	58.4	53.9	56.1	63.4	58.9	61.1
	Oct	273	58.3	54.7	56.5	63.3	59.7
274		58.3	55.8	57.0	63.3	60.8	62.0
275		58.2	57.0	57.6	63.2	62.0	62.6
276		58.3	57.9	58.1	63.3	62.9	63.1
277		59.6	57.5	58.6	64.6	62.5	63.6
278		60.7	57.0	58.8	65.7	62.0	63.8
279		61.5	56.3	58.9	66.5	61.3	63.9
280		55.5	60.0	57.8	60.5	65.0	62.8
281		61.9	54.8	58.3	66.9	59.8	63.3
282		61.8	54.1	58.0	66.8	59.1	63.0
283		61.3	53.7	57.5	66.3	58.7	62.5
284		60.5	53.7	57.1	65.5	58.7	62.1
285		59.6	54.2	56.9	64.6	59.2	61.9
286		58.8	55.1	57.0	63.8	60.1	62.0
287		58.1	56.2	57.1	63.1	61.2	62.1
288		57.6	57.2	57.4	62.6	62.2	62.4
289		58.1	57.0	57.5	63.1	62.0	62.5
290		58.8	56.5	57.6	63.8	61.5	62.6
291		59.4	55.9	57.7	64.4	60.9	62.7
292		59.8	55.4	57.6	64.8	60.4	62.6
293		60.1	55.0	57.6	65.1	60.0	62.6
294		54.5	60.0	57.3	59.5	65.0	62.3
295		60.3	54.1	57.2	65.3	59.1	62.2
296		60.3	53.7	57.0	65.3	58.7	62.0
297		60.0	53.4	56.7	65.0	58.4	61.7
298		59.7	53.3	56.5	64.7	58.3	61.5
299		59.1	53.4	56.3	64.1	58.4	61.3
300		58.6	53.9	56.2	63.6	58.9	61.2
301		57.9	54.8	56.4	62.9	59.8	61.4
302		57.4	56.0	56.7	62.4	61.0	61.7
303		57.3	56.8	57.1	62.3	61.8	62.1

Source: BST Associates using data from TIDE Model

Month	Day	55 Foot @ LL	55 Foot @ HL	55 Foot @ ML	60 Foot @ LL	60 Foot @ HL	60 Foot @ ML
Nov	304	58.8	56.3	57.6	63.8	61.3	62.6
	305	60.2	55.8	58.0	65.2	60.8	63.0
	306	61.5	55.3	58.4	66.5	60.3	63.4
	307	62.4	54.8	58.6	67.4	59.8	63.6
	308	62.9	54.4	58.6	67.9	59.4	63.6
	309	54.0	60.0	57.0	59.0	65.0	62.0
	310	62.9	53.7	58.3	67.9	58.7	63.3
	311	62.4	53.6	58.0	67.4	58.6	63.0
	312	61.4	53.7	57.6	66.4	58.7	62.6
	313	60.2	54.2	57.2	65.2	59.2	62.2
	314	58.9	55.1	57.0	63.9	60.1	62.0
	315	57.6	56.1	56.9	62.6	61.1	61.9
	316	57.3	56.5	56.9	62.3	61.5	61.9
	317	58.2	55.6	56.9	63.2	60.6	61.9
	318	59.1	55.0	57.0	64.1	60.0	62.0
	319	59.7	54.4	57.1	64.7	59.4	62.1
	320	60.2	54.0	57.1	65.2	59.0	62.1
	321	60.6	53.7	57.2	65.6	58.7	62.2
	322	60.9	53.5	57.2	65.9	58.5	62.2
	323	61.0	53.3	57.1	66.0	58.3	62.1
	324	53.2	60.0	56.6	58.2	65.0	61.6
	325	60.9	53.2	57.0	65.9	58.2	62.0
	326	60.6	53.2	56.9	65.6	58.2	61.9
	327	60.1	53.5	56.8	65.1	58.5	61.8
	328	59.4	53.9	56.7	64.4	58.9	61.7
	329	58.5	54.7	56.6	63.5	59.7	61.6
	330	57.5	55.8	56.7	62.5	60.8	61.7
	331	57.2	56.4	56.8	62.2	61.4	61.8
	332	58.6	55.4	57.0	63.6	60.4	62.0
	333	60.1	54.5	57.3	65.1	59.5	62.3
Dec	334	61.5	53.9	57.7	66.5	58.9	62.7
	335	62.5	53.5	58.0	67.5	58.5	63.0
	336	63.2	53.2	58.2	68.2	58.2	63.2
	337	63.3	53.2	58.2	68.3	58.2	63.2
	338	63.0	53.2	58.1	68.0	58.2	63.1
	339	53.5	60.0	56.7	58.5	65.0	61.7
	340	62.2	53.8	58.0	67.2	58.8	63.0
	341	61.1	54.3	57.7	66.1	59.3	62.7
	342	59.6	55.0	57.3	64.6	60.0	62.3
	343	58.1	55.8	57.0	63.1	60.8	62.0
	344	56.8	56.5	56.7	61.8	61.5	61.7
	345	57.8	55.2	56.5	62.8	60.2	61.5
	346	58.6	54.1	56.4	63.6	59.1	61.4
	347	59.4	53.4	56.4	64.4	58.4	61.4
	348	60.0	52.9	56.5	65.0	57.9	61.5
	349	60.5	52.7	56.6	65.5	57.7	61.6
	350	60.8	52.6	56.7	65.8	57.6	61.7
	351	61.1	52.6	56.8	66.1	57.6	61.8
	352	61.1	52.7	56.9	66.1	57.7	61.9
	353	61.0	52.9	57.0	66.0	57.9	62.0
	354	53.3	60.0	56.6	58.3	65.0	61.6
	355	60.7	53.7	57.2	65.7	58.7	62.2
	356	60.1	54.2	57.2	65.1	59.2	62.2
	357	59.3	55.0	57.1	64.3	60.0	62.1
	358	58.1	55.9	57.0	63.1	60.9	62.0
	359	57.0	56.8	56.9	62.0	61.8	61.9
	360	58.3	55.4	56.9	63.3	60.4	61.9
	361	59.6	54.2	56.9	64.6	59.2	61.9
	362	60.8	53.2	57.0	65.8	58.2	62.0
	363	61.9	52.6	57.2	66.9	57.6	62.2
	364	62.6	52.4	57.5	67.6	57.4	62.5
Averages		59.6	55.0	57.3	64.6	60.0	62.3

Source: BST Associates using data from TIDE Model

Table A-2
Washington & Alaska Barges With Highest Fixed Point > 55'

NAME	NET REG. LENGTH TONS	BEAM OVERALL	HIGHEST FIXED POINT	CAP. TONS	DRAFT LOADED	DRAFT LIGHT	EQUIPMENT	BASE	STATE OPERATOR
DRY CARGO									
Air Draft 55' to 59'									
HAWAII 9	7067	430	55.0	16,000	21.2	6	CONVEYORS	HILO	HI CROWLEY MARINE SERVICES, INC.
MIDWAY	3364	330.1	58.0	6,000	10	4	NONE	KETCHIKAN	AK ALASKA PULP CORP.
BARKLEY SOUND	3812	234	59.0	2,315	12	2	LIFT TRUCKS	SEATTLE	WA PUGET SOUND FREIGHT LINES
Air Draft 60' to 64'									
FOSS 290	1341	210	60.0	3,100	15	2	NONE	SEATTLE	WA FOSS MARITIME COMPANY
ALASKAN SPIRIT	1767	230	60.0	4,000	12.5	4	NONE	SKAGWAY	AK MARITIME NORTH LTD.
BARGE 500-1	7171	400	62.0	12,000	14.3	5	NONE	SEATTLE	WA CROWLEY MARINE SERVICES, INC.
BARGE 500-4	7171	400	62.0	12,000	14.3	5	NONE	SEATTLE	WA CROWLEY MARINE SERVICES, INC.
BARGE 500-3	7171	400	62.0	12,000	14.3	5	NONE	SEATTLE	WA CROWLEY MARINE SERVICES, INC.
MOLOKAI	8185	400	64.0	16,000	19.9	4.9	NONE	PORTLAND	OR CROWLEY MARINE SERVICES, INC.
LANAI	8185	400	64.0	16,000	19.9	4.9	NONE	PORTLAND	OR CROWLEY MARINE SERVICES, INC.
Air Draft 65'+									
CAPE FLATTERY	4378	253	68.0	4,000	13	3	LIFT TRUCKS	SEATTLE	WA PUGET SOUND FREIGHT LINES
SILVER BAY	3153	302	70.0	5,000	14.5	5.3	NONE	SITKA	AK ALASKA PULP CORP.
LIQUID CARGO									
Air Draft 60' to 64'									
PAC 570	5057	324	64.0	8000	16.5	3	NONE	SEATTLE	WA CROWLEY MARINE SERVICES, INC.

Source: BST Associates, USCOE

Table A-3
Equipment Belonging to Construction Companies in Seattle

VESSEL.	NET TONS	HORSE-POWER	LENGTH OVERALL	BEAM OVERALL	HIGHEST FIXED POINT	CAPACITY TONS	DRAFT LOADED	DRAFT LIGHT	EQUIP	BASE	STATE
GENERAL CONSTRUCTION COMPANY											
BARGES	218	0	93	40	3.0	600	6	2	NONE	SEATTLE	WA
ASTORIA	745	0	164.1	50.1	11.0	1350	11	2	NONE	SEATTLE	WA
GC101	745	0	164.1	50.1	11.0	1350	11	2	NONE	SEATTLE	WA
GC102	745	0	164.1	50.1	11.0	1350	11	2	NONE	SEATTLE	WA
GC103	745	0	164.1	50.1	11.0	1350	11	2	NONE	SEATTLE	WA
GC104	745	0	164.1	50.1	11.0	1350	11	2	NONE	SEATTLE	WA
GC120	668	0	160	50.6	11.0	2600	11	2	NONE	SEATTLE	WA
GC121	668	0	160	50.6	11.0	2600	11	2	NONE	SEATTLE	WA
GC21	215	0	110	30	8.0	406	4	2	NONE	SEATTLE	WA
GC23	182	0	110	30	8.0	406	4	2	NONE	SEATTLE	WA
GC240	2061	0	240	60	17.0	5000	14	2	NONE	SEATTLE	WA
GC58	50	0	104	29	8.0	200	4.5	2	NONE	SEATTLE	WA
GC74	342	0	136.6	34.1	8.0	325	5	1.2	NONE	SEATTLE	WA
CCDFO&T NO. 1	1487	0	210	60	17.0	5000	13.1	13.1	NONE	SEATTLE	WA
PT. BASALT	1086	0	180	50	18.5	2100	13.5	13.5	NONE	SEATTLE	WA
SEA MULE	55	0	35	15	3.0	100	2	1	NONE	SEATTLE	WA
HURLEN CONSTRUCTION CO.											
TUC	34	600	61.9	17.2	24.0	0	6.2	6.2	NONE	SEATTLE	WA
NORENE II											
BARGES											
H 4	218	0	110	40	9.0	600	8	2	NONE	SEATTLE	WA
H II	255	0	85	32	22.0	300	8	2	60 TON REVOLVING CRANE	SEATTLE	WA
H III	24	0	60	24	5.0	135	3	0.5	NONE	SEATTLE	WA
H V	218	0	110	40	20.0	500	8.8	2	50 TON CRAWLING CRANE	SEATTLE	WA
KIM SUSAN	86	0	120	60	9.5	800	9	2	NONE	SEATTLE	WA

VESSEL	NET TONS	HORSE POWER	LENGTH OVERALL	BEAM OVERALL	HIGHEST FIXED POINT	CAP_TONS	DRAFT LOADED	DRAFT LIGHT	EQUIP1	BASE	STATE
MANSON CONSTRUCTION AND ENGINEERING CO.											
TUCS											
ELMER M	71	850	64	24	30.0	0	8	8	NONE	SEATTLE	WA
GLADYS M	70	1200	69.4	19.6	30.0	0	6.4	6.4	NONE	SEATTLE	WA
HARRY M	101	1600	92.4	30	30.0	0	9	9	NONE	SEATTLE	WA
JEFFREY M	50	1000	69.4	19.6	30.0	0	6.4	6.4	NONE	SEATTLE	WA
KIMBERLY	38	800	65	18.5	25.0	0	6.8	6.8	NONE	SEATTLE	WA
BARGES											
LC 7	78	0	67.7	23.5	6.0	120	3.5	1	NONE	SEATTLE	WA
MANSON 32	320	0	110	32	10.0	1400	5.6	1.6	NONE	LONG BEACH	CA
MANSON 33	241	0	130	30	10.0	1400	60	1.6	NONE	SAN FRANCISCO	CA
MANSON 41	373	0	110	38	13.0	800	9	1.5	NONE	SEATTLE	WA
MANSON 42	373	0	110	38	12.0	800	7.6	3	NONE	SEATTLE	WA
MANSON 44	642	0	150	42	12.0	1650	8	2	NONE	SEATTLE	WA
MANSON 47	615	0	165	40.1	10.0	1500	10	2	NONE	SEATTLE	WA
MANSON 48	615	0	165	40	14.0	1500	9.4	2.5	NONE	SEATTLE	WA
MANSON 49	270	0	108	40	8.5	400	5.5	1.5	NONE	SEATTLE	WA
MANSON 50	905	0	180	50	12.0	2000	12	2	NONE	SEATTLE	WA
MANSON 52	1021	0	258.5	38	15.0	1500	11.7	3	NONE	SEATTLE	WA
MANSON 54	986	0	170	52	28.0	2700	12	3	NONE	SEATTLE	WA
MANSON 55	443	0	140	40	20.0	1200	10	2.5	NONE	SEATTLE	WA
MANSON 56	571	0	162.1	36.1	17.0	1400	8	2	NONE	SEATTLE	WA
MANSON 57	571	0	162.1	36.1	17.0	1400	8	2	NONE	SEATTLE	WA
MANSON 58	1133	0	180	54	10.0	2500	12	3	NONE	SEATTLE	WA
MANSON 59	1133	0	180	54	10.0	2500	12	3	NONE	SEATTLE	WA
MANSON 61	679	0	180	44	13.0	1600	10	2	NONE	SEATTLE	WA
MANSON 62	679	0	180	44	13.0	1600	10	2	NONE	SEATTLE	WA
MANSON PD 1	50	0	60	22	8.0	100	4	1	NONE	SEATTLE	WA
NEWPORT	2859	0	258.5	54.7	50.0	4000	17.2	5	NONE	SEATTLE	WA
SEA PORT	2051	0	220	54.6	22.0	2051	9	3	NONE	SEATTLE	WA
POWERS, ALBERT H.											
TUC	20	800	60	20	34.0	0	6	6	NONE	TACOMA	WA
DOUBLE EAGLE											
BARGES											
DS 11	1288	0	217.8	43	22.0	3000	16	4	NONE	TACOMA	WA
DTB 27	768	0	180	45	10.0	1800	8	2	NONE	TACOMA	WA
NO 14	328	0	105	36.1	10.0	600	8	2	NONE	TACOMA	WA

Source: BST Associates, USCOE

Table A-4
Tugs For Which The 16th Ave S. Bridge Opened
January 1989 - May 1994

VESSEL	COUNT	LENGTH	BEAM	HPP	EQUIP1	STATE	BASE1	OPERATOR DESCRIPTION	STATE
SHIELLEY FOSS	234	90	30	32.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
SHANNON FOSS	150	90	24.6	29.0	NONE	WA	TACOMA	FOSS MARITIME COMPANY	WA
HELEN S	132	67	18	25.0	NONE	WA	SEATTLE	ISLAND TUG & BARGE	WA
WEDELL FOSS	122	100	36	38.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
CATHERINE FOSS	107	73.5	25	27.0	NONE	CA	LONG BEACH	FOSS MARITIME COMPANY	WA
MERIDIAN	104	59.1	21.2	23.0	NONE	AK	PRUDHOE	CROWLEY MARINE SERVICES, INC.	WA
CLAUDIA FOSS	100	80	25	38.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
IVER FOSS	96	98	32	65.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
CAROL FOSS	76	92	24.6	29.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
TIGER	66	90.3	27.1	35.0	NONE	WA	SEATTLE	BRIX MARITIME BARGING	WA
WANDA S	60	55.9	20.1	25.0	NONE	WA	SEATTLE	ISLAND TUG & BARGE	WA
DOUBLE EAGLE	60	104	22.6	40.0	NONE	WA	SEATTLE	D & V BOAT COMPANY, INC.	WA
RICHARD FOSS	52	110	30.5	35.0	NONE	WA	BELLINGHAM	FOSS MARITIME COMPANY	WA
GAILS	51	88	27	28.0	NONE	WA	SEATTLE	ISLAND TUG & BARGE	WA
MARTHA FOSS	51	80	27	38.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
DUNCAN FOSS	40	72	24	30.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
CASEY MARIE	39	70	24	30.0	NONE	AK	JUNEAU	KELLY RYAN, INC.	WA
DEBORAH FOSS	34	72	24	30.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
DAVID FOSS	31	77.2	26.3	40.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
BARBARA FOSS	30	126	34	64.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
CALEB	28								
PATRICIA S	27	65	18	28.0	NONE	WA	SEATTLE	ISLAND TUG & BARGE	WA
HARRY M	25	92.4	30	30.0	NONE	WA	SEATTLE	MANSON CONSTRUCTION AND ENGINEERING CO.	WA
EDITH FOSS	22	77.2	26.3	40.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
WALDO	21								
EXPRESS	19	125	25.1	43.0	NONE	WA	SEATTLE	KENCO MARINE SERVICES, INC.	WA
ELMER M	19	64	24	30.0	NONE	WA	SEATTLE	MANSON CONSTRUCTION AND ENGINEERING CO.	WA
KIMBERLY	16	65	18.5	25.0	NONE	WA	SEATTLE	MANSON CONSTRUCTION AND ENGINEERING CO.	WA
NORENE II	16	61.9	17.2	24.0	NONE	WA	SEATTLE	HURLEN CONSTRUCTION CO.	WA
DONNA FOSS	15	72	24	30.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
SHIELTER ISLAND	13	87	22.4	36.0	NONE	WA	SEATTLE	SALMON BAY BARGE LINE, INC.	WA
JANETR	13	46	18	24.0	NONE	MO	ST. CHARLES	LIMITED LEASING CO.	MO
GLADYS M	12	69.4	19.6	30.0	NONE	WA	SEATTLE	MANSON CONSTRUCTION AND ENGINEERING CO.	WA
ALAPUL	12	105	31.1	43.0	NONE	WA	SEATTLE	BRIX MARITIME BARGING	WA
WESTRAC	11	76	28.2	35.0	NONE	WA	SEATTLE	WESTERN TOWBOAT COMPANY	WA
MARIAH	11								
JEFFERY M	11								
DOROTHY FOSS	11								
SANDRA FOSS	11	111.5	34	45.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
SEA CRESCENT	10	96	28	40.0	NONE	SC	YONCES ISLAND	STEVENS TOWING CO., INC.	SC
HENRY FOSS	10	100	36	48.0	NONE	WA	TACOMA	FOSS MARITIME COMPANY	WA

