

**King Harbor Small Craft Traffic Assessment**

Engineering and Regulatory Support – The Waterfront Development  
JN 625-13

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To: CDM Smith, Dorothy Meyer, Project Manager  
From: Jon Moore  
Date: July 29, 2015  
RE: King Harbor Small Craft Traffic Assessment  
Cc:

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In accordance with our professional services agreement, this memorandum addresses Task 4.5. Specifically, this memorandum provides an assessment of impacts to King Harbor's boat traffic and recreation use that might be associated with the proposed boat launch ramp facility. The harbor is home port for approximately 1,400 small craft that are mostly berthed in its three marina basins. In addition, the outer breakwaters provide sheltered water space that is available for temporary anchorage and recreational water use.

A new boat launch facility (BLF) is proposed to be built in King Harbor at a location that has yet to be selected. Candidate sites include areas on Moles A, B, C, and D. Alternative BLF siting is discussed in our memorandum to the City dated June 29, 2015. Because of available parcel size limitations and the extent of existing development within King Harbor, a new BLF will be limited to a one or two lane launch ramp that can park only 20 to 40 vehicles with trailers.

The purpose of this assessment is to estimate the potential for the proposed BLF to conflict with or adversely impact the existing water uses within King Harbor. Traffic and impact analysis of recreational small craft within open water is not an exact science. The assessment is hampered by a number of variables related to demand, use patterns, and scenarios that are difficult to accurately model. Consequently, water traffic analysis must often revert to qualitative assessment and professional opinion. This is especially true given the fact that most harbors generally have no long term database that can help define the hourly, daily, and seasonal movements of the different types of small craft and how they interact with and impact one another.

#### Existing Conditions

An aerial plan of King Harbor is shown in **Figure 1**. The total water footprint of the harbor is about 99 acres and consists of three mooring basins for wet storage of small craft, an outer harbor navigation channel and transient mooring area, and a turning basin that is offset from the main channel near the harbor entrance. The three marina basins total approximately 45 acres. About 36 percent of the 44 acre outer harbor area is dedicated as the harbor's main navigation entrance channel. The turning basin adjacent to Moles C and D comprises the remaining 10 acres of water area and serves as navigable waterway to and from Basin 3, temporary staging space for small craft, and recreation area for paddle sports activity.

Four marinas operate within the harbor’s three mooring basins. The distribution of boat slips is summarized in **Table 1**. The table was compiled and adjusted from recent aerial photography of the harbor. As shown by the tabulation, the percentage of sail and power boats in King Harbor is about evenly divided.

Table 1. Approximate Wet Storage Slip Count and Boat Type Distribution in King Harbor

Location	Total	Number of boat slips			
		Power boats	Sail boats	Percent power	Percent sail
Basin 1	498	234	264	47%	53%
Basin 2	785	418	367	53%	47%
Basin 3 (excludes concession dock)	66	38	28	58%	42%
Outer Harbor Mooring	29	varies	varies		
Total excluding outer harbor mooring	1,349	690	659	51%	49%

In addition to the permanent boat slips, there are additional boats and watercraft within upland dry storage areas adjacent to the outer harbor. Over 70 sail boats are kept in a mast up yard at the King Harbor Yacht Club, and a number of outrigger boats and ocean canoes are stored at the Lanakila and Nahoia Outrigger Canoe Clubs’ site on Mole B.

Transient boat use in King Harbor consists of activity at the Mole D boat hoist facility, the outer harbor mooring field, day visitors who hand launch paddle craft from the Seaside Lagoon dock, and commercial vendors who rent peddle boats, kayaks, and standup paddle boards to the general public on an hourly basis. Tarsan in Basin 1, Oympus at Rocky Point, and Paddle House and the Redondo Beach Marina in Basin 3 are the four rental outlet locations.

Main access to and from the harbor’s mooring basins is provided by the outer harbor navigation channel that is divided by marker buoys into an in-bound and out-bound lane. The total width of the 3,100 foot long waterway varies from about 230 feet at the entrance to 180 feet at the north end. At its widest point the two-lane channel is approximately 280 feet wide.

