STAFF REPORT

SAUSALITO PARKS AND RECREATION COMMISSION

AGENDA TITLE:
Dunphy Park Schematic Master Plan

RECOMMENDED MOTION:
Staff recommends that:

- The Commission recognize and thank the Friends of Dunphy Park for all their work with special thanks to Paul Leffingwell and Jacques Ullman for the countless hours and expertise that they have generously donated to the Schematic Master Plan process.
- Suggest changes to the plan based on public input if the commission feels they would enhance the project
- Recommend plan with changes (if any) to City Council

SUMMARY

In 2013 the City Council ranked the need for a Schematic Master Plan for Dunphy Park 5th on the Fiscal Year 2014 Priority Calendar. On November 16th, 2013 with the assistance of a professional neutral facilitator, a public forum was held to gather input for the Plan. On November 10 2015 the Friends presented the Plan to the City Council. Council direct the Parks and Recreation Commission to hold two well publicized public meetings where the Friends could present the Plan to the public and gather further input. Council also recommended that the plans be adjusted accordingly based on community input, and that the final plans be brought back to Council for approval.

BACKGROUND

In 2013 the Friends of Dunphy Park encouraged the Council to place the "Dunphy Park Schematic Master Plan Process" on the Council Priority Calendar for Fiscal Year 2014. The Schematic Master Plan was then ranked 5th on the FY 2014 Priority Calendar and the Council approved a public forum and schematic masterplanning process to further develop community consensus on a guideline that will assure that future detailed plans for improvements are compatible with the City's long range view for development of all Dunphy Park lands. The forum and schematic masterplanning process included identification of desired improvements and

priorities, preferred locations for various physical improvements and activities and appropriate guidelines such as size and technical requirements - without specifically designing them.

On November 16th, 2013 with the assistance of a professional neutral facilitator, the public forum was held with over 90 in attendance. At the March 18, 2014 the Friends of Dunphy Park presented the preliminary results of the forum. Council requested that the Friends continue to work in developing a schematic Master Plan for Dunphy Park in collaboration with Staff and with input from the Audubon Society and other sources.

On June 17, 2014 the Friends of Dunphy Park returned to Council seeking direction on the conceptual parking location and next steps for continued development of funding and more detailed planning. Council provided input to the parking element of the plan and directed Staff to obtain a soil analysis and provided other technical needs as necessary.

On November 10 2015 the Friends presented the Plan to the City Council. Council direct the Parks and Recreation Commission to hold two well publicized public meetings where the Friends could present the Plan to the public and gather further input. The meetings were to be facilitated by a paid facilitator. Council also recommended that the plans be adjusted accordingly based on community input, and that the final plans be brought back to Council for approval.

Two public forums were held in January. The first on January 19 and the second on January 27. To promote the forums press releases were issued to bot the Marin Scope and IJ, the meetings were listed on the City calendar, there were articles and postings in the Currents, and a postcard with the meeting information was sent to every address with a 94965 and 94966 zip code. In addition the website www.dunphypark.org was updated with the Schematic Master Plan, backup documents, and meeting videos and notes as they became available. As of February 2 the site had 621 hits in 2016.

The meetings were 2 hours each and facilitated by Pam Jones, the same facilitator as was used in 2013.

Prior to the meetings Jacques Ullman and Paul Leffingwell from the Friends met with the following groups:

- City Staff to gather information on the proposed North South Greenway path
- Representatives from the Bocce League to discuss 3 of courts, and court location
- Cruising Club to discuss the location of the Club and Parking
- Galilee Harbor to discuss parking, location of bocce courts, and paths of travel

During the two meetings five main areas of concern were brought up:

- Concern that there were not enough parking spaces
    - There are currently approximately 65-67 spaces in the main parking lot
    - The new plan includes 72 spaces including proper ADA spaces
    - For events and rentals the city has opened up the railroad right of way for parking of approximately 60 cars
        - The railroad right of way was not available until the City purchased the property in 2003.
        - The railroad right of way was only used for special event parking prior to approximately 2011.
        - In 2011 the railroad right of way was opened for parking as a convenience during Bocce Leagues, Park Rentals, Parking Rentals, and large Special Events.
        - The railroad right of way has not been open to public parking with the exception of the times that construction crews were using the area and left the chain down for prolonged periods of time (months).
    - Galilee Harbor, per agreements with both the City and BCDC, is to provide parking for their tenants on their own property. Eight of the spaces are to be open for public parking during daylight hours and are not to be used by Galilee Harbor.