STATE

OPERATOR DESCRIPTION

STATE BASE I

EQUIPI

HFP

BEAM

LENGTH

COUNTI

VESEL

VESEL	COUNTI	LENGTH	BEAM	HFP	EQUIPI	STATE	BASE I	OPERATOR DESCRIPTION	STATE
STEVIE	9								
JOE C	9								
ARTHUR FOSS	8	107	38	48.0	NONE	WA	BELLINGHAM	FOSS MARITIME COMPANY	WA
POLAR WIND	6	67.4	22.2	40.0	NONE	WA	SEATTLE	NORTHLAND SERVICES, INC.	WA
SOVEREIGN	6	185	38.1	63.0	NONE	AK	ANCHORAGE	GENERAL MARINE SERVICES, INC.	AK
WEST POINT	6	62	22	25.0	NONE	WA	SEATTLE	WESTERN TOWBOAT COMPANY	WA
BRYNN FOSS	6	100	36	38.0	NONE	WA	TACOMA	FOSS MARITIME COMPANY	WA
GLACIER BAY	6	268	57.3	16.0	2 ELEC. PUMPS	WA	SEATTLE	BRIX MARITIME BARGING	AK
SILVER BAY I	5	63.4	20.8	25.0	NONE	AK	JUNEAU	SILVER BAY LOGGING, INC.	WA
MYRTLE FOSS	5	70	22.8	25.0	NONE	WA	PORT ANGELES	FOSS MARITIME COMPANY	OR
TOM WHITE	4	57.1	18	28.8	NONE	OR	PORTLAND	BRIX MARITIME CO.	WA
JOSHUA T	4	58	15.3	29.6	NONE	WA	SUQUAMISH	TATE TOWBOAT CO.	WA
ISLAND CHAMPION	3								
DANIEL FOSS	2	98.1	32	31.6	NONE	AK	ANCHORAGE	FOSS MARITIME COMPANY	WA
PHILLIPS FOSS	2	120	31	64.0	NONE	WA	SEATTLE	FOSS MARITIME COMPANY	WA
VOSHUA T	2								
ANDREW FOSS	2	107	38	48.0	NONE	WA	BELLINGHAM	FOSS MARITIME COMPANY	WA
STONE MOUNTAIN	2	96	24.9	39.7	TOW WINCH	AK	KETCHIKAN	SELEY CORPORATION	AK
LUCY FRANCO	2								
ERIK T	2	54	15.1	24.5	NONE	WA	SUQUAMISH	TATE TOWBOAT CO.	WA
NEPTUNE	2	110	31.2	38.0	NONE			DANN TOWING CO.	FL
PACHENA	2	112	25	40.0	NONE			MANKE TUGBOAT CO.	WA
DELANCO	2	98	24	36.0	NONE	WA	TACOMA	WRIGH'S MARINE TOWING, INC.	WA
JAMES T QUICC	2	65	21.3	34.0	NONE			OLYMPIC TUC & BARGE	WA
FOSS TUG	2								
GARNET BANKS	2								
FISH HAWK	2								
ISLAND TUG	2								
INTEGRITY	2	166	38	54.0	35 TON CRANE	AK	PETERSBURG	LANGAKER MARINE, INC.	WA
PACIFIC EAGLE	2	93	27.6	45.0	NONE	CA	SAN FRANCISCO	SEA COAST TOWING	WA
SPAR	2								
RELIABLE	2								
ASTORIA	2	93	40	3.0	NONE	WA	SEATTLE	GENERAL CONSTRUCTION COMPANY	WA
ARCHIE	2								
POLAR HUSKY	2								
POLAR CUB	2								
POLAR STAR	2	125	24	48.0	NONE	WA	SEATTLE	NORTHLAND SERVICES, INC.	WA
APOLLO	2	87	29	40.0	NONE	WA	SEATTLE	CROWLEY MARINE SERVICES, INC.	CA
KELLEY FOSS	1								
DANIELLE	1	64	26.6	31.0	NONE	WA	SHELTON	MANKE LUMBER COMPANY	WA
BUSCO	1								
CUB	1								
SAN FRANCISCO	1	169.1	34.3	44.0	NONE	CA	LARKSPUR	GOLDEN GATE BRIDGE HIGHWAY AND TRANSPORTATION DISTRICT	WA
CA									
POLAR SCOUT	1	39.2	14.1	15.0	NONE	WA	SEATTLE	NORTHLAND SERVICES, INC.	WA
SVERDRUP	1								
SLEVIE	1								

VESSEL	COUNTY	LENGTH	BEAM	HFP	EQUIP	STATE	BASE	OPERATOR DESCRIPTION	STATE
NOINANT?	1								
DROPHY FOSS	1								
F.P. HUBBLE	1	55	17.5	20.0	NONE			OLYMPIC TUG & BARGE	WA
JOSHUA	1								
JOE . C	1								
SOVEREIGN		66	21	28.0	NONE	WA	SEATTLE	FREMONT TUG CO.	WA
TOM WHITE		65	19	31.0	NONE	WA	SEATTLE	JTC, INC.	WA

Name	Net Reg. Ton	Length	Beam	Highest Fixed Point	Loaded Draft	Light Draft	Operator	City	State
DRY CARGO BARGE (continued)									
CCCT	901	200	35	19.0	9	1.6	CONTICARRIERS AND TERMINALS, INC.	EAST CA. RONDELET	IL
CCCT	901	200	35	19.0	9	1.6	CONTICARRIERS AND TERMINALS, INC.	EAST CA. RONDELET	IL
CCCT	901	200	35	19.0	9	1.6	CONTICARRIERS AND TERMINALS, INC.	EAST CA. RONDELET	IL
CCCT	901	200	35	19.0	9	1.6	CONTICARRIERS AND TERMINALS, INC.	EAST CA. RONDELET	IL
CCCT	901	200	35	19.0	9	1.6	CONTICARRIERS AND TERMINALS, INC.	EAST CA. RONDELET	IL
CCCT	901	200	35	19.0	9	1.6	CONTICARRIERS AND TERMINALS, INC.	EAST CA. RONDELET	IL
CCCT	901	200	35	19.0	9	1.6	CONTICARRIERS AND TERMINALS, INC.	EAST CA. RONDELET	IL
CCCT	901	200	35	19.0	9	1.6	CONTICARRIERS AND TERMINALS, INC.	EAST CA. RONDELET	IL
CCCT	901	200	35	19.0	9	1.6	CONTICARRIERS AND TERMINALS, INC.	EAST CA. RONDELET	IL
PASSENGER									
NAPALI EXPLORER I	3	25	8	8.0	1.4	1	ROYAL HAWAIIAN CRUISES	KIKIOLA	HI
HAIG POINT PARKER	6	25.4	9.6	-	1.5	1.5	HAIG POINT FERRY CO.	DAUFUSKIE	SC
HAIG POINT PETREL	6	26.8	10.3	9.0	4.5	4.5	HAIG POINT FERRY CO.	DAUFUSKIE	SC
FREPORT SHUTTLE	10	33.5	12.7	14.0	5.4	5	I & W CORPORATION	CLEAR LAKE	TX
VECTOR QUANTITY	0	34	12	-	3	2	SAKONNET CRUISES, INC.	FAJARDO	PR
ISLETA II	19	34	12.8	7.0	5.3	5.3	ISLETA MARINA FERRIES, INC.	PORTLAND	OR
TRIUMPH	12	34	11	10.0	5	4.9	ANCHORAGE LAUNCH SERVICE	CLEARWATER	FL
HARBOR HOPPER	4	34	12	10.0	3	2	ANDERSON BAY CRUISES, INC.	BEAUFORT	NC
OUTRAGEOUS VI	11	34	12.2	27.0	6.2	1.5	OUTRAGEOUS DIVING, INC.	PITTSBURGH	PA
MERRY BELLE	21	35	12	13.0	4.8	4.8	THREE RIVERS CHARTER SERVICE	DAUFUSKIE	SC
HAIG POINT III	18	35.8	13	12.0	4	4	HAIG POINT FERRY CO.	FAJARDO	PR
ISLETA I	19	36	12.8	7.0	5.3	5.3	ISLETA MARINA FERRIES, INC.	FAJARDO	PR
ISLETA III	19	36	12.8	7.0	5.3	5.3	ISLETA MARINA FERRIES, INC.	FAJARDO	PR
DUCHESS	19	36	16.5	12.0	3	2.8	CATALINA CRUISES	LONG BEACH	CA
QUEENS LAUNCH	16	36	16	12.0	3.5	2.7	SEATTLE HARBOR TOURS	SEATTLE	WA
DUKE	19	36	16.5	12.5	3	2.8	CATALINA CRUISES	LONG BEACH	CA
SCOTT	7	38	11.2	15.0	3	3	WILLIAMSON, NARD	RIVIERA	TX
LADY CATHERINE	9	38	13.3	15.0	5	5	WILLIAMSON, NARD	RIVIERA	TX
CHESAPEAKE	7	39.8	12.2	12.0	2.2	1.1	CHESAPEAKE BAY FOUNDATION	NORFOLK	MD
CALADESI CONNECTION II	3	40	12	10.0	3	2	ANDERSON BAY CRUISES, INC.	DUNEDIN	FL
PASSENGER									
CALADESI CONNECTION I	3	40	12	10.0	3	2	ANDERSON BAY CRUISES, INC.	DUNEDIN	FL
MINUTEMAN	17	40	13.5	16.0	6	3	PATRIOT PARTY BOATS, INC.	FALMOUTH	MA
HARDY II	15	42	14	15.0	5	4.5	LEWIS, VERNON	NEW HARBOR	ME
ISLAND BELLE II	21	42	13	16.0	5	4	ISLAND FERRY	CRISFIELD	MD
VECTOR QUANTITY II	0	44	14	-	3	2	SAKONNET CRUISES, INC.	CLEAR LAKE	TX
LADYSHIP	6	44	10.8	40.0	5.1	5.1	WITT, THOMAS & BRUCE A.	BOOTHBAY HARBOR	ME
BAY LADY	6	44	10.8	40.0	5.1	5.1	WITT, THOMAS & BRUCE A.	BOOTHBAY HARBOR	ME
MARY ELIZABETH	34	45	16	19.0	7.5	7	BRADY, TIMOTHY C.	PLYMOUTH	MA
MINK	27	46.2	15	20.0	5.4	4.9	ISLE AU IHAU CO., INC.	STONINGTON	MA
CHARLES II	17	47	14.9	-	3	1.5	CHARLES RIVER BOAT CO., INC.	BOSTON	MA
BALTIMORE GUARDIAN	20	48	14.3	9.0	2.5	2.3	MARYLAND TOURS, INC.	BALTIMORE	MD
SEEKER	35	49.6	15.7	-	6.7	3	NORTH STAR CHARTER	SEATTLE	WA

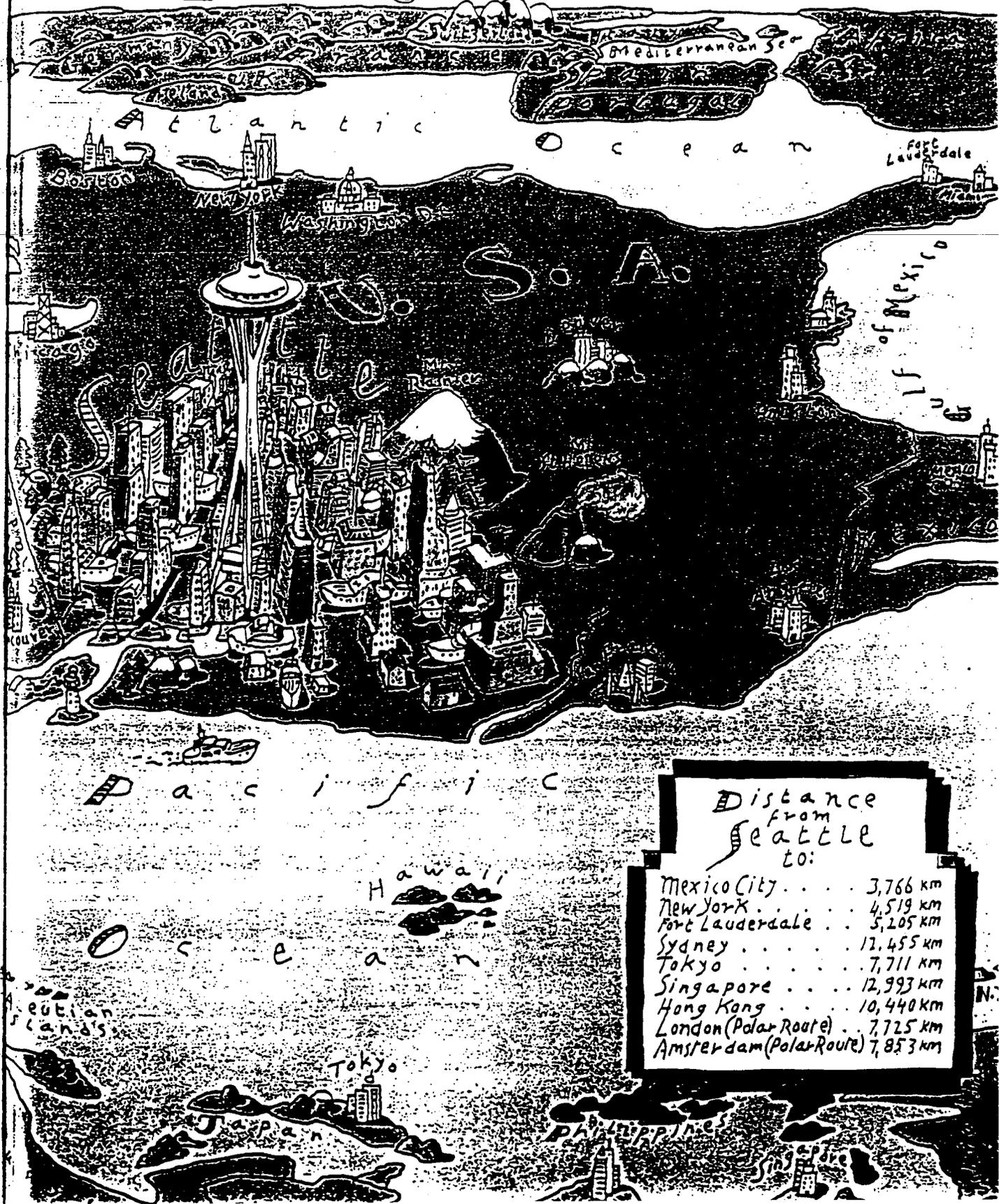
Net Name	Reg. Ton	Length	Highest		Fixed Point	Loaded		Light Draft	Operator	City	State
			Beam	Beam		Draft	Draft				
PASSENGER (continued)											
STIKINE PRINCESS	22	50	12	12	15.0	1.6	1.3	1.3	HIARDING, TODDE E.	WRANCELL	AK
SPIRIT SARATOGA PASSAG	45	50	14	14	28.0	5	4.5	4.5	MOSQUITO FLEET, INC.	EVERETT	WA
SAN JUAN EXPRESS	48	52	16.5	16.5	21.0	8.1	0	0	CLIPPER NAVIGATION, INC.	SEATTLE	WA
RUBAIYAT	31	53.1	15.8	15.8	26.0	7	6	6	RAND YACHT CHARTERS	BALTIMORE	MD
CORAL PRINCESS VII	38	55	12.3	12.3		6.2	0	0	LANCE SAILING CENTER	EDCARTOWN	FL
ON TIME II	22	55	18	18	12.0	4.6	4	4	EDGARTOWN FERRY, INC.	KEY WEST	FL
FIREBALL	28	55	17	17	17.0	4.4	4	4	G. R. M. ENTERPRISES, INC.	SAN PEDRO	CA
CHANNEL EXPRESS	47	56	17	17	17.0	4	3	3	CATALINA CHANNEL EXPRESS	NEW HARBOR	ME
HARDY III	52	56	18	18	18.0	5.5	5	5	LEWIS, VERNON	PORTLAND	OR
CRUISADER PRINCESS	33	57	13.5	13.5		8	5	5	YACHTS-O-FUN CRUISES, INC.	SEABROOK	NH
LADY ANNE II	9	58	18.3	18.3	22.0	4	3.6	3.6	SACA MARINE INDUSTRIES, INC.	CLEARWATER	FL
CLEARWATER EXPRESS	13	59	19	19	18.0	4	3	3	ANDERSON BAY CRUISES, INC.	BERKELEY	CA
ADMIRAL HORNBLLOWER	39	60	13	13	20.0	5	4	4	HORNBLLOWER YACHTS, INC.	BERKELEY	CA
CAPTAIN HORNBLLOWER	31	60	13	13	20.0	5	4	4	HORNBLLOWER YACHTS, INC.	SKAGWAY	AK
GLACIER QUEEN	49	61	15.7	15.7	20.0	4.9	4.3	4.3	BURRO CREEK ENTERPRISES	LAIHANA	HI
CORAL SEE	87	62	19.5	19.5	18.0	5.5	5.5	5.5	WINDJAMMER CRUISES	KEY WEST	FL
FIREBALL	0	63	22	22	18.0	4.6	4	4	G. R. M. ENTERPRISES, INC.	HONOLULU	HI
AUDACIOUS II	27	63	14	14	71.0	8.5	8.5	8.5	M & R CRUISE CORPORATION	CLEVELAND	OH
HARBOR CAT	30	64	26	26	22.0	6	5	5	CAT CRUISES, INC. D/B/A HARBOR CAT	EDGARTOWN MAPASSENGER	WA
ON TIME III	25	64.7	18	18	11.5	4.6	4	4	EDGARTOWN FERRY, INC.	VALDEZ	WA
LU LU BELLE	40	65	19	19	17.0	5	5	5	GLACIER CHARTER SERVICE	SEATTLE	WA
MAE WEST	56	65	19.6	19.6	19.0	4.5	4.5	4.5	COASTAL ISLAND TOURS	PORT ORCHARD	WA
EAGLE	55	65	19	19	20.0	5	4.5	4.5	HORLUCK TRANSPORTATION COMPANY	BOOTHBAY HARBOR	ME
BALMY DAYS II	78	65	18	18	28.5	12.3	12.3	12.3	CAMPBELL, ROBERT	PORTSMOUTH	NH
OCEANIC	95	71	19	19	12.0	4.6	4.6	4.6	ISLES OF SHOALS STEAMSHIP CO.	VALDEZ	AK
NAUTILUS II	85	75	22	22		6.4	5.5	5.5	STEPHENS, STAN	KAILUA KONA	HI
CAPT. COOK VI	64	75	20	20	30.0	4.4	3.1	3.1	ROYAL HAWAIIAN CRUISES	WEEHAWKEN	NJ
PORT IMPERIAL	52	76.8	20	20	40.0	8.8	6.1	6.1	PORT IMPERIAL FERRY CORP.	VALDEZ	AK
CHUGCHI	87	80	22	22		6	5.5	5.5	STEPHENS, STAN	VALDEZ	AK
GLACIER SPIRIT	89	80	22	22		6	5.5	5.5	STEPHENS, STAN	VALDEZ	AK
SHELTERED SEAS	95	90	22	22	23.0	6	6	6	ALASKA SIGHTSEEING CRUISE WEST	PETERSBURG	WA
ISLAND LADY	60	90	24	24	26.0	5	4	4	FISIL, R. N., & SON, INC.	BOOTHBAY HARBOR	ME
TWO HARBORS EXPRESS	70	90	21	21	27.0	4	3	3	CATALINA CHANNEL EXPRESS	SAN PEDRO	CA
CATALINA EXPRESS	70	90	21	21	27.0	4	3	3	CATALINA CHANNEL EXPRESS	SAN PEDRO	CA
CALIFORNIA SPIRIT	57	90	25.7	25.7	35.0	6.5	4.9	4.9	PACIFIC MARINE YACHT CHARTERS	SAN FRANCISCO	CA
SUPER EXPRESS	75	95	22.8	22.8	25.0	4	3	3	CATALINA CHANNEL EXPRESS	LONG BEACH	CA
AVALON EXPRESS	75	95	22.8	22.8	25.0	4	3	3	CATALINA CHANNEL EXPRESS	LONG BEACH	CA

Source:BST Associates, USCOE data

MEGAYACHT INFORMATION

Superyacht NW

1994 PROGRAM



Distance from Seattle to:

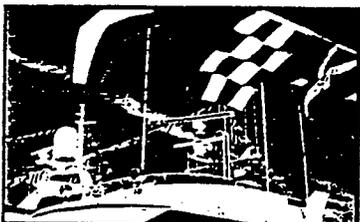
Mexico City	3,766 km
New York	4,519 km
Fort Lauderdale	5,205 km
Sydney	12,455 km
Tokyo	7,711 km
Singapore	12,993 km
Hong Kong	10,440 km
London (Polar Route)	7,725 km
Amsterdam (Polar Route)	7,853 km

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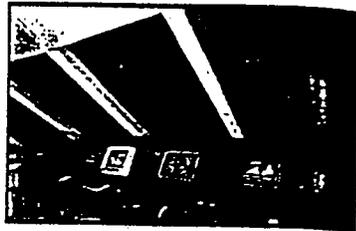
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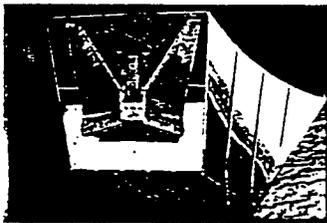
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Thursday, September 15

10 am - 6 pm Exhibits open
7 pm - 11 pm Welcoming cocktail party for exhibitors and their guests hosted by MTU, debis Financial Services, Mercedes Benz, American Eurocopter, and Freightliner Trucks

Friday, September 16

10 am - 5 pm Exhibits open
1 pm Forum: "Cruising Southeast Alaska and Baja California," presented by James O'Donnell, captain of charter yacht *Marco Polo*
5:30 pm - 7:30 pm Champagne Preview to Bal de la Mer (ticketed guests only)
7:30 pm - midnight Bal de la Mer presented by Showboats International to benefit the Nature Conservancy Willapa Bay Project (ticketed guests only)

Saturday, September 17

10 am - 6 pm Exhibits open
1 pm Forum: "The Technological Edge: Design & Construction of *Eriva*," presented by Daryl Wakefield, president of Admiral Marine Works

Forums take place aboard boats supplied by Seattle Harbor Tours

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70' Queenship - 98' Reminisc
Eagle Yachts - 94' Eagle One
Hestley Marine - 77'6" Compass Rose
Potter Stewart & Associates - 110' Crystal Spirit
Nordlund Boat Company - 80' Altiza VII
West Bay Sonsho Yachts - 80' West Bay Sonsho
Additional yachts to be announced.