### Existing Harbor Traffic

There are no statistics, observed boat counts, or summaries of user patterns available that document watercraft use in the harbor. Therefore, a qualitative understanding of King Harbor’s boating activity was developed from a series of interviews with Harbor Patrol staff who provided information based upon their many years of personal observations, local knowledge, and experiences. The information gathering was supplemented by accompanying staff on patrol of the harbor to better observe and understand existing harbor conditions and issues from an “on the water” perspective.

Despite the fact that King Harbor is a relatively small facility, no significant operational problems or traffic congestion issues were identified. For the most part, it is felt that boaters observe the rules of the road and small craft enter and exit the harbor without incident. On summer days when weather conditions are most favorable, the outer harbor area can be “busy”

which may require increased surveillance by the Harbor Patrol to monitor activity and promote safety.

The different existing water uses of the harbor may be generally classified as follows:

*1. Navigation of wet storage boats to and from Basins 1, 2, and 3 to points around and outside of the harbor.*

The 1,400 small craft that berth in the harbor's marinas are the main boat population. No statistics or count data are available to indicate user patterns. For purposes of this study, it is assumed that on average no more than 10 percent of the harbor's fleet are in use on a given day. The maximum peak weekend day use is assumed to not exceed 25 percent in keeping with studies of other Southern California small craft harbors. Of this total, it is assumed that the boats in use will be evenly divided between sail and power craft in reflection of the harbor's near equal distribution between the two boat types. Boats use will vary throughout the day. Sail boats generally leave the harbor for offshore cruising in the early to late afternoon time when winds are more favorable. Power boats tend to leave the harbor in the early morning hours and regularly throughout the day to fish, day cruise, or travel to more distant ports on extended trips.

*2. Yacht club sponsored events and activities*

The harbor's yacht clubs at Mole A and Basin 1 sponsor regattas and sailing activities regularly throughout the year. Evening offshore sail races are generally scheduled late in the day on Tuesdays and Thursdays when other boating activity in the harbor is generally light. On average, about 30 to 40 sail boats are estimated to participate in the evening events. Weekend race activity starts at mid day when boats depart the harbor for open ocean courses. Youth sailing classes are conducted from June through August with beginner instruction conducted using Optimist dinghy sail boats in the protected outer harbor waters in the afternoon.

*3. Commercial boat activity from vessels moored in Basins 1 and 3*

There are only 41 commercial slips in the harbor with most of them located in Basin 3. The boats consist of small commercial fishing boats, oil terminal service boats, sportfishing, and sightseeing vessels. Because the boats are operated by experienced pilots and are berthed closest to the harbor entrance, they tend to be least impacting to other water traffic.

*4. Transient boats who may visit King Harbor from other ocean ports or launch ramps*

Day visitors to King Harbor are estimated to constitute a small volume of boat traffic in the harbor. Boats may temporarily berth at any of the 25 available transient moorings adjacent to the North Breakwater or drop anchor west of the entrance channel. For the most part, the component does not significantly impact the harbor's water use. However, the transient mooring area does occupy a significant space adjacent to the entrance channel that could be used to relieve more

restricted navigation conditions in the outer harbor during higher volume summer peak demand days.

#### *5. Day use of trailered boats*

Launch statistics from the Mole D boat hoist between 1997 and 2014 are summarized in **Figure 2**. The data indicates a progressive decrease in demand of trailered boat launches over the past 17 years. The peak number of monthly launches reduced from a high of 784 in July 1997 to 160 in August 2014. Redondo Beach Marina personnel indicate that the maximum daily number of boats launched between 2012 and 2014 varied from only 12 to 14.

#### *6. Peddle boat and paddle sports activity*

As with most other Southern California harbors, the popularity of standup paddle boarding, and paddle sports has increased tremendously and the growing recreation demand for the sport presents challenges for harbor operations. Although no statistics are available for review, the four concessions in King Harbor are estimated to collectively rent at least 200 or more boards on a peak summer weekend day. Standup paddlers, kayakers, and peddle boats will emerge from their Basin 1, 2, or 3 points of origin. From there they will generally paddle close to the shoreline of Moles B and C, around the turning basin, or venture across the main channel near the Portofino Hotel to cruise along the North Breakwater shoal.