- Number and location of Bocce courts
    - After meeting with representatives from the bocce league it was decided that the addition of a third court was necessary.
    - The Bocce players also expressed a strong desire to be closer to the waterfront. The location of the Bocce courts and volleyball court were reversed to accommodate this request.

- Relocation of the Cruising Club
    - Discussions with the City and the Club resulted in the agreement that the Club would look into what it would take to turn the barge 90 degrees however these discussions would come at a separate time than the Park discussions and the rotation of the barge would not change the plans for the Park.

- Park Safety - There was concern that the large ‘Multi Use” area would become an area that people would be uncomfortable visiting as it would be a hangout for people drinking, doing drugs, and other nefarious activities
    - With the new open design there would be sightlines across the park from Bridgeway making it easier than it is now for the Police to observe the area and enforce City codes and laws.

    - With the rehabilitation of the Park it is expected that visitation will go up. This will make people who want to use the park for illegal activity uneasy and they will refrain from illegal activity.
    - The City is researching the Park hours and will be making a suggestion to Council to close the park after dusk except for special and permitted events.

- Restricted Waterfront use/Wildlife Habitat - There was concern that the Plan suggested that no boats or paddle boards be allowed East or South of the beach area and all boat traffic would have to enter and exit in front of the Cruising Club.
    - This is an issue that will be discussed at length prior to any new rules or regulation. This issue does not affect the design of the park.

FISCAL IMPACT

The Schematic Master Plan that is being reviewed was done at minimal cost through the hard work of the Friends of Dunphy Park, Specifically Jacques Ullman and Paul Leffingwell.

The next step, taking the Schematic Master Plan to a Landscape Architect for further design through construction is estimated to cost $200,000-$300,000 depending on what services are requested.

The full costs to construct everything in the Schematic Master Plan will not be known until actual construction bidding takes place. If the $1,800,000 of Measure F funds allocated to Dunphy Park do not cover all costs, Staff will present options to the Council to either reduce the project scope to stay within the current budget and/or use alternative funding sources such as Tidelands Funds and Grants.

STAFF RECOMMENDATIONS

Staff recommends that:

- The Commission recognize and thank the Friends of Dunphy Park for all their work with special thanks to Paul Leffingwell and Jacques Ullman for the countless hours and expertise that they have generously donated to the Schematic Master Plan process
- Suggest changes to the plan based on public input if the commission feels they would enhance the project
- Recommend plan with changes (if any) to City Council

ATTACHMENTS

Attachment A – Schematic Master Plan

Attachment B – DRAFT minutes from January 19 and 27 meetings

Attachment C – Letters and emails that Staff and Council have received

PREPARED AND SUBMITTED BY:

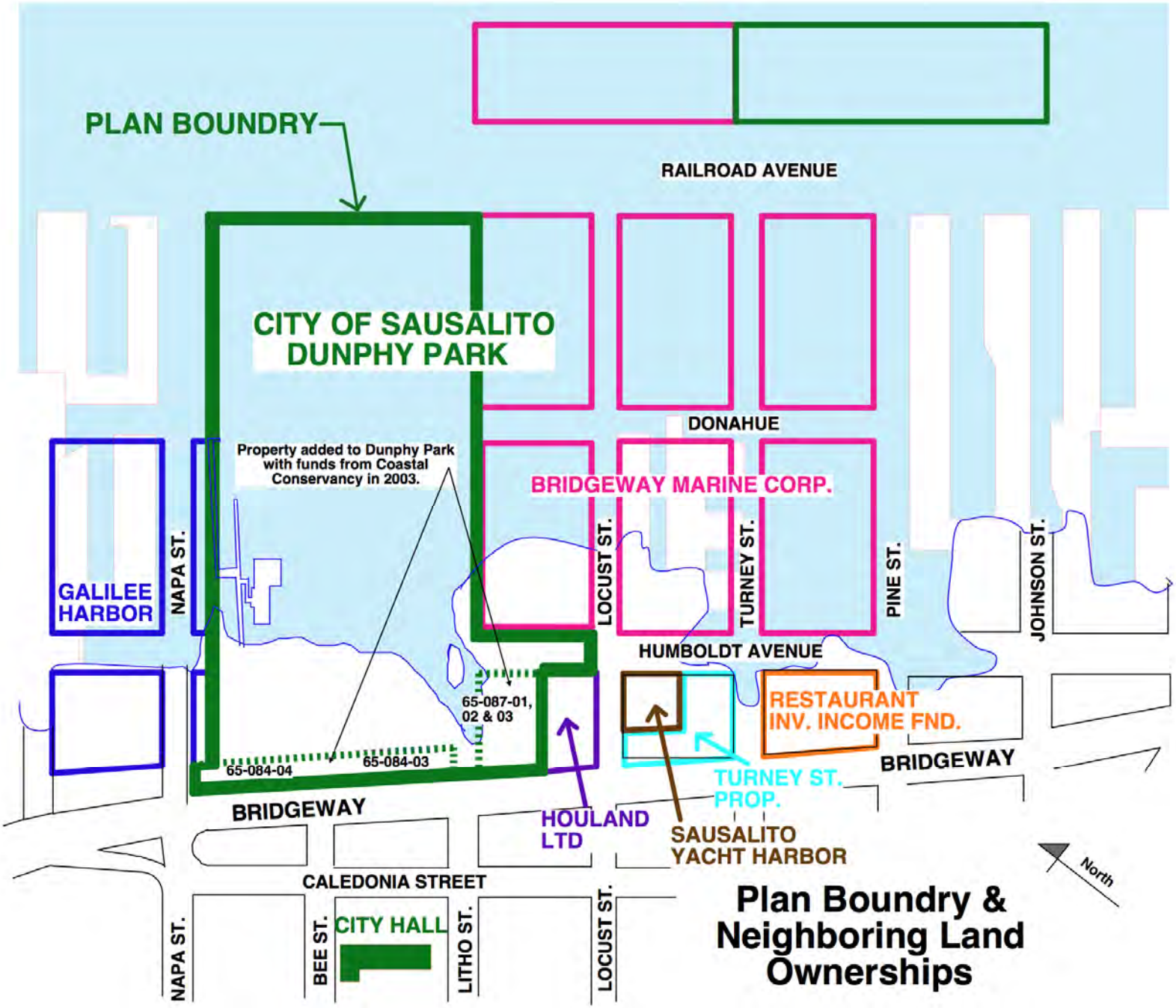
_____
Mike Langford
Parks and Recreation Director

Attachment A – Schematic Master Plan

DUNPHY PARK SCHEMATIC MASTER PLAN

Prepared by Friends of Dunphy Park • Jan. 2016

Improve & maintain, for public use as a park and habitat preserve, this last remaining portion of undeveloped waterfront


PLAN BOUNDRY
RAILROAD AVENUE
CITY OF SAUSALITO
DUNPHY PARK
DONAHUE
Property added to Dunphy Park with funds from Coastal Conservancy in 2003.
BRIDGEWAY MARINE CORP.
GALILEE HARBOR
NAPA ST.
LOCUST ST.
TURNEY ST.
PINE ST.
JOHNSON ST.
HUMBOLDT AVENUE
65-087-01, 02 & 03
RESTAURANT INV. INCOME FND.
65-084-04
65-084-03
BRIDGEWAY
TURNEY ST. PROP.
BRIDGEWAY
HOULAND LTD
SAUSALITO YACHT HARBOR
North
CALEDONIA STREET
NAPA ST.
BEE ST.
CITY HALL
LITHO ST.
LOCUST ST.
Plan Boundry & Neighboring Land Ownerships

The Schematic Master Plan is a guideline to assure that future incremental improvement plans are compatible with the City's long range view for Park development.

Desired improvements, activities, and priorities will be defined along with preferred locations, technical requirements, and governmental limitations.