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Hokyon — Bob Saxon Associates
Hotar — Jack Charles
Marco Polo — Bruce Branch
Moonraker — Allied Marine
Sumaum — Arthur E. Hall
Additional yachts to be announced.

The SuperYacht Northwest '94 program was designed & produced by Showboats International magazine 21994 Ft. Lauderdale, Florida

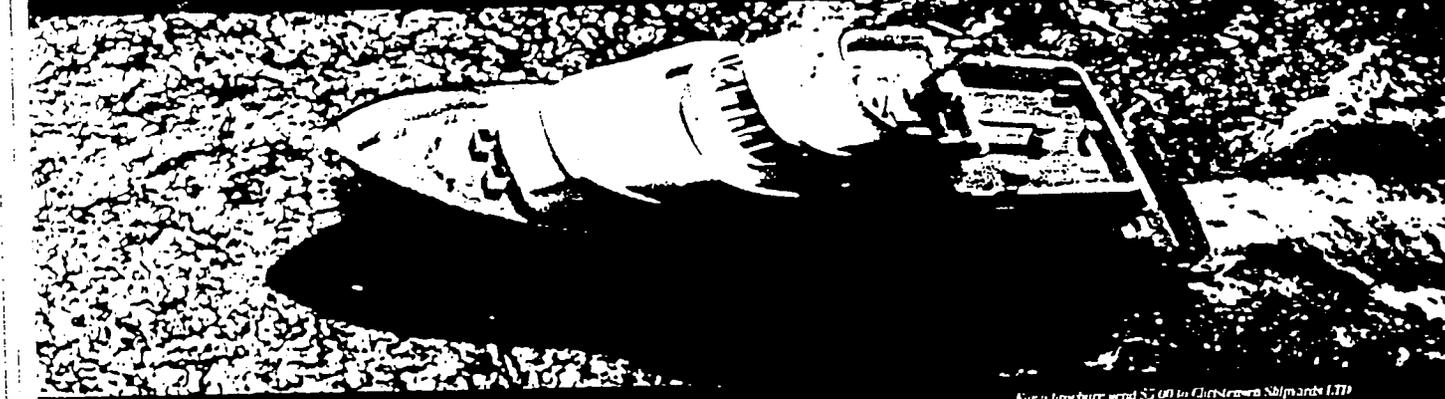
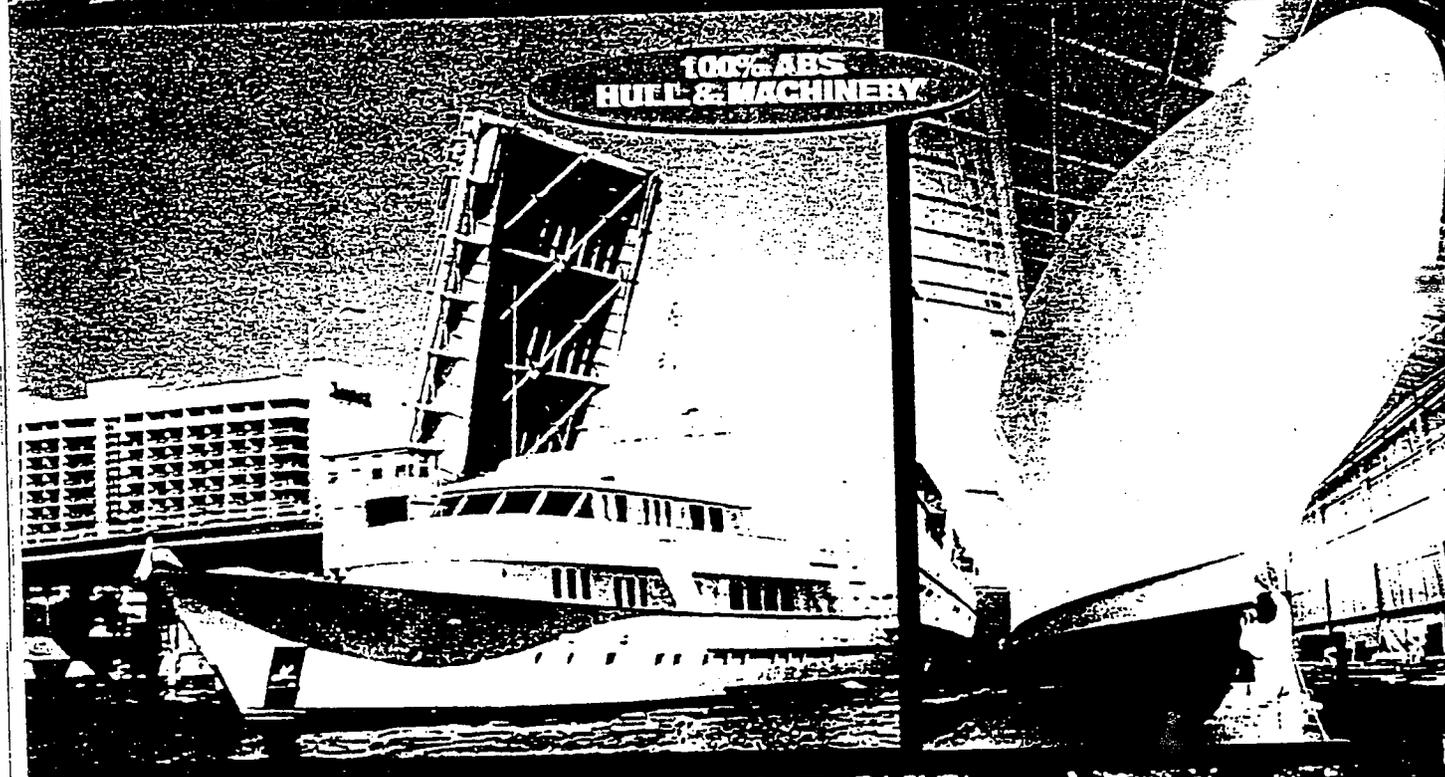
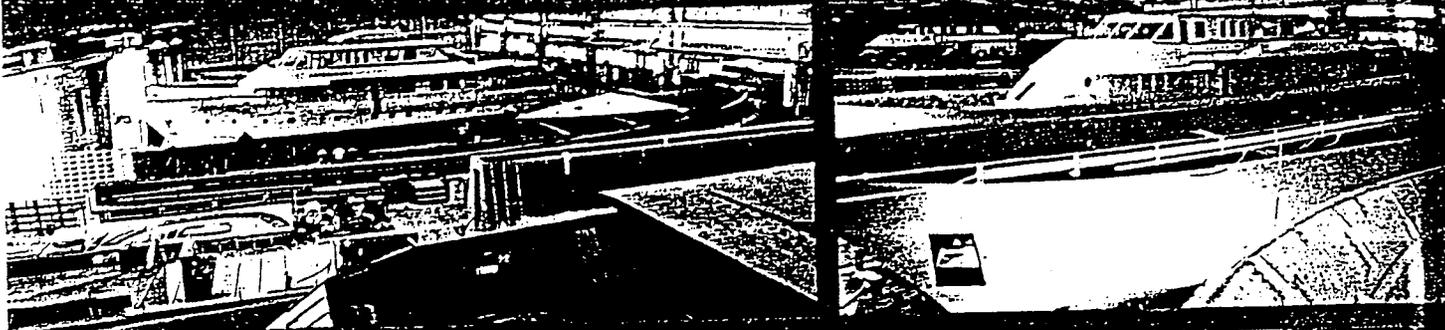
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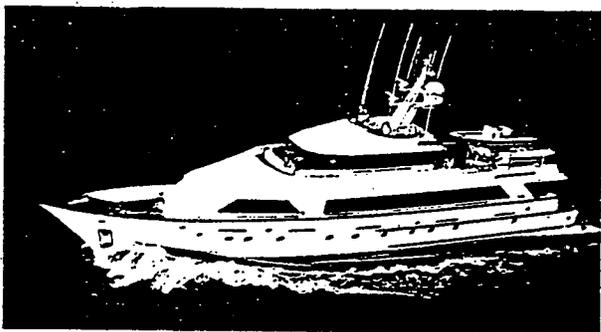
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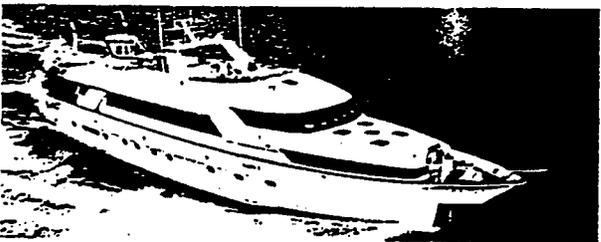
Marine Industry



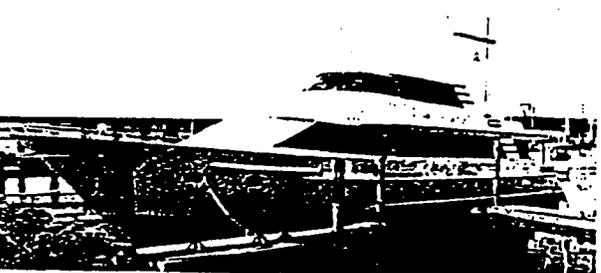
161' Eryva — Admiral Marine Works



126' Emerald Isle, Christensen Shipyards



110' Mary II — Cooper & Queenship



115' Krishna — Crescent Beach

BUILDERS

Admiral Marine Works, Port Townsend, WA

Located at the entrance to Puget Sound, Admiral Marine was founded in 1947. Admiral builds custom composite yachts from 60 feet to 200 feet in a modern 32,000 sq. ft. facility. The yard has earned a reputation for building innovative and technically sophisticated yachts while never abandoning the company's tradition of craftsmanship. Admiral's dedicated workers are all vitally and uniquely involved in design, planning and construction.

Admiral's custom production incorporates fully detailed one-off female molds and aerospace materials including Airex foam, Kevlar, carbon fiber, hybrid woven fabrics and Nomex honeycomb aircraft panels, with high-quality interiors for yachts that meet the highest standards for luxury vessels.

Christensen Shipyards, Vancouver, WA

Christensen builds quality custom fiberglass ocean-going motoryachts from 110 feet to 150 feet. All yachts are built to ABS+A1-AMS certification for both structure and machinery. All phases of construction, including metal and fiberglass fabrication, all mechanical and electrical systems, and finish carpentry, are completed in-house at the company's state-of-the-art facility.

Christensen yachts are true custom projects designed in profile and interior layout to meet individual customer preferences while utilizing modern production techniques to maintain high construction standards. The staff includes an impressive support network of engineers, design coordinators, project managers and administrators to handle all aspects of construction and customer service.

Cooper & Queenship, Albion, BC

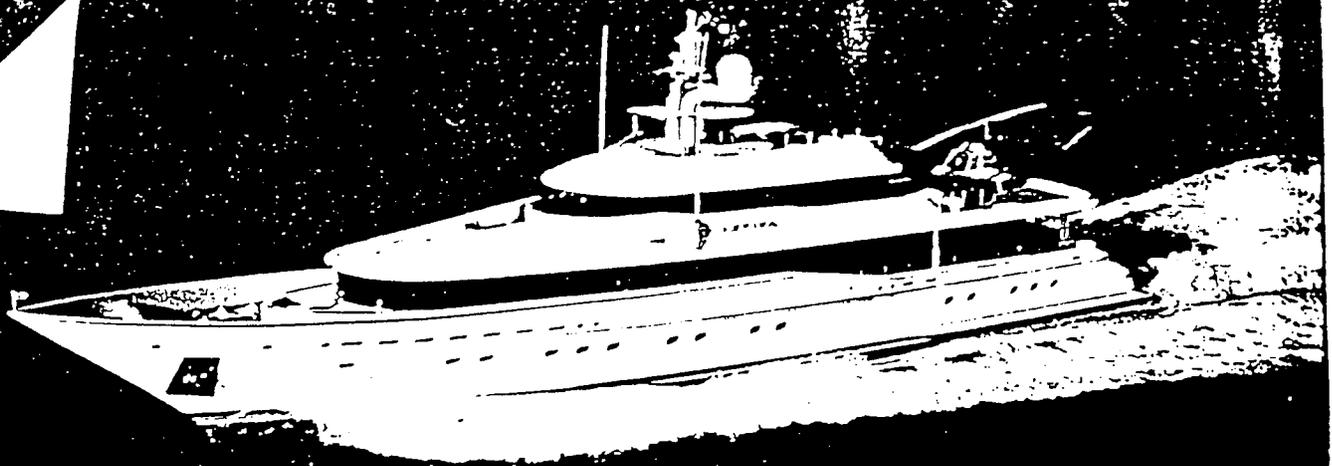
Cooper & Queenship Yacht Works, is located 26 miles east of Vancouver in British Columbia, on the Fraser River. The plant is divided into three fiberglass production units: small boats to 36 feet; motoryachts from 48 to 70 feet; and, custom yachts from 70 to 135 feet. Since entering the large custom yacht business, Cooper & Queenship has launched five large yachts, with the sixth to be completed during the summer of 1994. Cooper & Queenship yachts are noted for their strong cored hulls, quality materials, and handcrafted wood interiors. The yard continues to grow with increasing market recognition.

Crescent Beach Boatbuilders, Hamilton, BC

This yard has earned a reputation as a premier fiberglass boatbuilder with the capability of producing exceptional joinery and luxurious interiors. Because Crescent Beach has built yachts for a variety of American and European customers, it has become one of the few yards with experience in building to the rigid specifications of ABS, Bureau Veritas, and the French Affaire Maritimes.

Recent launches include a 105-foot raised pilothouse motoryacht and a 115-foot tri-deck cockpit motoryacht. Currently, Crescent Beach is building a 112-foot raised pilothouse yacht on spec and available for December delivery.



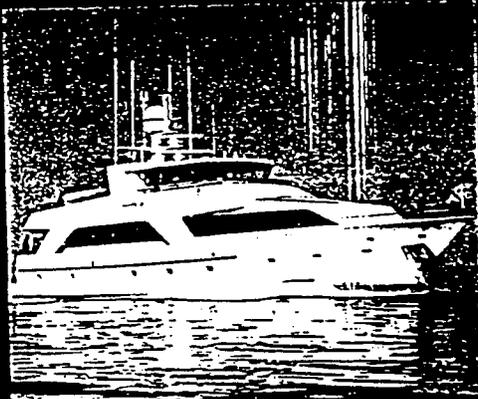


M/V EVVIVA 161 ft.

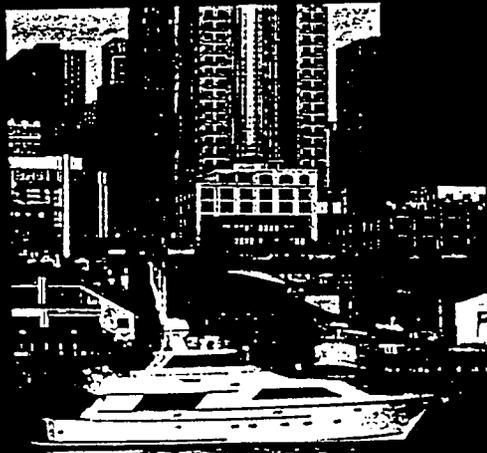


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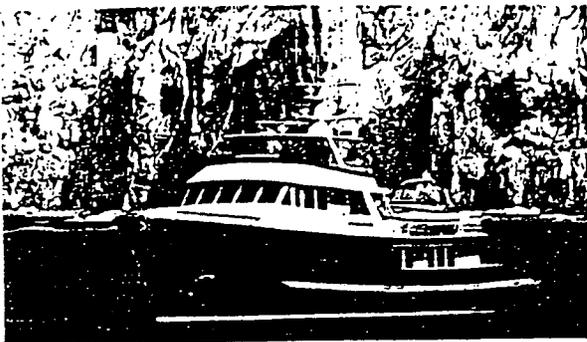
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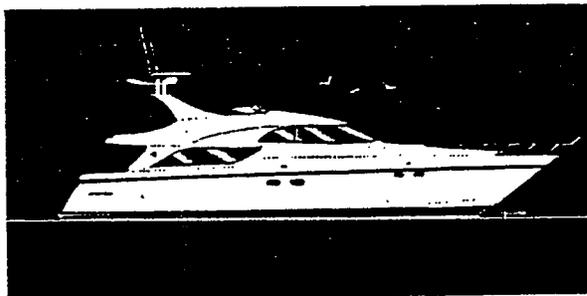
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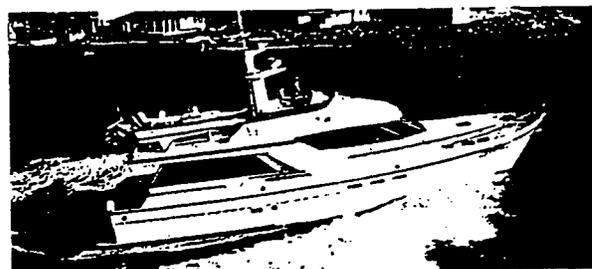
Marine Industry



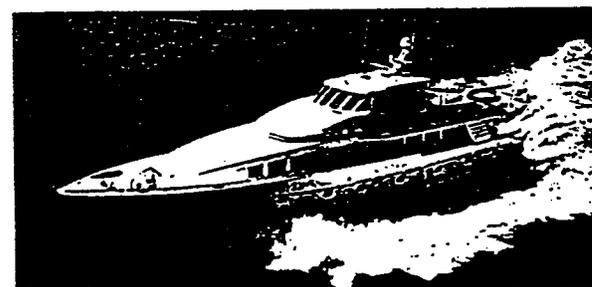
105' Princess Gloria — Delta Marine



Caribe 60 — Heisley Marine



63' Independent - Nordlund Boat Co.



111' La Corniche - North Coast Yachts

Delta Marine, Seattle, WA

Since 1967 Delta Marine has delivered more than 700 fiberglass vessels to discriminating and knowledgeable clients throughout the world — vessels designed for seaworthiness, safety, low maintenance, and ease of operation. With expertise gained from building commercial workboats for demanding conditions off Alaska, Delta constructs vessels that combine the latest boat-building technologies with traditional standards of craftsmanship. All Delta vessels are built to meet or exceed ABS requirements for their intended service.

Delta builds motoryachts of 50 feet to 150 feet from a variety of expandable molds. Current projects include 58-, 116-, 131-, and 151-foot motoryachts. Recent deliveries include the first two 110-foot motoryachts in Delta's high-speed series: *Onika* and *Beth-A-Belle*.

Heisley Marine, Portland, OR

Located on the Columbia River, this yard was founded in 1988 by George Heisley, a knowledgeable boat builder and original co-founder of Christensen Motor Yachts. Heisley's state-of-the-art environmentally controlled facility is capable of supporting simultaneous construction of six yachts up to 90 feet in length. While day-to-day systems installation and quality control is overseen by Heisley's in-house registered engineer and production managers, the builder retains the services of world-renowned naval architects and stylists. Heisley builds both custom and production composite fiberglass yachts and has just announced a new line of five semi-custom yachts from 60 feet to 72 feet called the Caribe series.

Nordlund Boat Company, Tacoma, WA

The Nordlund Boat Company has been constructing high quality custom yachts since 1958. Superior workmanship, proven expertise in cored composite hull fabrication, and on-time deliveries have earned Nordlund a unique and respected reputation.

Owner Paul Nordlund's philosophy is that quality yachts create their own demand. Customer satisfaction and frequent customer referrals affirm the success of Nordlund's continual pursuit to build character, integrity, and seaworthiness into each yacht. Nordlund delivers yachts from 60 feet to 110 feet for discriminating yachtsmen who demand that their yachts be an investment of enduring value and pleasure.

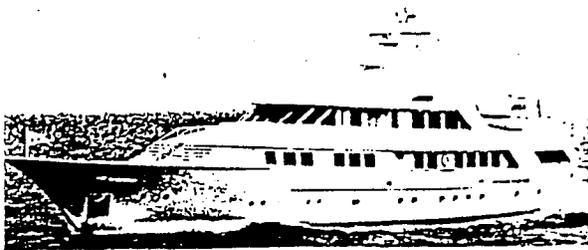
North Coast Yachts, Tacoma, WA

North Coast Yachts has been building high-tech custom motoryachts on the leading edge of design for more than 15 years. With the launch of 111-foot *La Corniche* in 1993, North Coast made its debut as a megayacht builder as well. This triple-deck yacht received critical acclaim at the prestigious Ft. Lauderdale International Boat Show last October.

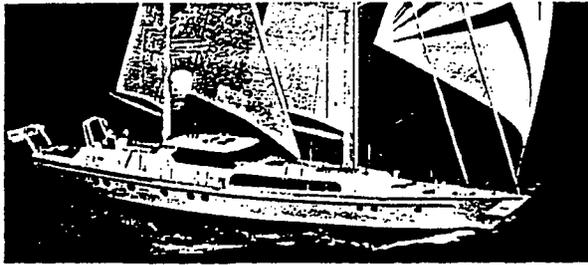
Now under construction at North Coast is 131-foot *Countach* designed by Jack Sarin — a masterpiece in the making. The company's one-piece molds in a variety of sizes and a 40,000 square foot construction facility ensure smooth and efficient building and delivery.