Not all of the paddle craft users are experienced and familiar with the harbor's rules of the road. Consequently members from King Harbor's boating community regularly report incidents of novice paddle boarders drifting into the navigation channel or crossing in front of oncoming traffic. There is no analysis or statistics available that quantifies the magnitude and extent of the problem. We understand that the rental concessions do instruct visitors on paddle craft rules in the harbor and how to safely maneuver about. Furthermore, the Harbor Patrol vigilantly polices the waterways on their routine patrols in a continuing effort to educate users and help keep paddlers out of boat navigation lanes. In our opinion, this Harbor Patrol management practice is probably the most effectively measure to deal with the issue and promote safe separation between boat traffic and paddle craft.

Additional paddle craft are launched from the existing Seaside Lagoon dock. No data on the numbers of launches that occur from the facility is available. We assume that at least 50 launches per day may occur from the hand launch dock on peak weekends. The paddle craft activity is assumed to be continuous from late morning through late afternoon. The volume of hand launch activity from Seaside Lagoon may double if the lagoon is directly connected to the outer harbor to allow beach launching.

The two ocean canoe and outrigger clubs that operate from Mole B sponsor weekday activities that usually start late in the day and last until dark when water traffic is light. Times of weekend activity vary. Club members are knowledgeable mariners and experienced in maneuvering and navigating inside King Harbor.

### Entrance Channel Capacity

All of the water use activity outlined above share and use the outer harbor area in different ways and times. The ability of the entrance channel, turning basin, and mooring area to accommodate the volume of existing and future demand during times of normal and peak activity will determine the safe carrying capacity of the space.

A first approximation of the entrance channel's traffic volume carrying capacity may be derived from review of a simple spatial relationship. By assuming a safe boat separation distance and transit speed, the volume capacity of the channel may be roughly estimated. A prior comprehensive study of boater activity in Channel Islands Harbor<sup>1</sup> indicated that the preferred safe separation distance between adjacent small craft is about 2-1/2 boat lengths. The average boat length of small craft berthed in King Harbor's marinas is about 32 feet. This implies a minimum center to center separation distance of at least 100 feet to avoid congested conditions in the channel. Based upon this assumption, approximately 30 outbound and 30 inbound boats can safely transit through the channel simultaneously in single file succession.

If all of the boats are sailing at the allowable no wake speed of 5 knots, the maximum capacity of each navigation lane is about 30 boats per six minutes or 300 boats per hour. This rate represents about 20 percent of the King Harbor's total wet storage capacity. Rarely are more than 10 percent of moored boats in a Southern California harbors in use on any given weekday day. The maximum peak summer day use of any Southern California harbor has been estimated to not exceed 25 percent of its fleet.<sup>2</sup> However, not all of the boats will be in use at the same time. As previously discussed, the daily number of sail and power boats in use will spread out over the day. Consequently it is conservatively estimated that boat traffic volume in King Harbor's entrance channel will never exceed one-half of its theoretical maximum volume capacity.

Recommendations for harbor entrance channel widths in small craft harbors vary. A reasonable criteria that has been proposed is derived from the following simple equation:

$$\text{Channel width in feet} = 5 \times \text{largest boat beam} + 10\% \text{ of boat slips available}^3$$

For King Harbor, this formula may be interpreted as follows using a conservative commercial vessel beam width of 20 feet:

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<sup>1</sup> Noble Consultants, Inc., 1992. Final report, Channel Islands Harbor Entrance Channel Study, prepared for the U.S. Army Corps of Engineers, Los Angeles District, May 1992.

<sup>2</sup> Moffatt & Nichol, 2007. Dana Point Harbor Boat Traffic Study, November, 2007.

<sup>3</sup> American Society of Civil Engineer, 2012. Planning and design guidelines for small craft harbors, Manual and Reports on Engineering Practice No. 50.

Channel segment between harbor entrance and entrance to Basin 2:

$$\text{Channel width} = 5 \times 20 \text{ feet} + 1,400 \times 0.10 = 240 \text{ feet}$$

Channel segment between entrance to Basin 1 and entrance to Basin 2:

$$\text{Channel width} = 5 \times 20 \text{ feet} + 498 \times 0.10 = 150 \text{ feet where 498 is the boat population of Basin 1}$$

The formula suggests that King Harbor's entrance channel width is minimally adequate for its boat population.