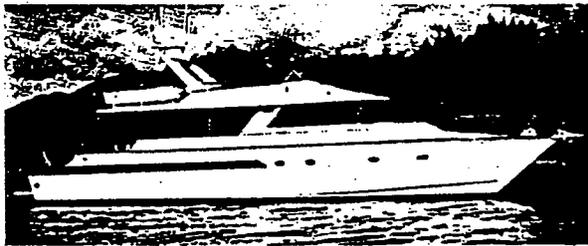
Marine Industry



150' *Samantha Lin* — Puglia Shipbuilding



110' *Ventura* — Sovereign Yacht



72' *West Bay SonShip*



Westport Shipyard

Puglia Shipbuilding Inc., Tacoma, WA

On July 29, 1993, Puglia launched America's first steel hull/aluminum superstructure megayacht. This occasion not only helped to reinforce the U.S. position as a leader in yacht construction, but marked a new beginning for a group of renowned shipbuilders.

Since its creation in January 1991, Puglia Shipbuilding has become a leader in the Puget Sound area for steel and aluminum construction and repair. With its wealth of knowledge and expertise, Puglia daily meets the demands of such agencies and classification societies as ABS, Coast Guard, Lloyd's, NKK, DNV, and the U.S. Navy.

Sovereign Yacht, Seattle, WA

Sovereign Yacht is a builder of quality custom aluminum and steel motor and sailing yachts. With a strong heritage of building a variety of commercial vessels rugged enough to withstand the waters of the Pacific Northwest and Alaska, Sovereign has developed a trained work force using the most modern equipment and building techniques available. With Sovereign's broad range of capabilities, the company has delivered such projects as a 103-foot Glade Johnson Design motoryacht, the 110-foot motorsailer *Ventura*, recently named Best Sailing Yacht Under 35 meters by *Showboats International*, and 49-passenger tourist submarines capable of operating to depths of 450 feet.

West Bay SonShip, Delta, BC

West Bay is a family-owned and run shipyard with 26 years of experience in commercial craft, pleasure boats, and luxury motoryachts. Located in a suburb of Vancouver on the south arm of the Fraser River, West Bay's 220,000-square-foot facility supports more than 50,000 square feet of construction buildings, including the recent addition of a climate-controlled building with capacity for yachts up to 160 feet. West Bay's SonShip yachts range from 52 feet to 120 feet. The most popular vessel is the 58, with 12 delivered to date. Frank Mulder has recently been commissioned to design a line of 100-, 110-, and 120-footers.

Westport Shipyard, Westport, WA

In operation since 1964, Westport Shipyard is located on the Pacific coast of Washington. With more than 65 hulls from 70 feet to 130 feet to its credit, Westport has become one of the most prolific builders of large Airex-cored FRP yachts and Coast Guard-inspected passenger boats in the U.S. In the past few years, all of Westport's completed yachts have been built for Westship, Inc., of Ft. Lauderdale, Florida. Westship, which is the yard's exclusive marketing agent for the East Coast and South America, has kept the yard busy building raised pilot-house motoryachts in the 96- to 112-foot range — the 10th yacht in this series is underway. In addition to its own yachts, Westport has also worked cooperatively to supply hulls to many of the premier yacht builders in the Northwest.



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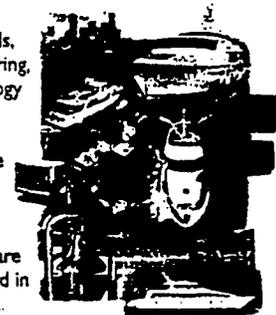
SUPERYACHT NORTHWEST '94

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September 15, 16, 17 - 1994

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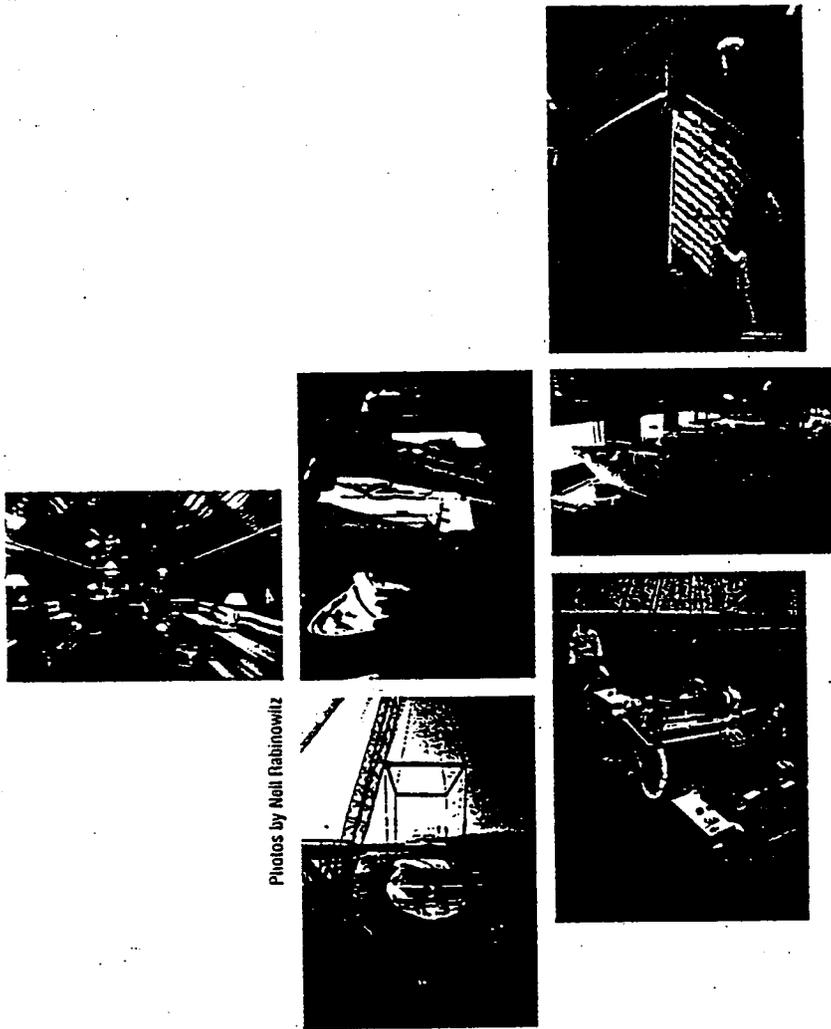


Superyacht Northwest '94 brings the
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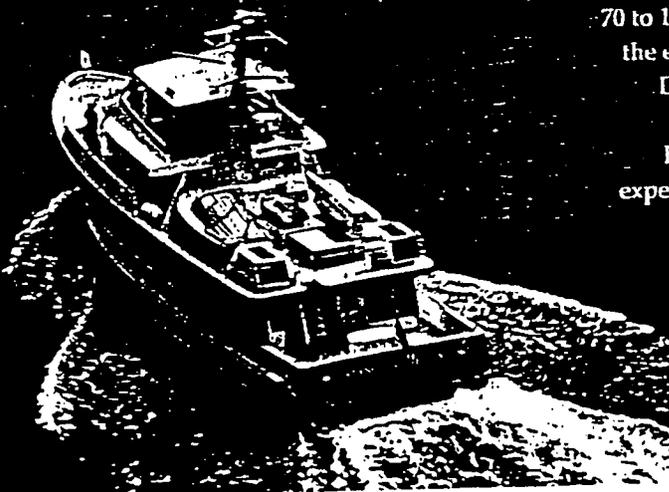
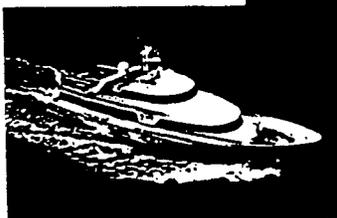
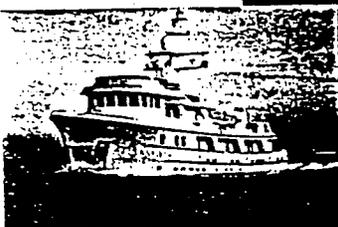
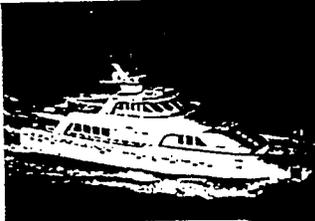
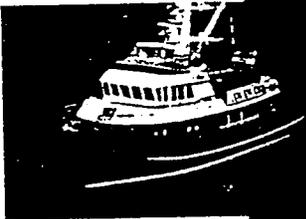
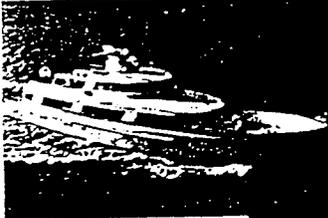
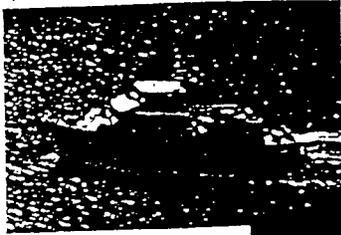
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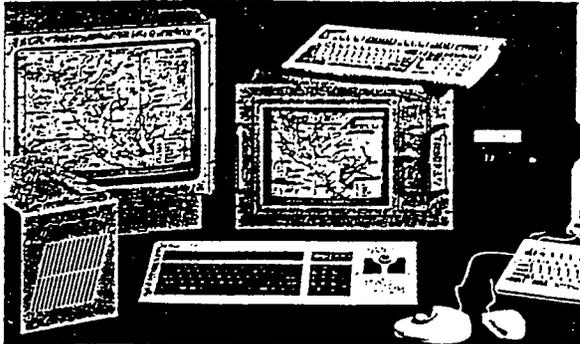
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Marine Industry



Oceanvision marinated units

ELECTRONICS

Oceanvision, Vancouver, BC

Oceanvision is an open architecture electronic chart display and information system for 486 computers utilizing Microsoft Windows to display precise reproductions of hydrographic charts and bathymetric maps. A vessel's position, route, waypoints, and other navigation information are all displayed and may be filed on the system's database. The system is designed to interface with GPS, radar, depth sounder, and autopilot. It is also possible to overlay satellite imagery on the screen.

A variable zoom function allows chart viewing at a 1:1 ratio. This display may be a windowed portion of different charts (even at different scales) seamlessly joined. Oceanvision charts are exact reproductions. Special steps are taken in the scanning process to maintain the integrity of each chart, including latitude/longitude and Mercator projection verification.



SEA, Inc. single sideband receivers

SEA Inc., Mountlake Terrace, WA

SEA Inc., a unit of Datamarine International, Inc., is a leading American manufacturer of both marine and land mobile radio communications equipment. Since its incorporation in 1975, the company's principal product line has been high-frequency single sideband (HF/SSB) radio products used for long-distance marine communications. SEA designs, manufactures, and markets a full line of HF/SSB and FM marine communications equipment, as well as satellite and EPIRB products. SEA products are consistent National Marine Electronics Association award winners and have an unmatched reputation for quality and reliability. SEA products are distributed worldwide by more than 300 marine electronics dealers.



Mark Cole and Sam Stokes

The Ship's Computer, Seattle, WA

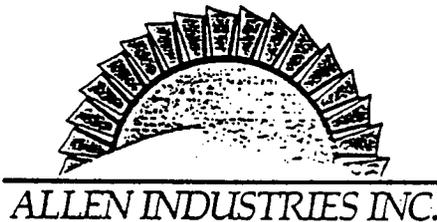
This company is a full-service source of computer software and hardware for the marine industry. The software listings run from radar training packages to networked, fully integrated navigation/communications/weather packages to hardware/software combinations that monitor ship-board mechanical systems. All systems and hardware are interfaced and proven before installation.

The staff of The Ship's Computer has the skills to join a design team in the early phases of yacht construction or refit to help design a computer-assisted bridge that integrates navigation, communications, and vessel management into one powerful package.

ENGINES / GENERATORS

Allen Industries, Seattle, WA

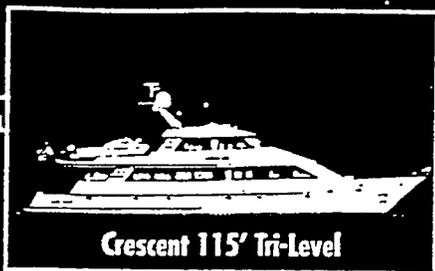
Allen Industries prides itself on offering the best of both worlds: being small enough to offer one-on-one customer involvement, yet large enough to handle world-wide endeavors. Allen provides services ranging from simple engine consultation to complete design, fabrication, and installation of state-of-the-art marine gas turbine yacht power packages. With 30 years in the business, Allen is a recognized turbine specialist for pleasure craft, including CODOG and CODAG systems, with propulsion interfaces for surface drives, waterjets, RCP or conventional props. Allen meets customer requests for new or factory fresh turbines and turbine packages for the total horsepower required.



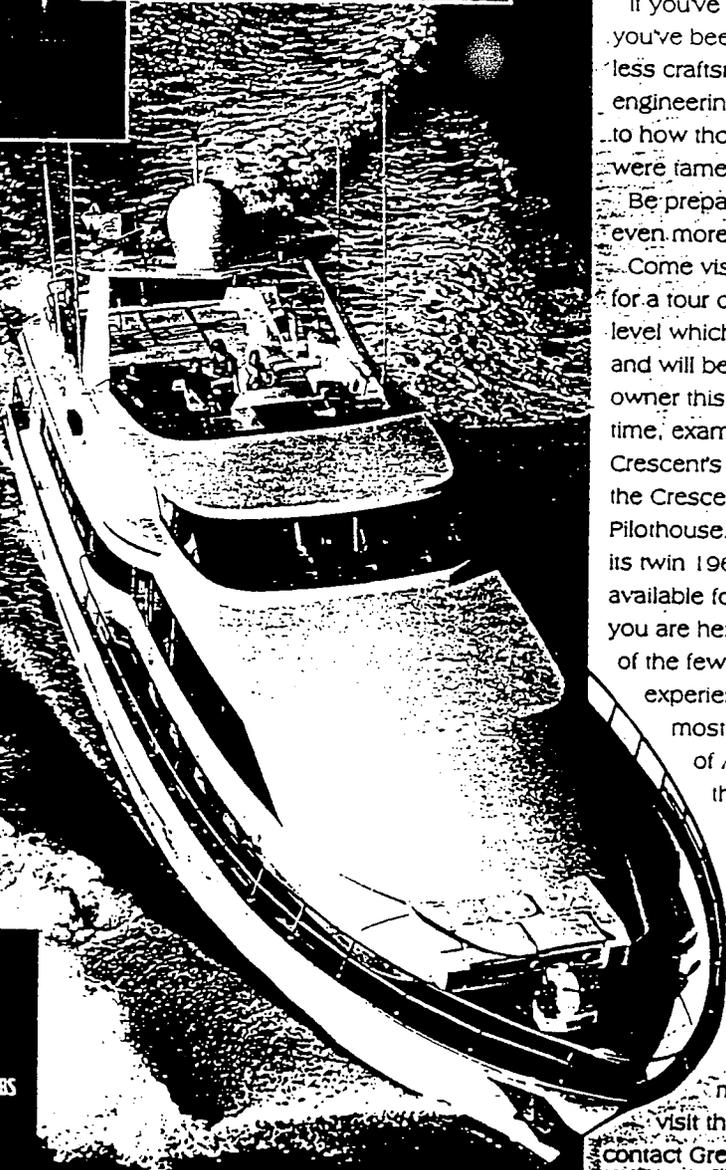
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- 105' Raised Pilothouse "Crescent Lady" - Bureau Veritas Ⓢ 100A1. Powered by 16V92TA DDEG
- 115' Tri-Level "Krisba" - ABS. Owner delivery - Spring 1994
- 112' Raised Pilothouse. Powered by MTU. Available for 1994 delivery

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If you are about to enter the elite class of megayacht owners and have been cruising the waters of Alaska's Inside Passage, Cabo, Intercoastal Waterway or the Caribbean, chances are you have admired a Crescent.

If you've been aboard a Crescent, you've been impressed by the flawless craftsmanship and intelligent engineering. You were surprised as to how thousands of horsepower were tamed to a mere whisper.

Be prepared to be impressed even more!

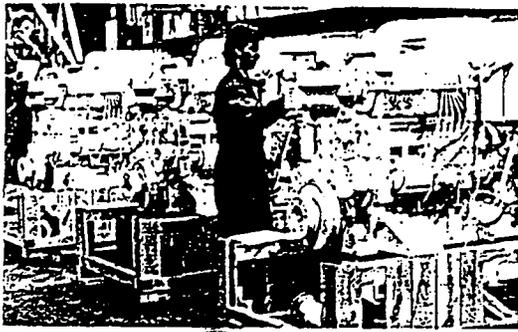
Come visit the Crescent shipyard for a tour of the Crescent 115' Tri-level which is nearing completion and will be delivered to her proud owner this spring. At the same time, examine the progress on Crescent's most advanced yacht, the Crescent 112' X 24' Raised Pilothouse. The Crescent 112', with its twin 1960 hp MTUs, will be available for a 1994 delivery. While you are here, you will discover one of the few shipyards in the world experienced in surpassing the most exacting specifications of ABS, Bureau Veritas and the French *Alfaire Maritimes*.

And, with the favorable Canadian exchange rate, there's never been a better time to purchase a Crescent.

If you would like to make an appointment to visit the shipyard, please contact Greg Tiemann at Crescent Beach Boatbuilders Ltd.

Photos by Itell Robinowitz

Marine Industry



Lugger Diesels

Northern Lights/Lugger, Seattle, WA

Like vessels built in the Pacific Northwest, Northern Lights generator sets and Lugger diesels — manufactured by divisions of Alaska Diesel Electric — have a reputation for uncompromising quality. Features such as one-piece cast iron manifolds, replaceable liquid-cooled cylinder liners, and modular iron pistons have long made Lugger and Northern Lights gensets the choice of commercial operators in Alaska. More recently, yacht owners and captains have come to routinely specify these items for their own engine rooms. One of the company's important new products is the environmentally smart STARS anti-soot device for generator sets.

The full range of Northern Lights gensets (5-350 kW) and Lugger diesels (67-1,300 hp) can be found on vessels ranging from *Endeavour* to *Eviva*. Factory tours are available upon request.

EQUIPMENT MANUFACTURERS

Hydra-Power, Portland, OR

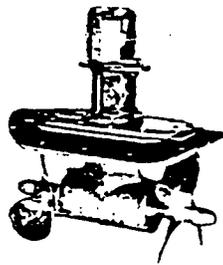
HPS is a well-known thruster supplier to luxury yachting with more than 350 systems introduced into service since 1985 at a zero failure rate. HPS has led the industry through development of many innovative thruster system components, including unique, load-tested, five- and seven-bladed propellers, which offer powerful quiet operation. HPS attributes much of its success — and its repeat orders from yacht builders — to its development of relatively compact and lightweight hydraulic reservoirs and valving manifolds. New to HPS's product line are thruster door actuators offering the industry the first practical tunnel door system.



Hydra-Power

Wesmar Bow Thrusters, Bothell, WA

Western Marine Electronics is the builder of the Wesmar line of counter rotating, dual propeller bow thrusters, first introduced to the market in 1992. The fixed-pitch, four-bladed Kaplan propellers are designed to deliver equal thrust in either direction of rotation — thrust amplified a minimum of 40 percent over standard thrusters at the same input horsepower, according to the manufacturer, due to the counter-rotation feature. The Wesmar bow thrusters range in size from 5 to 350hp. Western Marine Electronics was formed in 1965 and was the first electronics company to totally automate its design and manufacturing processes. Wesmar also manufactures roll fin stabilizers, and a variety of scanning sonars for commercial and private vessels.



Wesmar Bow Thrusters

INTERIOR DESIGN

Bell Design Group, Seattle, WA

The staff of Bell Design Group has more than 130 years of combined experience in marine, aerospace, commercial, and industrial design. Thoroughly experienced in both lightweight and traditional construction methods, designers use both CAD and computer imaging to interface with clients, shipyards and naval architects, providing specifications on disc as well as in bound format. Directed by founder Judy Bell Davis — the first woman elected president of the Society of Boat and Yacht Designers — the firm has completed major marine construction and interiors around the world with 80 percent of their business consisting of repeat and referral clients. Current projects are underway in Singapore, Costa Rica, Canada, Alaska, Washington, Oregon, and California.

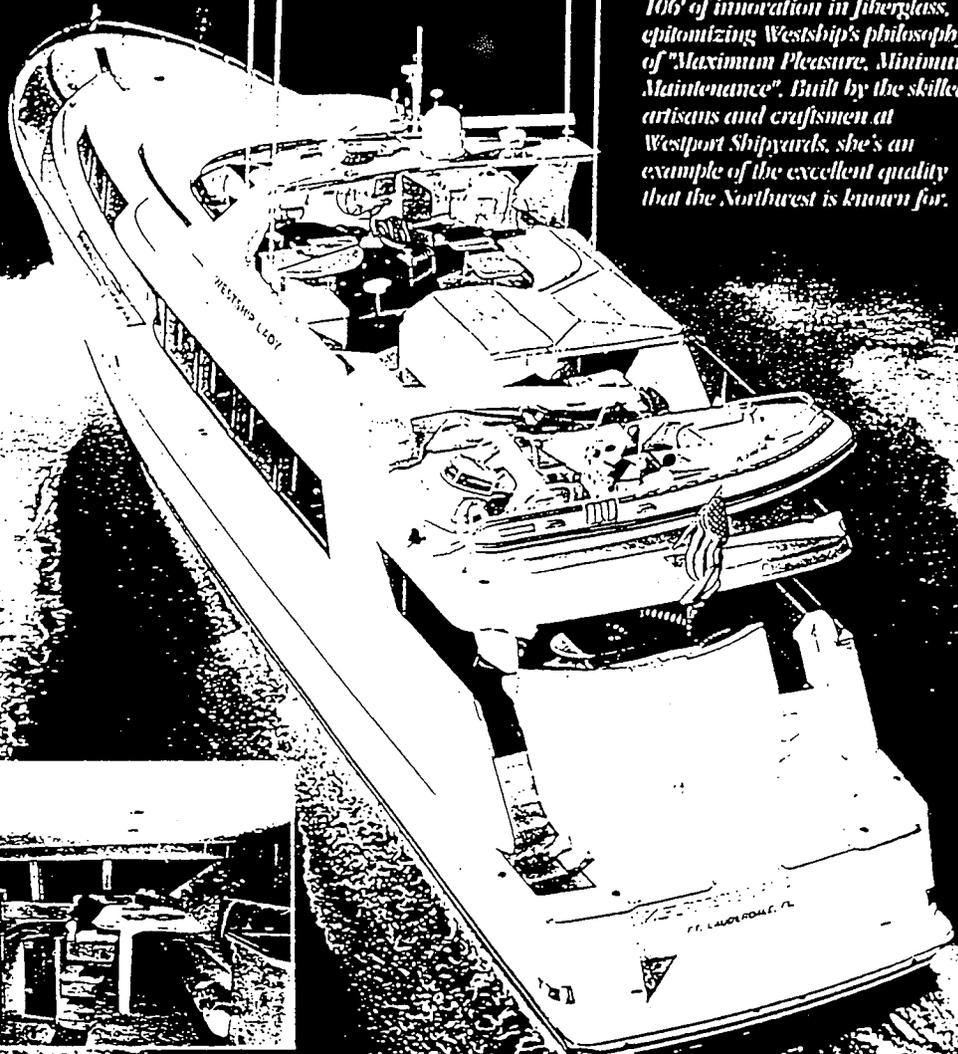


Judy Bell Davis (top center) and Bell Design Group



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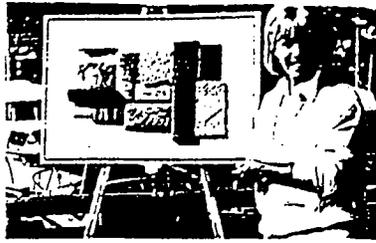


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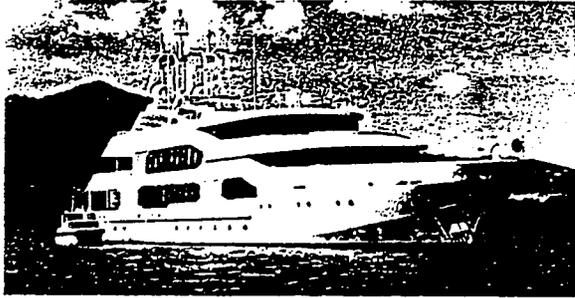
Marine Industry



Charlotte Henke

Charlotte Henke Designs, Seattle, WA

Charlotte Henke Designs had its beginnings in traditional architecture and classic European studies. Love of boating and a knowledge of marine design criteria led to the firm's current marine interior design focus. The company's philosophy is simply "client first." Client interests, lifestyles, and preferences become the basis for each project theme. Charlotte Henke's guidance in integrating interior and exterior styling and color selection helps clients create their own personal look for their yacht regardless of whether the project is a complete refit, a partial renovation, or new construction.



Double Haven styled by Glade Johnson Design

Glade Johnson Design, Bellevue, WA

This firm has been specializing in full-service design for private aircraft and large, high-quality custom motor and sailing yachts for 14 years. Among the 13 major yacht projects to date are a number of vessels built in the Pacific Northwest, including 110-foot *Onika*, 140-foot *Atessa*, 120-foot *Pzazz*, 102-foot *Shana II*, and 110-foot *Venturosa*. CV-9, a 131-foot motoryacht, is currently under construction at Delta Marine. To the firm's international credit are a custom 121-foot sailing yacht under construction at Alloy Yachts in New Zealand, and two completed Feadships. Glade Johnson Design, Inc., is the winner of four Showboats Awards, including two for 1993: *Double Haven*— Best Full Displacement Motor-yacht — and *Venturosa*, Best Sailing Yacht Under 35 Meters.



Kimberly Ramsey and Jon Pokela

Pokela Design, Tacoma, WA

Within the last six years, Pokela Design has completed 24 interior projects on custom yachts ranging in size from 60 feet to 130 feet. The firm's growing reputation is the result of valuable experience and a thorough understanding of how a yacht functions. Jon Pokela assures discreet and attentive professional management of all design functions and project supervision. Planning, consideration, and creativity contribute to livable, elegant, and timeless interiors. Further success is assured by the mutual respect established with the yards constructing Pokela Design's projects, including several recent launches by Delta Marine.



110' Crystal Spirit by Potter Stewart

Potter-Stewart & Associates, Bellevue, WA

Founded in 1976, Potter-Stewart has earned a reputation as the Northwest's premier full-service furniture gallery and design studio. Potter-Stewart operates two showrooms, featuring the finest furniture, lamps, and accessories from dozens of manufacturers from around the world. The Potter-Stewart Design Studio boasts award-winning interior designers led by principal Gary Potter for projects including yachts, offices, and distinctive homes. The showrooms feature a comprehensive selection of marble, granite, carpeting, fabrics, and wallcoverings.



Paul Birkey

MARINE SERVICES

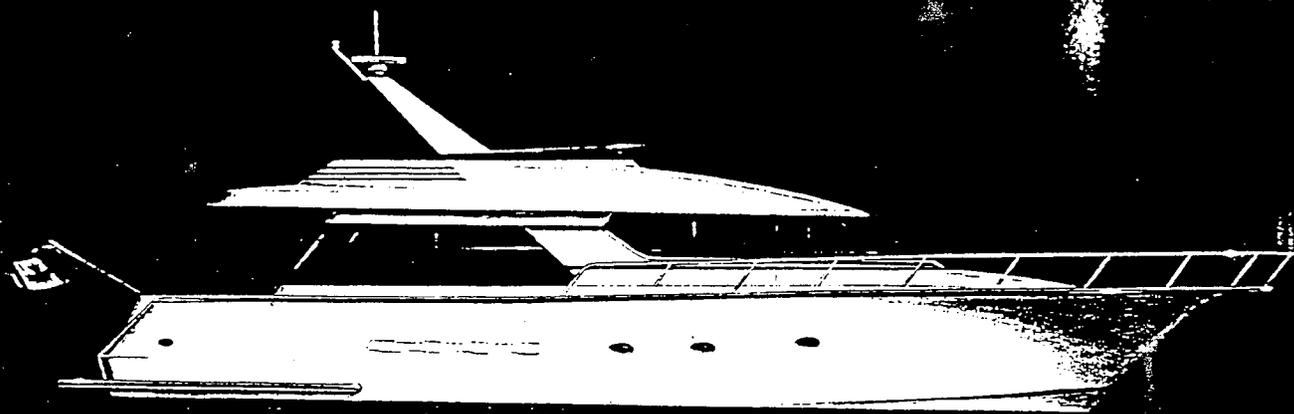
Belina Woodworks, Tacoma, WA

Belina Woodworks is engaged exclusively in the construction of fine yacht interiors. As with founder Paul Birkey, many of the firm's key personnel were originally boatbuilders. Oriented to prefabrication and the micro-management of design details, Belina's craftsmen build intricate components off-site, including entire interior modules as well as unique furniture pieces, for installation and finishing according to shipyard specifications. Belina's clients encompass shipyards of the region, including several recent projects with Delta Marine, as well as interior designers.

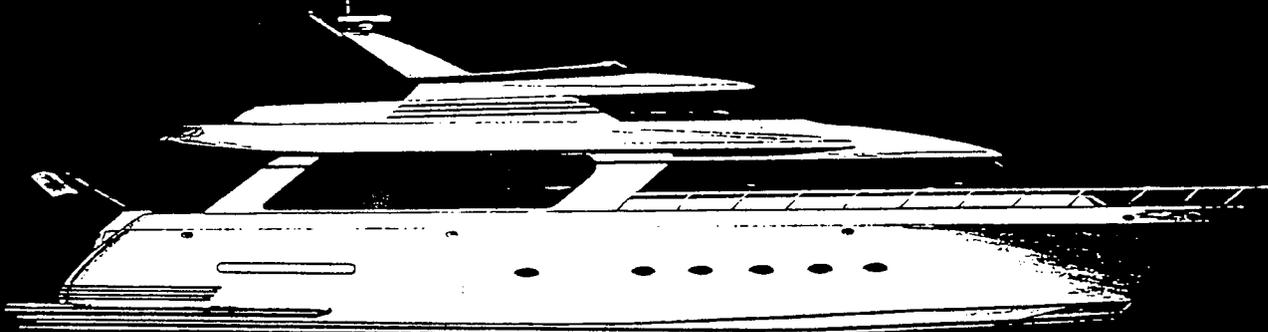


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Marine Industry



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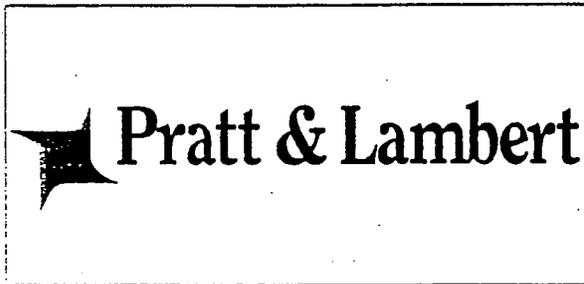
First New England Financial, a part of GE Capital Corporation, is an originator of marine loans, and the oldest company of its kind in the U.S. With regional offices located in Ft. Lauderdale, Florida, and Fairfield, Connecticut, as well as Newport Beach, California, the company provides consumer loans for purchase or refinancing of pleasure yachts from \$25,000 to \$7,000,000. A variety of lending options meet most yacht financing requirements and situations. First New England Financial is a specialist in large yacht financing.



Fisheries Supply Company

Fisheries Supply Company, Seattle, WA

Founded in 1928, this prominent West Coast marine accessories distributor/retailer is comprised of a central wholesale operation and three retail stores. On the wholesale side, Fisheries Supply Company serves the boat builders, naval architects, boatyards, and other commercial and industrial accounts of the Pacific Northwest as well as national and international accounts. The company is famous for its knowledgeable staff and uncommonly high order-fill rate. The three retail stores, named Crow's Nest Marine Supplies, draw from the nearly 70,000-item inventory of the wholesale division, offering a complete line of general marine accessories as well as quality custom and extra-high-performance items for the serious boat owner.



Pratt & Lambert, Sedro Woolley, WA

For almost a quarter of a century, Pratt and Lambert has dominated the business jet and general aviation coating's market. Its "Only One" Jet Glo/Acry Glo urethane paint system is the premier choice of aviation manufacturers and recoaters.

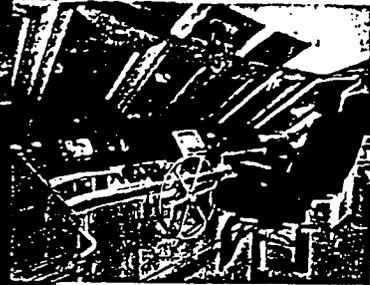
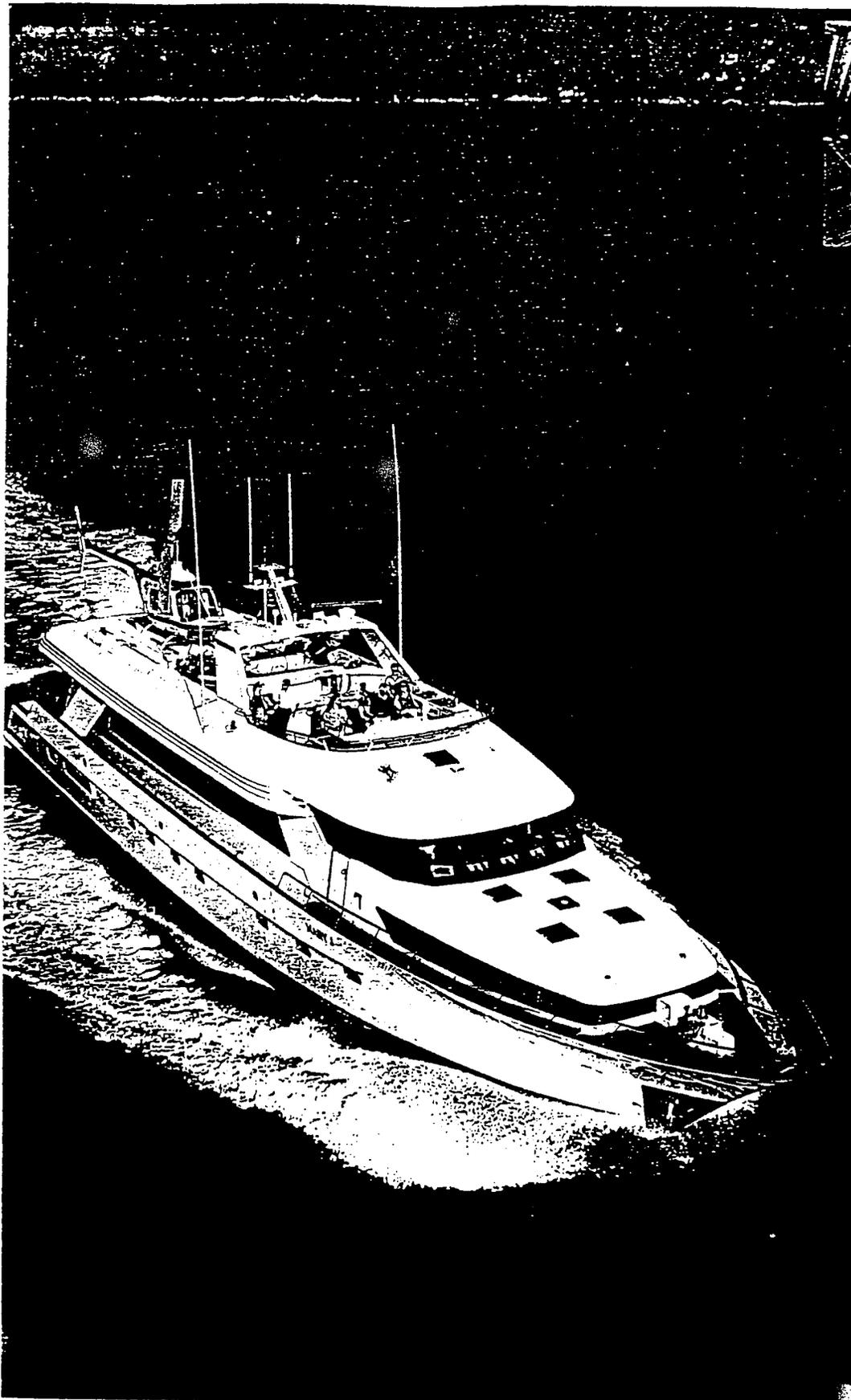
Now, Pratt and Lambert is making an aggressive move into the marine coatings market with these top-of-the-line polyester and acrylic urethane paints for use on the interior and/or exterior of yachts. Important features such as brilliant color, gloss, and durability, fast and accurate color matching, along with easy and consistent application, are rapidly making Pratt and Lambert's Marine Urethanes a popular choice for the yachting industry.

Riesner McEwen

Riesner McEwen, Seattle, WA

This Seattle-based firm of marine surveyors and consultants specializes in part in performing pre-purchase, insurance, and damage-related surveying services on larger yachts. The firm is well established with major financial and insurance institutions. In addition to routine marine surveying, RM&A provides construction management services during the construction, reconstruction, and repair of large yachts. Recent projects in which the firm has served as owner's agent and/or representative include the construction of 114-foot, 120-foot, and 142-foot motoryachts and a 94-foot yachtfisherman, and the reconstruction of a 50-foot classic wooden motoryacht.





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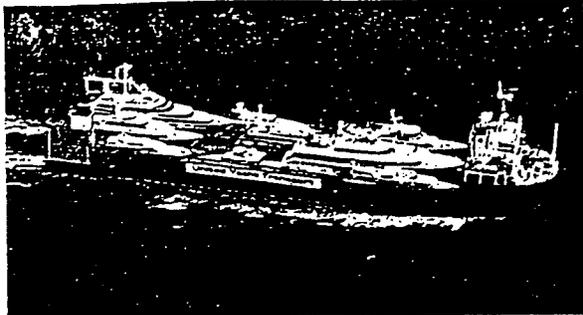
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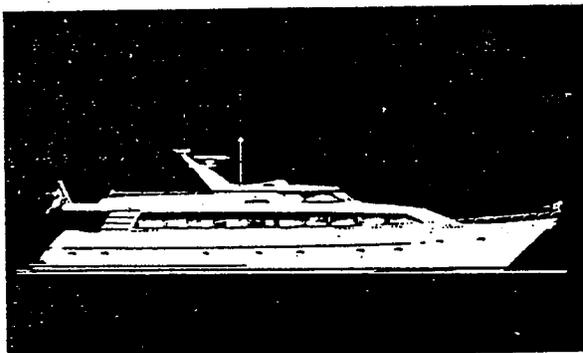


Powered by Detroit Diesel

Marine Industry



Super Servant 6 for United Yacht Transport



112' Jack Sarin Design for Crescent Beach

United Yacht Transport, Ft. Lauderdale, FL
Beginning with the premise that just getting there is not half the fun, United Yacht Transport operates a 460-foot ship that carries luxury yachts to exotic locations, thus extending their cruising range and saving wear and tear. In the two years since its inception, United Yacht Transport has carried more than 250 yachts between Europe and the United States and Caribbean, and between the United States and French Polynesia. The transport ship, Super Servant 6, has a submersible hold, and yachts are floated in and secured and blocked before the hold section is raised, spilling its seawater in the process. With its 3,500m² of hold space, Super Servant 6 typically carries 12 or more yachts per crossing. The largest yacht carried to date is the 170-foot *Southern Cross III*.

NAVAL ARCHITECTS

Jack W. Sarin Naval Architects, Inc., Bainbridge Island, WA
This full service naval architectural firm has been in operation since 1980. In addition to hull design and engineering, the firm provides an in-house staff and facilities offering a full range of services including interior and lighting design, styling, and ship's system coordination during construction. Sarin's focus on combining hull design and exterior styling with engineering and interior design in a single operation has proven popular with a number of clients for its efficiencies in project coordination.

The office has participated in the design and construction of more than 400 vessels, both commercial ships and private yachts, up to a length of 180 feet, and to various ship-building rules including ABS, U.S. Coast Guard, Lloyd's, NKK, and Bureau Veritas.

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Starting with the high-gloss, wet look of Jet Glo® for yacht exteriors and adding the excellent color and mirror-like gloss of Acry Glo® trim, only Pratt and Lambert paint can give your yacht a paint job of unmatched, long-lasting beauty and durability — from just one paint system.

So, rather than try to mix and match different paint systems, make sure your yacht receives the benefit of Pratt and Lambert's Jet Glo®/Acry Glo® Paint System.

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Polyester Urethane

- Complete exterior coating.
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- Proven durability and gloss retention.
- Intermix — 5,000 colors.