Proposed Launch Ramp Traffic Impact

The largest BLF proposed for King Harbor is a two-lane ramp with no more than 40 parking spaces for vehicles with trailers. A reasonable assumption during times of peak demand is that 15 minutes will be required to launch a trailered boat. This implies a maximum boat launch rate of no more than 4 launches per hour per lane. Thus even if the proposed launch ramp facility quickly filled in the morning, the introduction of boats into the turning basin or main channel areas would be regulated by the limiting launch rate. Two boats entering the harbor from the proposed BLF every 15 minutes is not expected to significantly disrupt existing harbor traffic or impact water use.

Boats returning to the launch ramp for retrieval may arrive at more frequent intervals in the afternoon. For purposes of this assessment, it is assumed that in an extreme case, one-half of the 40 boats return within a 2.5 hour mid to late afternoon time window. This implies that during times of extreme peak demand and an assumed retrieval rate of 8 boats per hour, up to twelve boats may queue at any one time. Four of these boats could wait at the boarding float. The remaining 8 boats could stage immediately offshore of the ramp to wait their turn. Sufficient space within the turning basin or the north end of the outer harbor near the mooring area is available for temporary mooring until boarding float space becomes available. On non-peak days, boat launches are estimated to be much lower and impacts to existing harbor traffic minimal.

The Mole C and D launch ramp sites are situated within the Turning Basin and as such more proximate to Basin 3 and the Seaside Lagoon hand launch traffic. Construction of a protective breakwater at the Mole C site may impact water traffic patterns and increase the potential for conflict with paddle and hand launch craft emanating from Seaside Lagoon. However, the magnitude of the problem would be somewhat offset because of the slow speeds that the motor boats will transit during departure from or return to the ramp area. This will allow time for sufficient maneuvering as necessary to avoid errant paddle craft if encountered. Nevertheless, we believe that potential conflict between boaters and paddle craft at the Mole C BLF site can be best avoided by deleting the fixed breakwater component and its limiting sight lines and

orienting the launch ramp toward the harbor entrance to direct boat traffic away from the Seaside Lagoon area.

In our opinion, the Mole B ramp location provides the least impacting location from a water traffic standpoint. Launch and retrieval of boats would be confined to the sheltered Basin 2 fairway away from outer harbor traffic. Less paddle craft are anticipated to be encountered when navigating into and out of the Basin 2 ramp area.