Acry Glo®

Acrylic Urethane

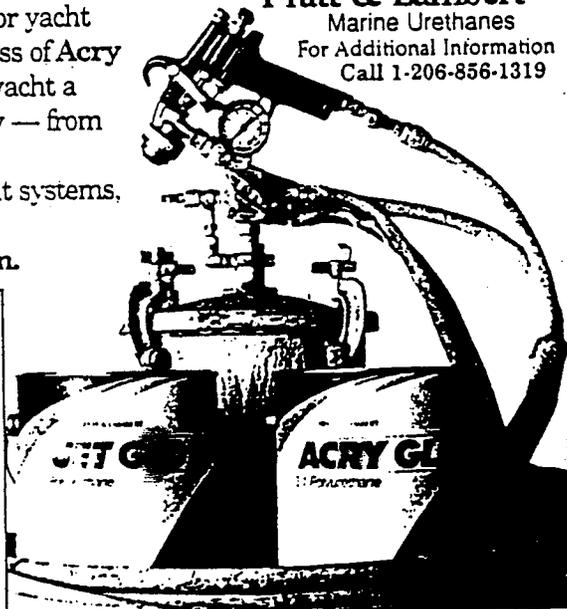
- Interiors and stripes.
- Long-lasting, high-gloss retention.
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- Intermix — 5,000 colors
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Pratt & Lambert

Marine Urethanes

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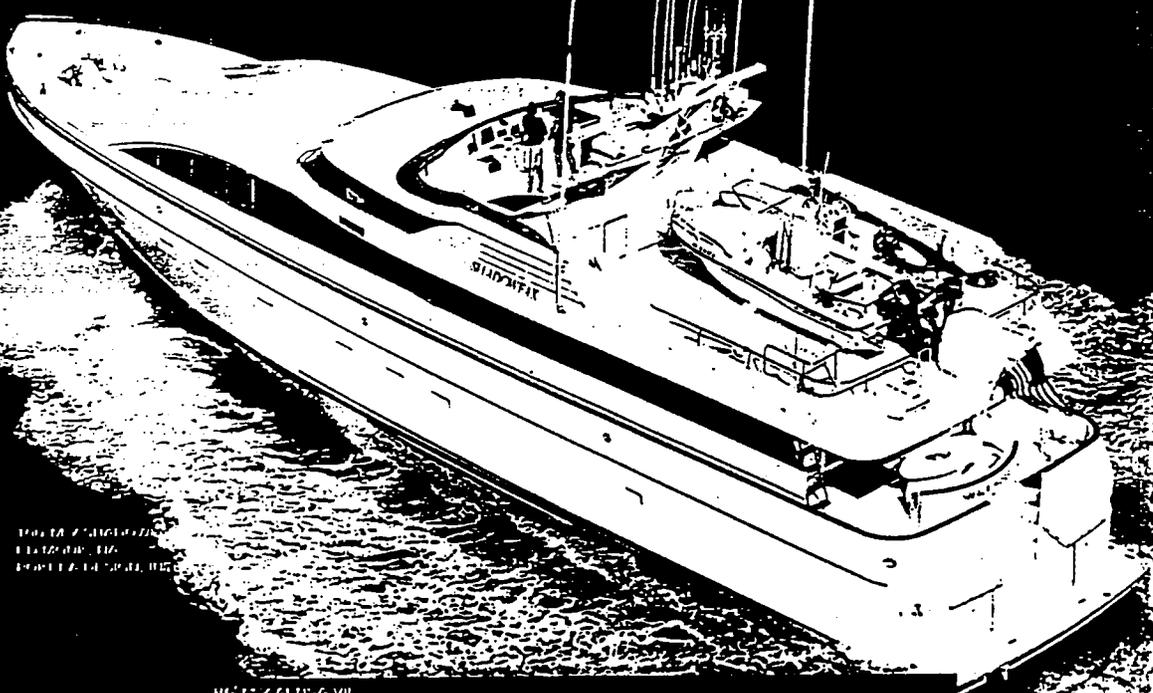
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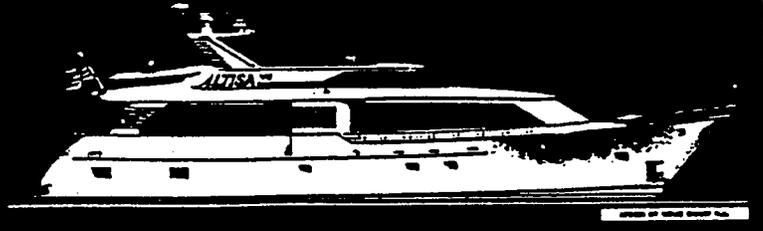


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80' M. V. ALTA
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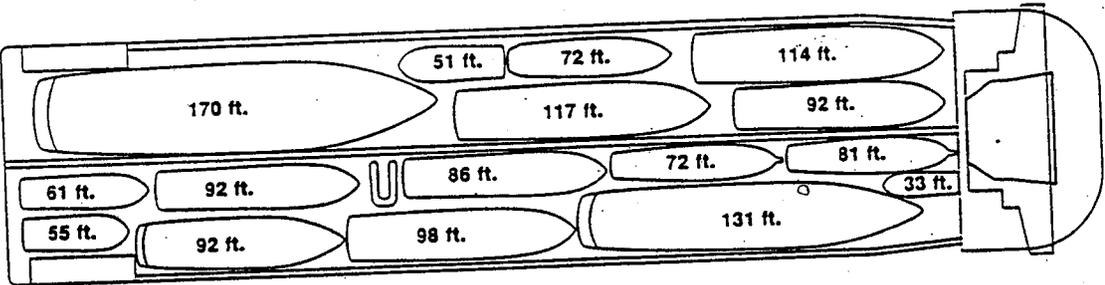
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unity

united

united \yü-nit-əd \adj (1552) 1: made one; combined 2: relating to or produced by joint action 3: being in agreement ; harmonious
united yacht transport \yü-'nited 'yät trans-'pö(ə)rt (1992): operators of the motorvessel "SUPER SERVANT 6", principal characteristics: length overall 139 meters, width: 32 meters, depth: 8.50 meters, draft sailing: 6.02 meters, draft submerged: 14.55 meters, gross tonnage: 10,278 m/tons, dead weight: 13,310 m/tons, total deck space 3,500 m2, deck load: 15t/m2; offices in Ft. Lauderdale, Florida; Mandelieu, France; Meer, Belgium; offering liner services to the Caribbean, Mediterranean, Florida, West Coast Mexico, French Polynesia - in 1993 a total of 101 yachts, bringing the total of yachts transported since operation to over 250 to date from St. Thomas - Pt. Everglades - Toulon: ADLER / DELPHIN II / PANACHE / MOONEN PRINCESS / SAFE CONDUCT II / LAZY DEVIL / LOONEY BIN / ENCHANTRESS / ORION / AMIGO BEACH / OCTOPUSSY / TRANSITION / SUPER ALLIGATOR / OSPREY; Toulon-Pt. Everglades: KERANNA / CARTOUCHE / MAFERIA 6 / BEST / MY TOY / MAFFY BLUE / LADY JUSTITIA / AL DIWAN; Pt. Everglades - Palma de Mallorca : FANTASY / MALANA STAR / BONDO / CHATO / JAMI / BIG FOOT / CORONA DEL MAR / ESTEREL / THERAPY / KAMP KOGEN /

KISMET / YABRO II; Palma de Mallorca - Pt. Everglades: REFLECTION / MOHAMI / PRIDE / CINDY T; Pt. Everglades - Palma de Mallorca: AQUARIUS / PALOMA BLANCA / TERANGA / AL DELLA; Palma De Mallorca - Pt. Everglades: LE FANTASTIQUE / CORONA DEL MAR / ADLER / FANTASY / ANTIPODEAN / IRONIC / A.G. / LADY COLETTE / 82 CONVERTIBLE HATTERAS / PERCEVAL / EMMY / LEKID 4 / VANTARE; Pt. Everglades - Palma De Mallorca: BREEZY / CHARISMA / ENDLESS SUMMER / WANDO LADY; Palma de Mallorca - Pt. Everglades - St. Thomas: PELAGIAL, SAFE CONDUCT II / DELPHIN II / SELKIT / CHATO / PERCALE / GEMINI LADY / PAPA / PUMA / TOUCHSTONE AT SEA / OCTOPUSSY / JOZAAM / BARONESS L / SKY TRAX / BELLA RENA / SOUTHERN CROSS III; Pt. Everglades - St. Thomas - Palma de Mallorca: LA BELLA / CHARMER / VELOCE / CARBON COPY / TASTE TIME / TRANSITION; Palma de Mallorca - St. Thomas - Pt. Everglades: SAFARI R / PANACHE / NINETY TWO / NATURAL HIGH / SPICA / PRINCESS PAULINE / DREAM OF DELIGHT / PEPONI / VALLARTA / ALTENA / LUCKY; Caribbean - Pt. Everglades - St. Thomas: MY ITCH / GAMBLER / MER DE CRYSTAL / INDEPENDENCE / CAROL A / ARION / MERCI BERE / COEUR DE PASSION / FANTA SEA from 1gsaaaab to 1gsaaaab.



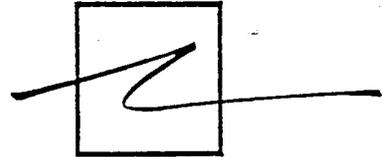
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The Pacific Northwest

A Guide to Super Yacht Builders



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Victoria

San Juan

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Where you go before or after attending Superyacht Northwest likely will be determined by what shipyards or companies you want to visit. This guide includes tips on places as far south as Portland, Oregon, and as far north as southern British Columbia. The following visitor's bureaus can provide additional information.

Portland Visitors Association:
800-962-3700 or 503-275-9750.

Greater Seattle Chamber of Commerce: 206-389-7200.
Seattle-King County Convention & Visitors Bureau:
206-461-5800.

East King County Visitors Bureau: 206-455-1926.

North Olympic Peninsula Visitor Bureau:
800-942-4042 or 206-452-8552.

San Juan Islands Visitor Information Service: 206-468-3663.

Tourism Association of Vancouver Island: 604-382-3551.
Tourism British Columbia: 800-663-6000 or 604-739-9011.

September is the month for visiting the Pacific Northwest. The weather is perfect, the pears and apples are ripe, the salmon are fat, and at the higher elevations, the leaves are turning. The scenery is beyond compare and the multi-cultural richness of the region is unparalleled. Little more than 100 years ago, this area was open frontier and the rugged pioneer spirit still exists in the friendly, can-do attitudes of the people.

SEATTLE/KIRKLAND/ BELLEVUE

We asked some Seattle natives where they take their out-of-town

guests. Here's what they suggested:

The Tillicum Village tour includes a narrated harbor cruise to Blake Island Marine State Park in Puget Sound for an Indian-style salmon dinner and stage show: 206-443-1244.

Seattle's Wing Luke Asian Museum is well known for its landmark cross-cultural exhibits. The permanent centerpiece exhibit, "One Song, Many Voices," depicts the 200-year history of immigration of Asians and Pacific Islanders. From Sept. 6, the museum features "Asian American Artists 1900-1960": 206-623-5124. Closed Mondays.

Five East King County Loop Tours explore the region



Washington has many notable wineries

between Lake Washington and the Cascades. These are self-drive tours of 25-150 miles outlined in a publication called *Loop de Loop* by the East King County Visitors Bureau: 206-455-1926. The most interesting tour puts you at Snoqualmie Falls and Salish Lodge (location of the "Great Northern" in the TV series *Twin Peaks*). The falls has a 270-foot vertical drop and you can hike to the base. Many hiking trails traverse 3,010-foot Snoqualmie Summit and the Cascades.

East of the Cascades is Washington's farm and cowboy country where cattle drives are still a way of life. The Ellensburg Rodeo is among the country's most famous.

More than a dozen wineries are less than an hour's drive, or ferry boat ride, away from Seattle. Beyond the Cascades are the wineries of the Columbia and Yakima Valleys. In Washington, grapes ripen in mid-September. Chateau Ste. Michelle (206-488-4633) and Columbia (206-488-2776) in Woodinville are among the best known of the Puget Sound area wineries.

Another way to visit wine country is aboard *The Spirit of Washington* dinner train. Luxurious vintage railroad cars carry guests along the shores of Lake Washington as dinner is being served enroute to the Columbia winery: 800-876-7245.

At Boeing Field you can tour the Museum of Flight with its more than 40 aircraft on display and a fabulous exhibit on the history of aviation: 206-764-5720. Thirty miles north is Boeing's Everett Field facility, which offers tours and a chance to see 747s

being assembled in the world's largest building: 206-544-1264.

The Seattle Art Museum re-opened in 1991 in a dramatic new building designed by Robert Venturi. The museum is well-respected for its collection of Native American and modern art: 206-654-3100. Closed Mondays. The Bellevue Art Museum in Bellevue displays national and regional contemporary art: 206-454-6021.



Working cowboys in cattle country



There are two resident Orca pods among the San Juan Islands



Fly in for flyfishing

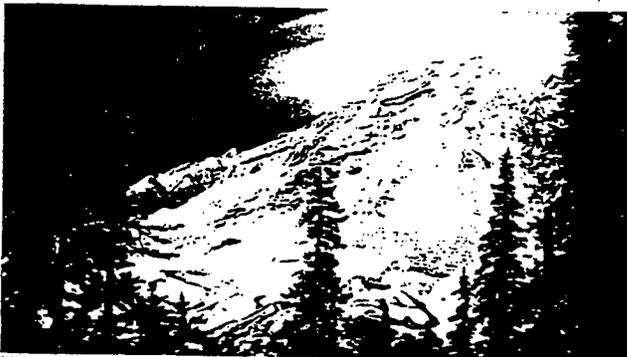
With 150 stalls and 200 shops and restaurants, Pike Place Market is the heart and soul of Seattle. Opened in 1907, it is the oldest continually operated independent farmers' market in the U.S.

The Washington Park Arboretum and Japanese Garden south of the Lake Washington Ship Canal is a botanical research park: 206-543-8800. For another beautiful botanical setting visit the Bloedel Reserve on Bainbridge Island: 206-842-7631.

Near Tacoma in Eatonville is the popular Northwest Trek Wildlife Park. Naturalists take



A Northwest tribal totem



Mt. Rainier keeps an ice cap all year

you on a tram tour through 435 acres where wild animals roam freely in herds: 206-832-6117. In Seattle, the beautiful Woodland Park Zoo displays precedent-setting techniques in natural setting animal exhibits including savannas and a tropical rain forest: 206-684-4026.

At 14,410 feet, Mt. Rainier National Park (206-569-2211) dominates the skyline. The Paradise Lodge at the 6,000-foot level is a popular spot for a dramatic Sunday brunch. The

glaciers start nearby. Until the first snow, visitors can drive around the mountain on Steven's Canyon Road and return to Seattle via the 4,630-foot Cayuse Pass.

The Olympic Peninsula is best for an excursion of two days or more. The long way is through the state capital, Olympia. The other choice is to take the ferry to Bainbridge Island and drive to Port Gamble, a historic lumber town. Cross the Hood Canal Floating Bridge and make your

way to Port Angeles, gateway to the Olympic National Park. One of the highlights is the 17-mile trip up to 5,200-foot Hurricane Ridge. Other choice spots are the Hoh Rain Forest and the Lake Quinalt Lodge. For coast spots of note, visit Neah Bay, home to the Makah Indian tribe for more than 2,500 years, and Cape Flattery, the northernmost point in the lower 48 states.

Seattle is the gateway to the San Juan Islands, a group of 172 beautiful islands of various sizes that are the most popular cruising grounds on the West coast. Automobile ferries serve four of the islands — Lopez, Shaw, Orcas, and San Juan — from Anacortes and Mukilteo. Among the favorites are Friday Harbor and Roche Harbor on San Juan Island, Whidbey Island, which has the distinction of being the longest island in the U.S.

BRITISH COLUMBIA

Two and a half hours by car north of Kirkland is Vancouver, British Columbia's largest city. Rich in cultural diversity, it is the only city in North America with three five-diamond hotels. Canadians love their gardens and Vancouver has some of the best, including Stanley Park — 1,000-acre near downtown — and the VanDusen Gardens: 604-266-7194. Stanley Park is also the site of world-class Vancouver Aquarium: 604-682-1118. The University of British Columbia campus contains the tranquil Nitobe Japanese Gardens and the Museum of Anthropology, an architectural gem designed by Arthur Ericson. The Dr. Sun Yat-Sen Classical Chinese Garden is

Sept. 2-4 Classic Boat Festival, Inner Harbour Victoria, Vancouver Island, BC: 604-385-7766.

Sept. 3-5 Artquake: Featuring outstanding visual arts, music, theater, and dance. Pioneer Courthouse Square, Portland, OR: 503-227-2787.

Sept. 8 Kirkland Artwalk, downtown Kirkland art galleries: 206-461-5840.

Sept. 8-11 49th Annual Salmon Festival: Fair Grounds, Port Alberni, Vancouver Island, BC: 604-724-6535.

Sept. 9-10 Seattle Pops Concert - A Tribute to Gershwin: 206-443-4747.

Sept. 9-11 Port Townsend Wooden Boat Festival, Port Townsend, WA: 206-385-3628.

Sept. 12, 13 Garrison Keillor in Concert: Stories for Orchestra. Seattle Opera House: 206-443-4747.

Sept. 16, 17 Seattle Symphony Opening Nights Masterpiece Concerts: Brahms and Bartok program: 206-443-4740.

Sept. 16-18 Whistler Fall for Jazz Festival: Whistler Resort, Whistler, BC: 604-932-4222.

Sept. 23-25 Leonard Bernstein's "Candide." Performed in an amphitheater atop Peacock Hill in Gig Harbor, WA. Moorings nearby for yachts to 80 feet: 206-851-PLAY.

Sept. 24, 25 Northwest Chamber Orchestra Concert Mozart and Haydn program. Kane Hall, Univ. of Washington campus, Seattle: 206-343-0445.

Sept. 24-25 Whistler Big Band Boom Weekend. Whistler Resort, Whistler, BC: 604-932-4222.

Seattle Mariners

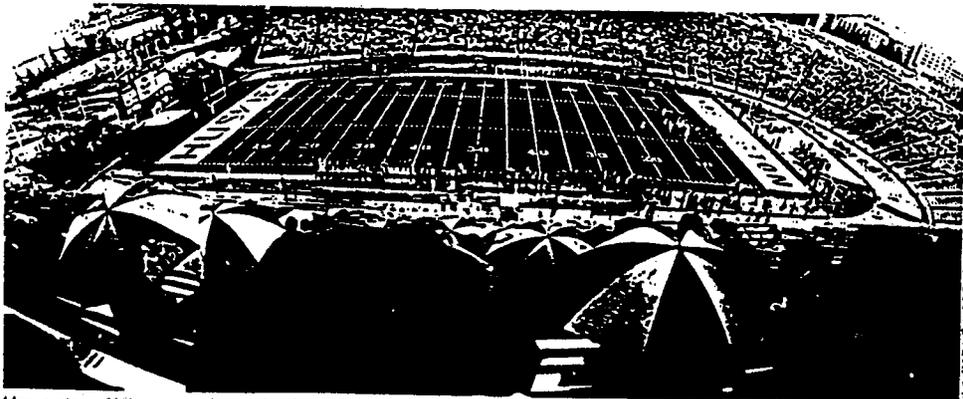
The Mariners have a home-stand Sept. 6-14 vs. Milwaukee, Cleveland, and Oakland: 206-628-3555.

Seattle Seahawks

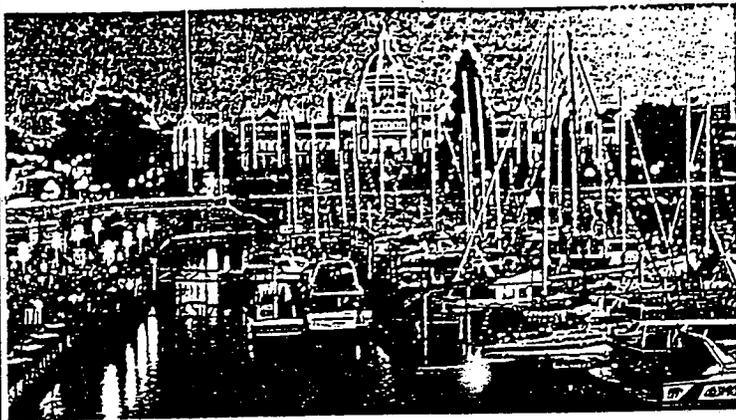
The Seahawks play the San Diego Chargers Sept. 18 and the Pittsburgh Steelers Sept. 25: 206-827-9777.

Washington Huskies

Home game vs. Ohio State, Sept. 18: 206-543-2200



University of Washington Huskies Stadium, Seattle



British Columbia's Parliament building in Victoria

the first such garden outside of mainland China: 604-662-3207.

Robson Square, formerly the law court buildings in the downtown area, is an interesting collection of shops and restaurants. The architecture, by Arthur Ericson, is remarkable.

Those seeking adventure should try Skyride, an enclosed gondola that whisks you up to the 3,700-foot top of Grouse Mountain in six minutes for an overall view of Vancouver and hiking trails.

On the waterfront in the charming False Creek district is Granville Island, a chic locale with public market, artists' studios, and fine restaurants. Further up the Creek is the Vancouver Maritime Museum: 604-257-8300.

Whistler is 75 miles north of Vancouver. An alpine village with European charm, the resort area is home to two magnificent mountains, Whistler and Blackcomb, both above 7,000 feet. The Blackcomb Horstman Glacier offers summer skiing, while the lower altitudes feature hiking, biking, tennis, horseback riding and two championship golf courses: 800-944-7853 or 604-932-4222.