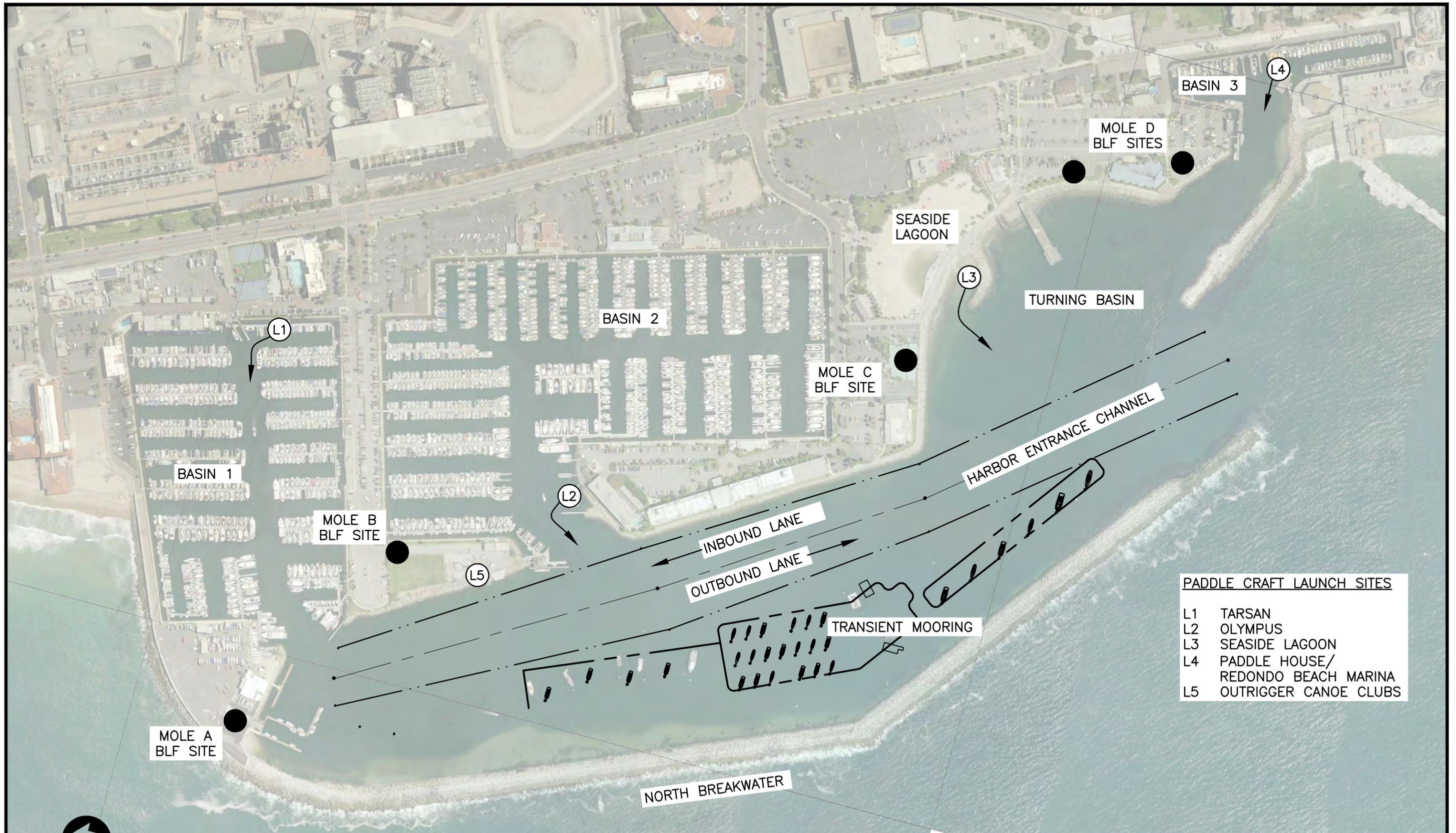
Location of a launch ramp at Mole A is considered to not have significant impact on existing harbor traffic since the site is located near the end of the main navigation channel where traffic volume is lowest. Hand launch activity does originate from Basin 1 so there is potential for conflict if novices inadvertently venture into the navigation channel. Potential conflict with adjacent yacht club activity is also possible to occur on times of peak use days. However, we believe that real or perceived issues could be quickly resolved by Harbor Patrol staff via enforcement action and management practices to promote safe boating practice and sharing of the harbor's relatively limited water space.

In summary, we believe that the proposed BLF will not significantly impact existing water traffic volume and uses in King Harbor. The growth of paddle sports and their popularity in King Harbor will invariably lead to problems at times of peak use. King Harbor is self regulated from the standpoint that its relatively small size limits water traffic volume. The increase in paddle craft use has the potential to be the most disruptive issue for safe boating within the outer harbor especially when novice users unknowingly venture into boating lanes. This is a controversial and difficult issue with competing points of view. King Harbor will continue to experience "busy" peak weekend summer days when the chances for conflict between boaters and paddle craft will be highest. However, we believe that the City's Harbor Patrol has developed an effective management strategy and is enforcing a reasonable water use plan that tries to accommodate all users and recreation demands that are appropriate for the harbor. In our opinion, their continued patrol and monitoring of King Harbor's water use and traffic activity will continue to be the most practical way to allow for maximum public use and sharing of the resource as safely as possible.