Northwest from Vancouver



Stroll Bloedel Reserve on Bainbridge Island

by ferry across Horseshoe Bay is BC's Sunshine Coast and a veritable yachtsman's paradise including such magical places as Pender Harbour, Jervis Inlet, and Powell River. If you can only do one special thing on your trip, consider chartering a float plane for a trip up Princess Louisa Inlet.

Take the ferry to Victoria on Vancouver Island from Seattle, Bellingham, or Port Angeles, or to nearby Sidney from Anacortes. Victoria's harbor is picture-postcard pretty. There are many historic sites, including the Craigdarroch Castle (604-592-5323), the Royal British Columbia Museum (604-387-3701), and the Maritime Museum of History (604-385-4222). Many fine old turn-of-the-century mansions have been turned into B&Bs. The 50 acres of famous Butchart Gardens should still be in summer flower: 604-652-4422.

Vancouver Island is 450 kilometers long with less than one million population. Its proximity to the Humboldt Current makes its weather temperate and its western coast features a rain forest within Pacific Rim National Park. The roar of the sea is silenced a few steps from the water's edge by the forests of

cedar, hemlock, and 800-year-old fir trees. Near the coast are scores of lakes and streams full of brown trout, while the Stamp River System provides excellent steelhead fishing. Port Alberni is the center of much of BC's salmon industry.

PORTLAND, OREGON

Portland covers 130 square miles fronting on the Willamette River. It is 78 miles from the sea and 65 miles from the glaciers surrounding Mt. Hood. Nicknamed the City of Roses, it has 37,000 acres of parks. The International Rose Test Gardens are in Washington Park.

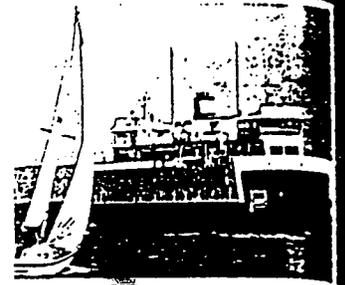
Highlights of the central city include the Tom McCall Waterfront Park and Riverplace Promenade with its restaurants, marina, and specialty shops. In the Skidmore Historic District local craftsmen, entertainers, and chefs fill the



Windsurf Columbia Gorge

Skidmore Fountain area each Saturday for the nation's largest continuous outdoor crafts fair. The Cowboys Then and Now Museum is located in Oregon Square. It features a theater, library, and hands-on exhibits on the American West. The Oregon Museum of Science and Industry (504-797-4000) offers all manner of exhibits and tours of the Navy sub Blueback.

Fifteen miles north of Portland, across the Columbia River, is Vancouver, Washington. Founded as Fort Vancouver, the former headquarters of the famous Hudson Bay Company, this city was once the fur-trading capital of the Pacific Northwest. The Mt. St. Helien's National Historic Monument (206-247-5473) is nearby and the mountain is easily visible from the city.



The Northwest is such a vast region and the terrain often so daunting that the locals developed a unique form of mass transportation. In Puget Sound and coastal British Columbia, ferries and float planes function like buses and taxis. Ferry service is generally a mix of auto and passenger-only service, so remember to check in advance if your desired passage will accommodate a car. Float planes operate on scheduled service as well as on a charter basis.

Washington State Ferries

This is the largest ferry system in the U.S., operating 25 ferries over nine routes among the 2,000-mile-long shoreline of Puget Sound: 206-464-6400.

Victoria Clipper High-speed (2.5 hour) passenger service from Seattle to Victoria, B.C.: 206-448-5000.

Victoria Line Daily service from Seattle to Vancouver, B.C.: 800-668-1167

B.C. Ferries

Auto-carrying ferries between the mainland and Vancouver Island from numerous terminals: 604-381-5452.

Air Services

Kenmore Air World's largest seaplane operation. Daily scheduled flights to Victoria and the San Juan Islands. Day excursions, scenic flights, salmon fishing: 800-543-9595 or 206-486-1257.

Puget Sound Helicopters: 206-764-9630.

Other regional companies offer float planes for charter, including Puget Sound Seaplanes, Chrysler Air, and Northwest Sea Planes. The largest local commuter airline is Horizon Air.

IT'S ABOUT TIME...

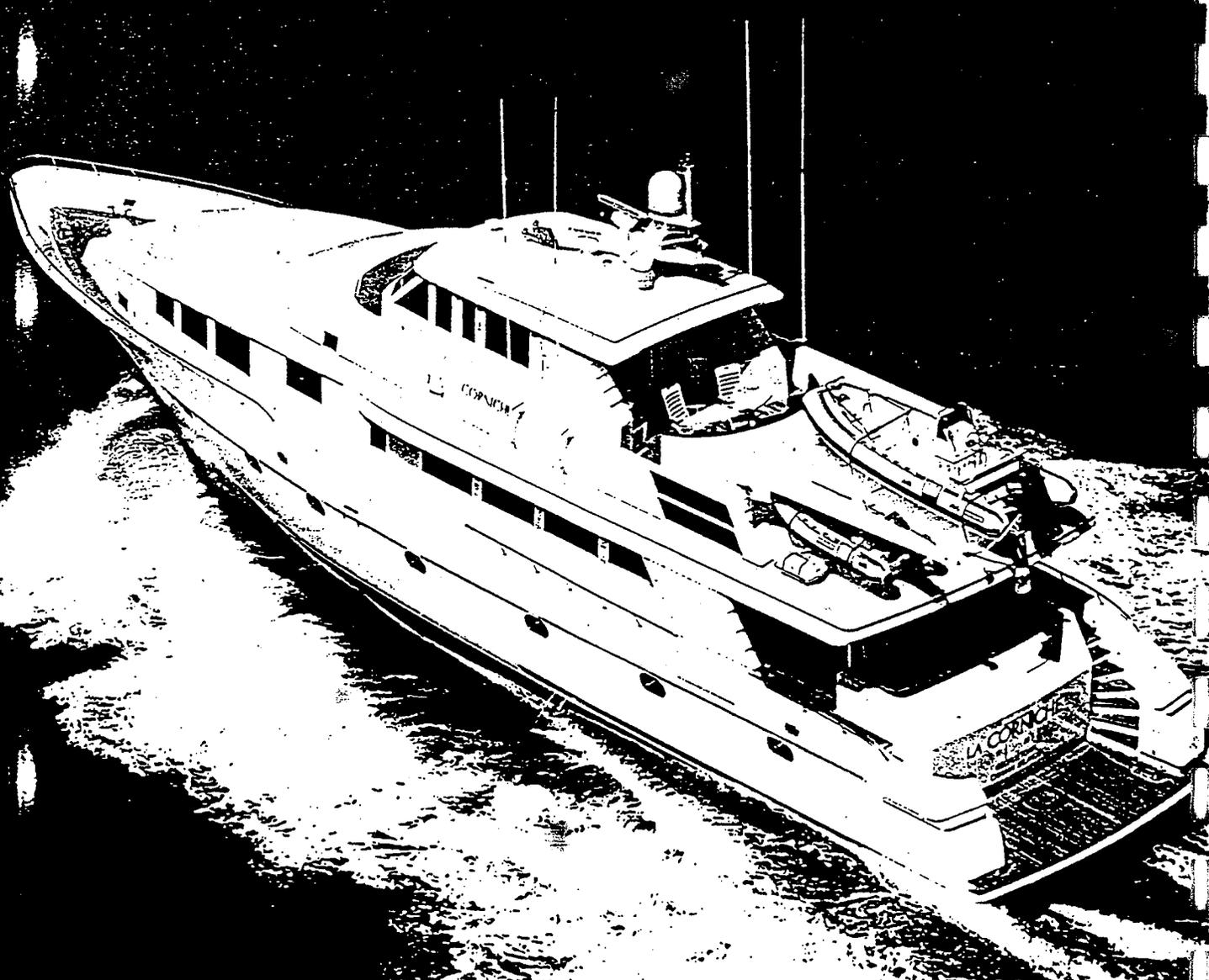
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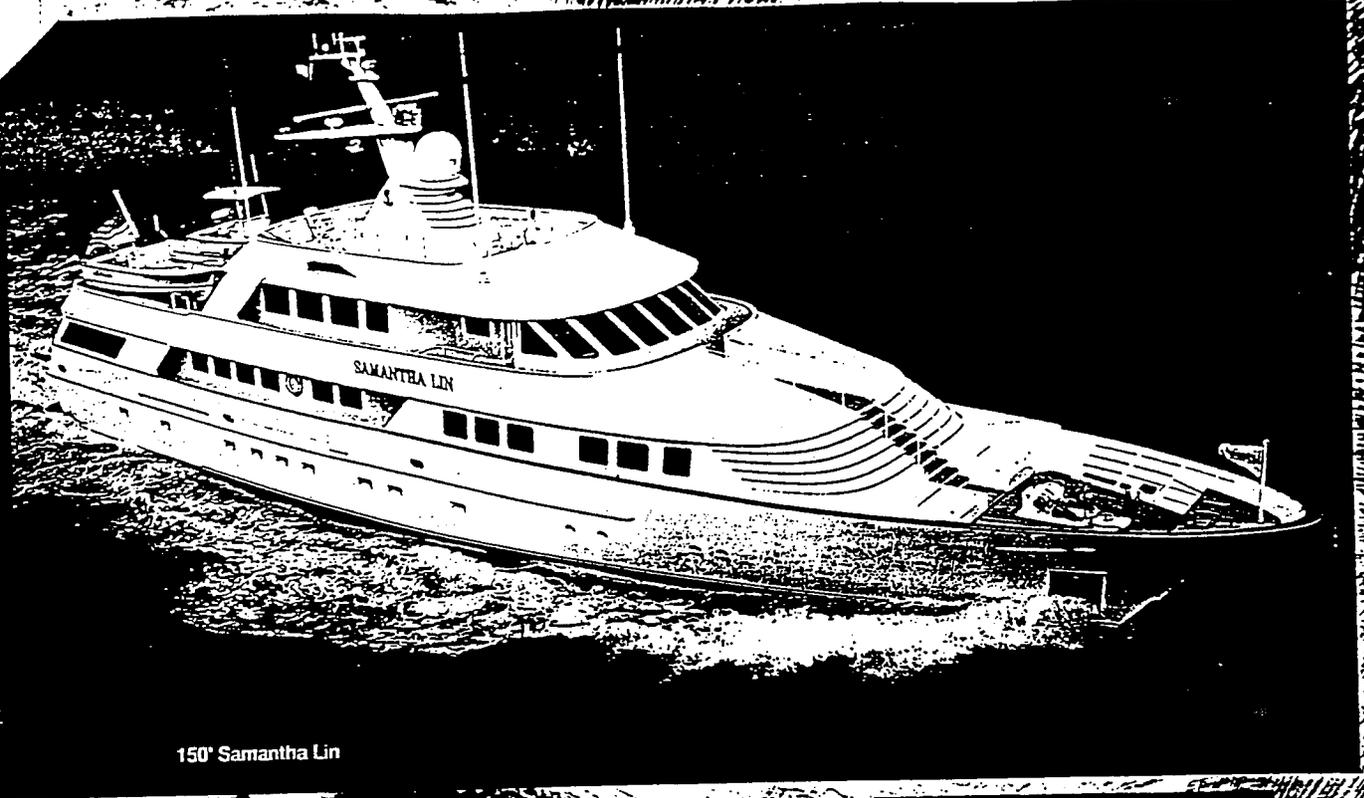
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Bal de la Mer

JOINING THE NATURE CONSERVANCY'S CAMPAIGN TO PRESERVE WILLAPA BAY

The Bal de la Mer, a non-profit fundraising arm of *Showboats International* magazine, is proud to form an association with Superyacht Northwest to raise money for a very special project of The Nature Conservancy.

The Superyacht Northwest Bal de la Mer gala, which will take place September 16, marks the third venue for the charity, and the first on the Pacific. The charity, which serves as a bridge between the luxury yacht community and worthy marine conservation causes, produces extremely successful fund-raisers each year in Monaco and Newport, Rhode Island.

In Seattle, the Bal de la Mer is expected to attract hundreds of people from local and international yachting, and from local business and social circles to raise money for purchasing acreage in Willapa Bay, a vital and clean 700,000-acre watershed of temperate rainforest, rich mudflats and marshes, and hundreds of rivers and streams located in the southwest corner of Washington State.

One of the largest and most productive estuary systems in the U.S., Willapa Bay has been selected by The Nature Conservancy as an important ecosystem to protect from destruction. This rich ecosystem is still in remarkably good health, yet it is not immune from the pressures of development that exist in the rest of the state. According to Nature Conservancy vice president Elliot Marks, who directs the organization's Seattle-based efforts, Willapa Bay represents an important example of what he calls the "post-wilderness conservation strategy" that will be the next major development in conservation.



Bone River



Willapa Bay waterfowl

Willapa Bay is part of The Nature Conservancy's "Last Great Places" campaign, which calls for acquiring important natural areas, and developing programs for sustaining their environmental quality and diversity while providing for compatible economic development. Conservation in the next century, Marks believes, must include "sustaining the ecosystems and economies of

the larger, populated areas that surround natural areas." Approximately 19,000 people live in the Willapa Bay area and most make their living from the region's oyster beds and tree farms.

Part of The Conservancy's ecosystem management/sustainable development program in Willapa includes purchasing land along two excellent quality river/saltwater marsh sys-

tems. To date, The Conservancy has acquired 1,800 acres for preserves in these key natural areas.

The Nature Conservancy is a private non-profit organization dedicated to preserving plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. To date, The Conservancy and its members have protected more than seven million acres in the United States, often through direct purchase of ecologically significant lands. In Washington State, The Conservancy has protected more than 34,000 acres of native habitat including islands among the San Juans. The Conservancy of Washington owns and manages 30 preserves within the state.

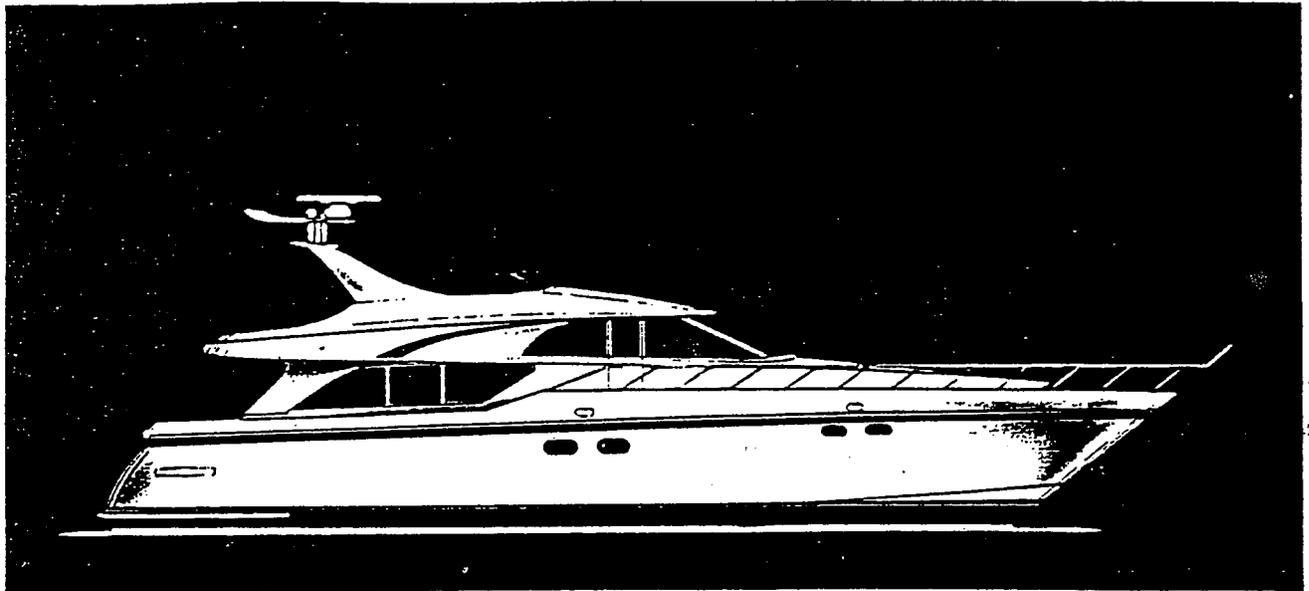
Thus far, The Nature Conservancy has been able to forge extraordinarily strong bonds with the Pacific Northwest's business community and governmental agencies in its drive to protect Willapa Bay and other important ecosystems in the region.

Lester Abberley, publisher of *Showboats International* and co-director of the Bal de la Mer, said that with the combined efforts of Superyacht Northwest and the local luxury yacht community, the charity offers the region an unprecedented opportunity to galvanize a broad and powerful cross-section of the Pacific Northwest to preserve Willapa Bay. Co-director Jim Gilbert, editor-in-chief of the magazine, added that the Bal de la Mer only becomes involved in long-range projects, and that the new event represents a minimum five-year effort with Superyacht Northwest to secure the future of Willapa Bay.

Tickets to the Bal de la Mer can be obtained by calling 206-827-3200. Tickets are available at \$250, \$500, and \$1,000 and are tax deductible to the extent allowed by law.

Bal de la Mer is part of the Hachette Filipacchi Foundation, a registered tax-deductible charity with the U.S. Internal Revenue Service. For information regarding the charity, contact *Showboats International* magazine. For information on the Willapa Bay project, contact the Washington Field Office of The Nature Conservancy, 206-343-4344.

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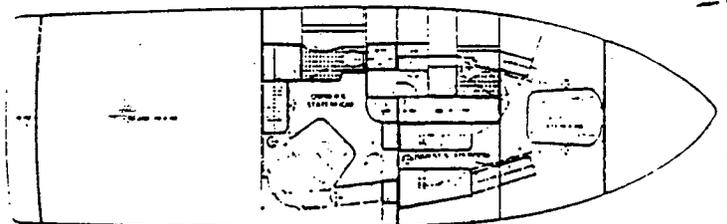
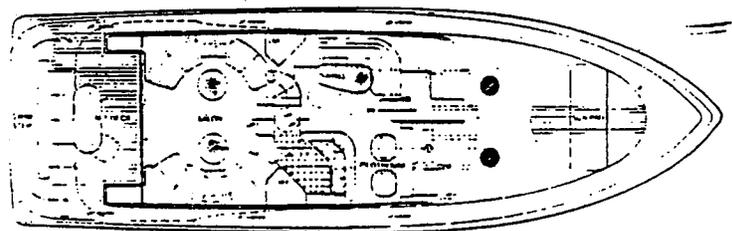
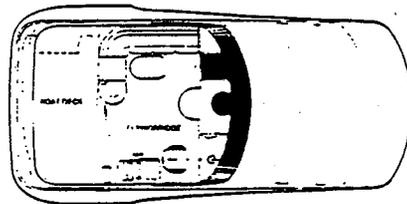
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A TASTE OF THE NORTHWEST

The *Bal de la Mer* to be held September 16 during *Superyacht Northwest* will feature specialties prepared by the top chefs of the most exciting restaurants in the Northwest, plus fine local wines, ale, and desserts. This taste of the great Northwest will no doubt whet your appetite, and we suggest you use the following restaurant guide to plan your culinary tour of the area.