The following figures are attached and complete this report:

Figure 1 Plan of King Harbor

Figure 2 Mole D Boat Hoist Launch Statistics

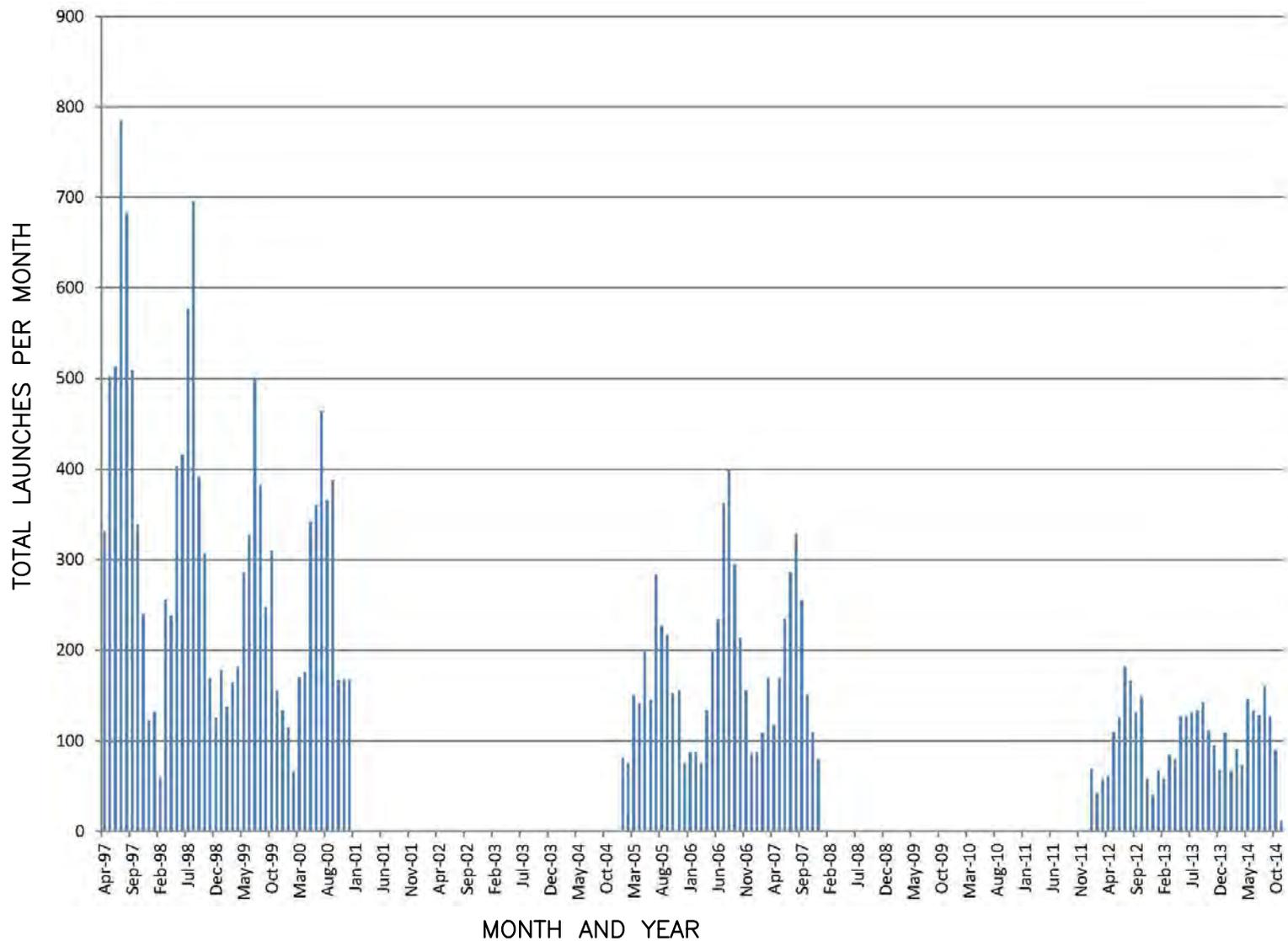


**PADDLE CRAFT LAUNCH SITES**

L1	TARSAN
L2	OLYMPUS
L3	SEASIDE LAGOON
L4	PADDLE HOUSE/ REDONDO BEACH MARINA
L5	OUTRIGGER CANOE CLUBS

Plan of King Harbor





Mole D Boat Hoist Launch Statistics

SOURCE: DATA FROM REDONDO BEACH MARINA