Adriatica

Winner of *Seattle* magazine's Reader's Choice Award for Best Restaurant and Best Mediterranean Restaurant two years in a row! The atmosphere is of a 1920s villa; the setting is overlooking Lake Union. Marvelous menu with unusual Greek/Italian influences applied to grilled meats and seafood, pastas and risottos. Famous for extensive appetizer list ranging from fresh mussel pan roasted with fresh tomato, basil and cream, to roasted garlic served with eggplant caponata, Montrachet chèvre, pizza triangles, and Niçoise olives as well as its signature calamari. 1107 Dexter North, Seattle (Tel.) 285-5000



(Tel.) 285-5000

Cafe Juanita

Located in a converted house on Juanita Creek, Cafe Juanita is decidedly cozy, spontaneous, and popular with the natives. The menu is limited to what fits on a couple of blackboards, but there are always nightly specials, and sometimes a barbecue on summer weekends. The cuisine is hip — Neumark's chicken in pistachio sauce is legendary — and approachable. Generally the list includes three pasta dishes and a mixed grill, along with seafood. And then there's the winery in the cellar. Owner Peter Dow produces about 500 gallons of wine a year under the label Cavatappi for consumption solely in the restaurant. He also stocks more than 250 Italian wines and for the past several years Wine Spectator has named his cellar one of the greatest in America. 9702 NE 120th PL, Kirkland (Tel.) 823-1505

Chef John Neumark

Campagne

This delightful restaurant features the flavors of the Provence countryside in the heart of the Pike Place Market. Award-winning cuisine is served in the intimacy of a sophisticated yet unpretentious dining room, while lighter fare is offered until midnight in the casual café/bar. Until the end of September, dinner is also served alfresco on the patio. Chef Murphy's appealing assortment of hors d'oeuvres include calamari dusted with almonds and sautéed to a tender crunch, a marvelous lobster and asparagus salad served with garden pea pancakes and a carrot truffle vinaigrette, and a forest mushroom fricassée served with lace potato pie. The entrees are even more French and include dishes with squab, rabbit, and lamb. Fresh fish specials are prepared daily according to the chef's whim. 86 Pine Street, Seattle (Tel.) 728-2800

Chef Tamara Murphy

Chandler's Crabhouse

Situated on Lake Union, Chandler's ambiance is reminiscent of an East Coast fish house. The menu features Northwest cuisine with Pacific Rim influence and special emphasis on seafood. Chef Poor's most oft-requested entrees include the House-Smoked Seafood Sampler, Chandler's Dungeness Crab Cakes, the slightly exotic Coconut Prawns, and hearty Stuffed Baked Prawns. For starters, Poor recommends the Whiskeyed Crab Soup. The signature dessert is Dungeness Crab Ice Cream. Chandler's is also a major fish market and Chef Poor holds gourmet crab-cooking classes each spring. 901 Fairview Avenue North, Seattle (Tel.) 223-2722

Chef Brian Poor

Christina's

There are just 12 tables in this award-winning restaurant renowned for the creativity of its chef/owner — a member of a third-generation Washington farming family. Christina Orchard is famous for using only fresh, regional food of the season and for a fabulous wine cellar that offers as many as 60 Northwest wines. *Pacific Magazine* lists her among the top seven chefs of the region. An author of several cookbooks, she is also a member of Les Dames D'Escoffier. Christina's is located in the San Juans, a popular stop for yachtsmen cruising north of Seattle. North Beach Rd at Horseshoe Hwy., Eastsound, Orcas Island (Tel.) 376-4904



Dahlia Lounge

Co-winner of the 1994 James Beard Award for Best Chef in the Pacific Northwest, Douglas is generally considered the originator of Pacific Rim cuisine. Recently profiled in *Gourmet* magazine's "Chefs Across America" series, his cooking is passionately eclectic and he delights in transferring the spices and ingredients typical of one culture to any and all others. Consider Ginger Glazed Short Ribs or Roast Duck with Green Peppercorn Sauce and Butternut Squash Risotto. While most of the fare is light, the Dahlia Lounge is popular with dessert aficionados as well, and the Creme Brulee is said to be a match for that of Manhattan's Le Cirque. Atmosphere is hip with Asian overtones. 1904 Fourth Ave., Seattle (Tel.) 682-4142

Chef Tom Douglas

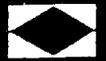
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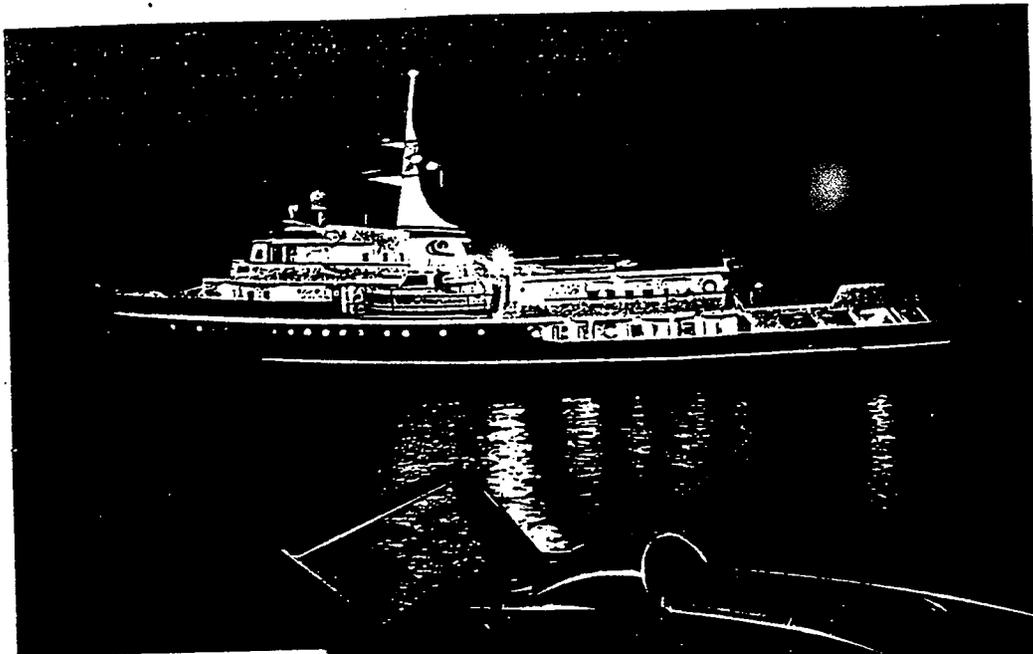
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Fullers

Fullers has been rated as one of the top restaurants in the nation for four consecutive years by Condé Nast's *Traveler* and has received a four-star rating from *Mobil Travel Guide* for the past seven years. Monique Barbeau, a graduate of the Culinary Institute of America, is a co-winner of the 1994 James Beard Award for Best Chef in the Pacific Northwest. She has made her mark with internationally influenced cuisine that utilizes regional ingredients with emphasis on seafood. Among the signature items are Herb-crusted Alaskan Spot Prawns with Warm Mushroom Salad, and Tequila Cured Salmon Napoleon with Savory Dill Pancake and Fried Capers. Atmosphere is upscale and marked by art collections.

Within Sheraton Seattle Hotel, 1400 Sixth Ave., Seattle (Tel.) 447-5544

Chef Monique Barbeau



Gretchen's of Schwartz

Chef Cathy Conner

This Seattle native is classically trained in the art of French pastry and received her diploma at the "Cordon Bleu" Ecole de Cuisine in France. As manager, Schwartz Brothers Bakery, she was one of three winners in the Northwest region James Beard Foundation pastry chefs and bread bakers competition. Her dessert entry Bellefiore de Vino, a white Genoese sliced into five layers, soaked in white Riesling syrup, garnished between layers with champagne zabaglione, and topped with whipped cream, crushed amaretto biscuits, and shaved chocolate won the chef's choice category. Schwartz Brothers Bakery is a bustling wholesale and retail operation producing more than 18,000 pieces of baked goods each night, from marvelous hearty breads to delicate pastries.

1333 Fifth Avenue, Seattle (Tel.) 623-3134

Kaspar's

Chef Kaspar Donier

With world-class food and impeccable service, Kaspar's is perennially rated among Seattle's best restaurants. Swiss-born Kaspar is a classically trained chef whose fame lies in his subtle combinations of varied styles. He mixes the unique flavors of the American Southwest with the Asian influences of the Pacific Northwest to create such unique items as Smoked Salmon and Goat Cheese Quesadilla appetizers, and King Salmon in Crispy Potato Crust. Kaspar's flair for flavors and textures has won him numerous culinary awards including ranking among the top regional restaurants by both *Gourmet* magazine and *USA Today* in 1993, and one of the top three restaurants as chosen by *Seattle* magazine's readers in 1994. Kaspar's has a pleasing Northwest atmosphere accented with many antiques and local artists' work. 19 West Harrison, Seattle (Tel.) 298-0123

Ponti Seafood Grill

Chef Alvin Binuya

Ponti means bridges in Italian, and this charming bistro-style restaurant overlooks three, including the Fremont — America's most-opened drawbridge. Nestled alongside the Ship Canal, this Mediterranean-inspired restaurant is equally famous for ambiance and fine food. Chef Binuya was raised on an island in Puget Sound by Filipino horticulturist parents who grew or raised nearly everything the family ate. His background led to an extensive exploration of international and ethnic cuisine. His menus are noted for their devotion to light, fresh, more colorful foods and unique preparations that mix Pacific, Italian, French, and American Southwestern

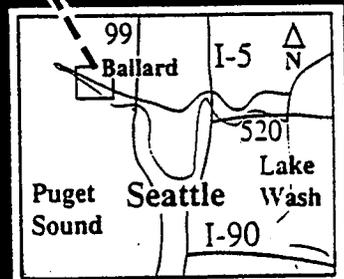
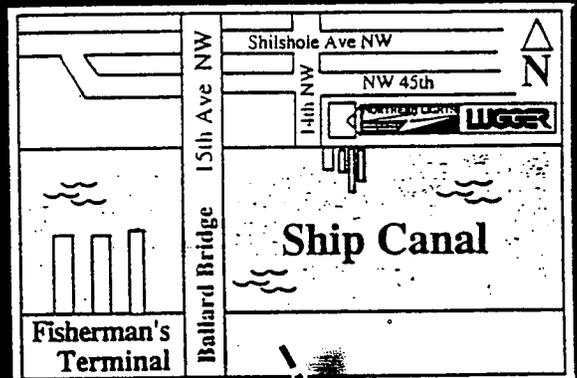
treatment of the region's freshest seafood and produce. He is particularly proud of his Thai Curry Penne with Scallops and Crab. Ponti also has one of Seattle's finest wine lists. 3014 Third Avenue North, Seattle (Tel.) 284-3000



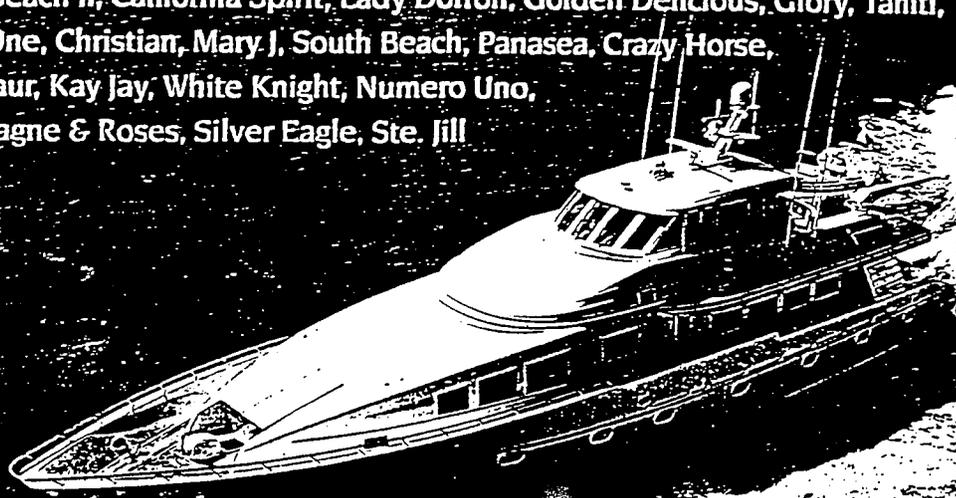
Ray's Boathouse

Chef Charles Ramseyer

Nationally acclaimed, this waterfront restaurant of magical views overlooking Shilshole Bay and the Olympic Mountains specializes in the finest Northwest seafood. Simple preparation with respect for the natural integrity of the product is the hallmark of Ray's. *The New York Times* says, "Visiting Seattle without dining at Ray's would be like visiting Paris and missing the Eiffel Tower." While the flavors may be fresh and clean, the cuisine is anything but commonplace, witness the Fresh Blueberry Salsa served with grilled salmon, or the Black Bean Sauce for white fish and vegetables. To complement the menu, Ray's has a wine cellar of more than 6,000 bottles, and the wine manager was one of five sommeliers nationwide to be nominated for the James Beard Award for Outstanding Wine Service. 6049 Seaview Avenue NW, Seattle (Tel.) 789-3770

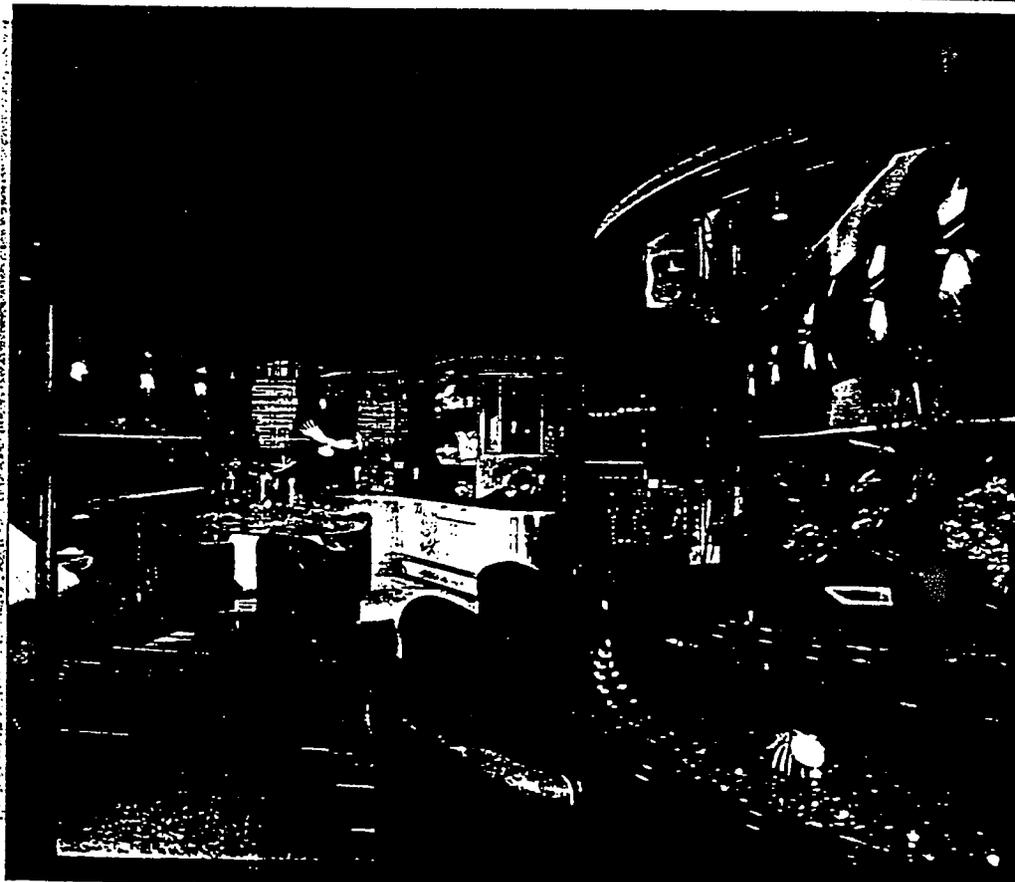


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Chef Walter Pisano



Wild Ginger

Seattle magazine's readers recently chose Wild Ginger as Best Asian Restaurant. This restaurant and satay bar features the cuisine of China and Southeast Asia in a menu that is a world tour for taste buds, and why not? The owners spent two years touring Asia and educating their palates before opening the place. For example, Dungeness crab is a mainstay but it is offered in four styles, from wok-fried, to Burmese curry, to Singapore style, with ginger, garlic, chili, black bean and tomato sauce. Crispy Duck Spiced with Cinnamon and Star Anise and served with a plum dipping sauce is a signature item. The satays take their cues from traditional Malaysian ingredients such as shrimps and scallops and improvise from there with Vietnamese, Thai, Cambodian, and Indonesian overtones. 1400 Western Avenue, Seattle (Tel.) 623-4450

Chef Jim Han Lock



Fran's Chocolates

Chocolatier Fran Bigelow Acclaimed by many food writers as the best candy maker in America, Fran Bigelow is a classically trained patisserie chef. Beginning with a simple personal passion for perfect chocolate, she experimented with dozens of varieties before discovering a special blend of Belgian Callebaut. Her hand-dipped figs and apricots have been described as the food of the gods, and then there are the truffles... 2805 Madison, Seattle (Tel.) 322-0233

Chocolatier Fran Bigelow

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Pike Place Brewery

The Pike Place Brewery is one of the most professional and exciting micro-breweries in America. Located in the Pike Place Market, the country's oldest continually operated public market, the brewery has a well-deserved reputation as a regional phenomenon, and the brews have become sought-after commodities by gourmet shops across the country. Brewmaster Charles Finkel, author of several books on beers and brewing, is listed in *Who's Who in the World of Beer*, and has been named as one of the 50 most influential people in the American beer industry. Pike Place Brewery has a regular production of six brews including the popular Pike Place Pale Ale. 1432 Western Avenue, Seattle (Tel.) 322-5022

Brewmaster: Charles Finkel



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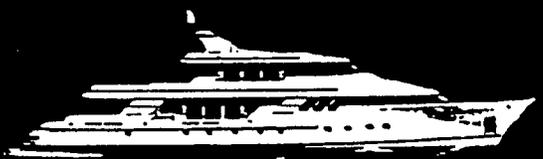
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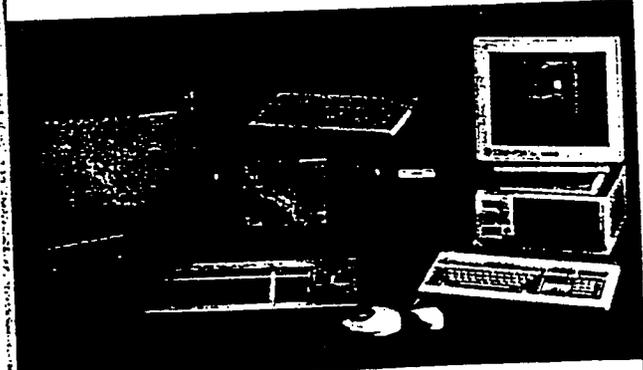
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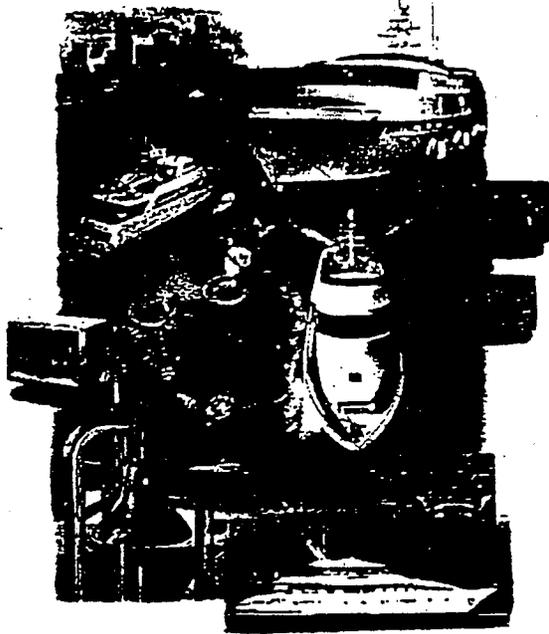
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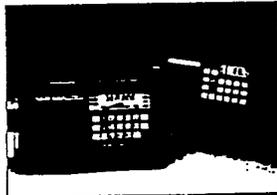
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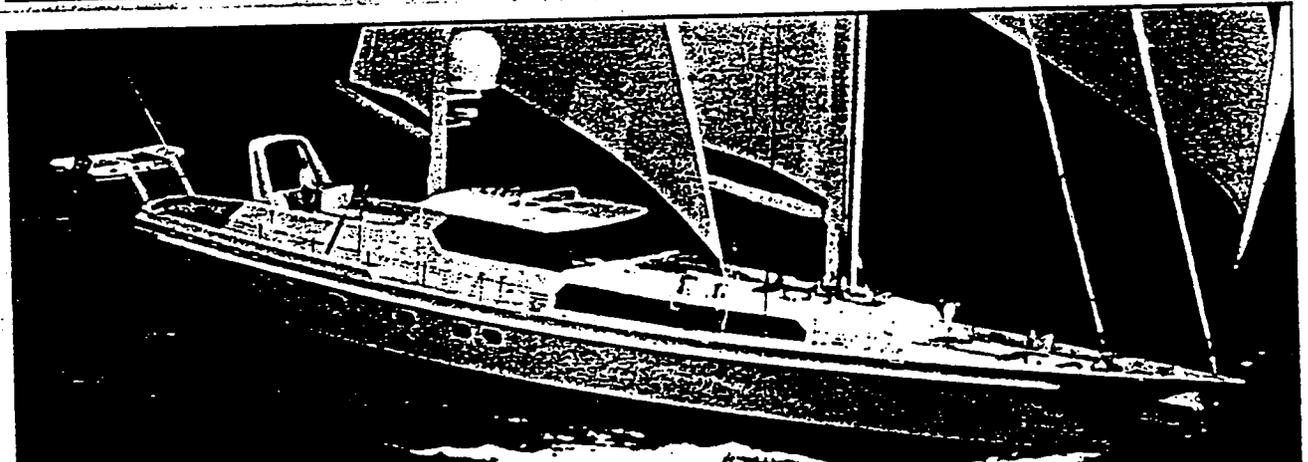
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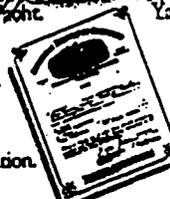
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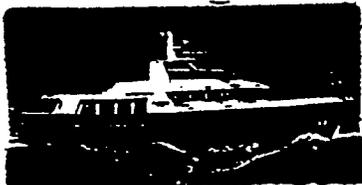
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