The program for the Dunphy Park Schematic Master Plan is based on Public input from an Outreach program that included a City Website Survey, a Questionnaire, and a professionally facilitated Public Forum

A summary of Public comments from these three sources was presented to The City Council at a Public hearing

Overall Schematic Site Plan

Prepared by Friends of Dunphy Park • Jan. 2016

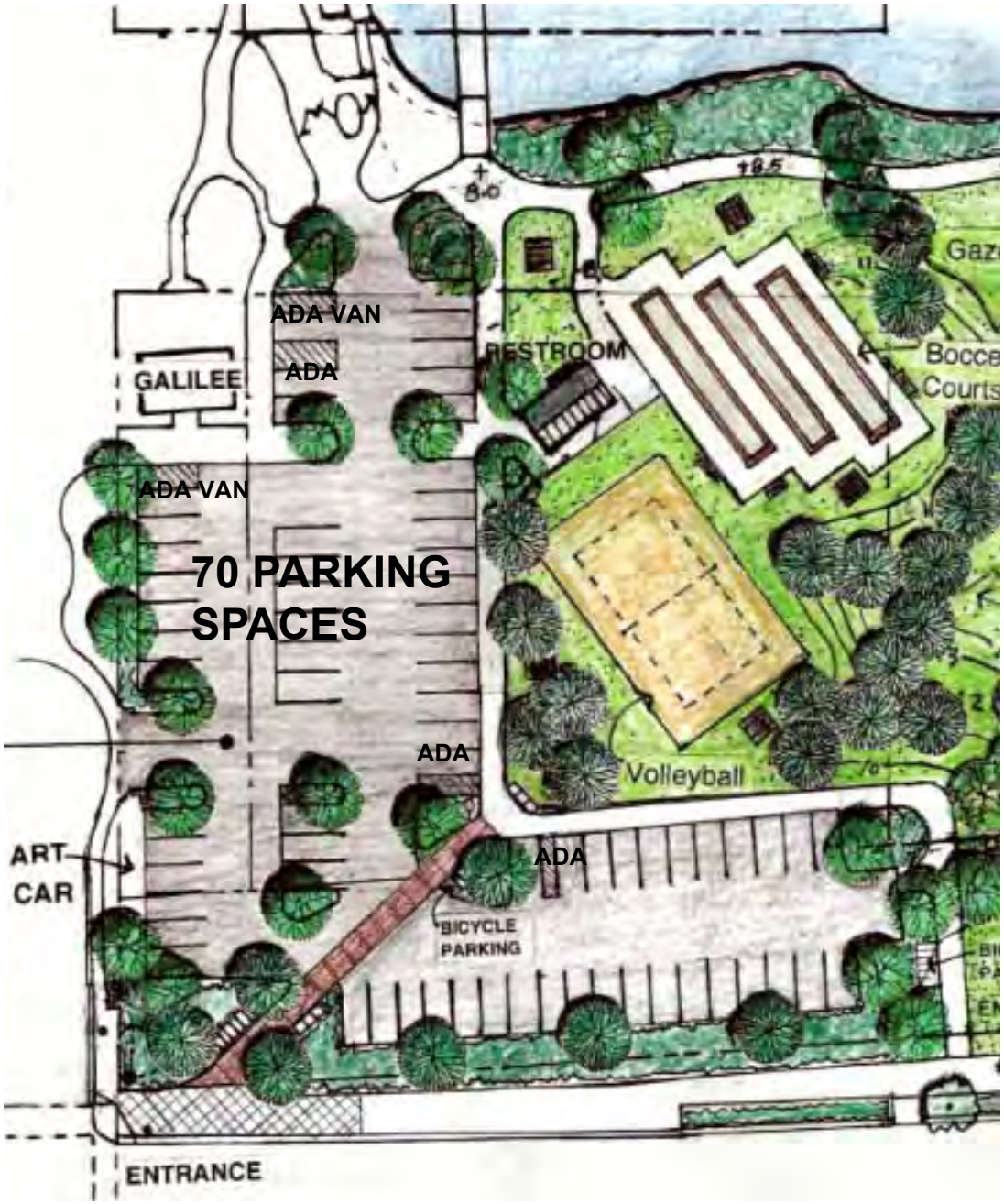
Input from Public Outreach clearly indicated that the Plan would have to respond to a very broad spectrum of activities ranging from Bocce Ball tournaments to quiet habitat for wildlife.

The Plan includes six zones that blend with minimum conflict. Parking, Toilets & Active uses are placed together at the North end, Multi Use in the grass bowl in the middle, and Passive Habitat Rehab. & Preservation to the South.

Overall Schematic Site Plan

Prepared by Friends of Dunphy Park • Jan. 2016

Parking



70 Parking Spaces Including 2 ADA van & 3 ADA auto spaces

Parking at north end of Park with toilets and active uses such as bocce & volley ball near parking.

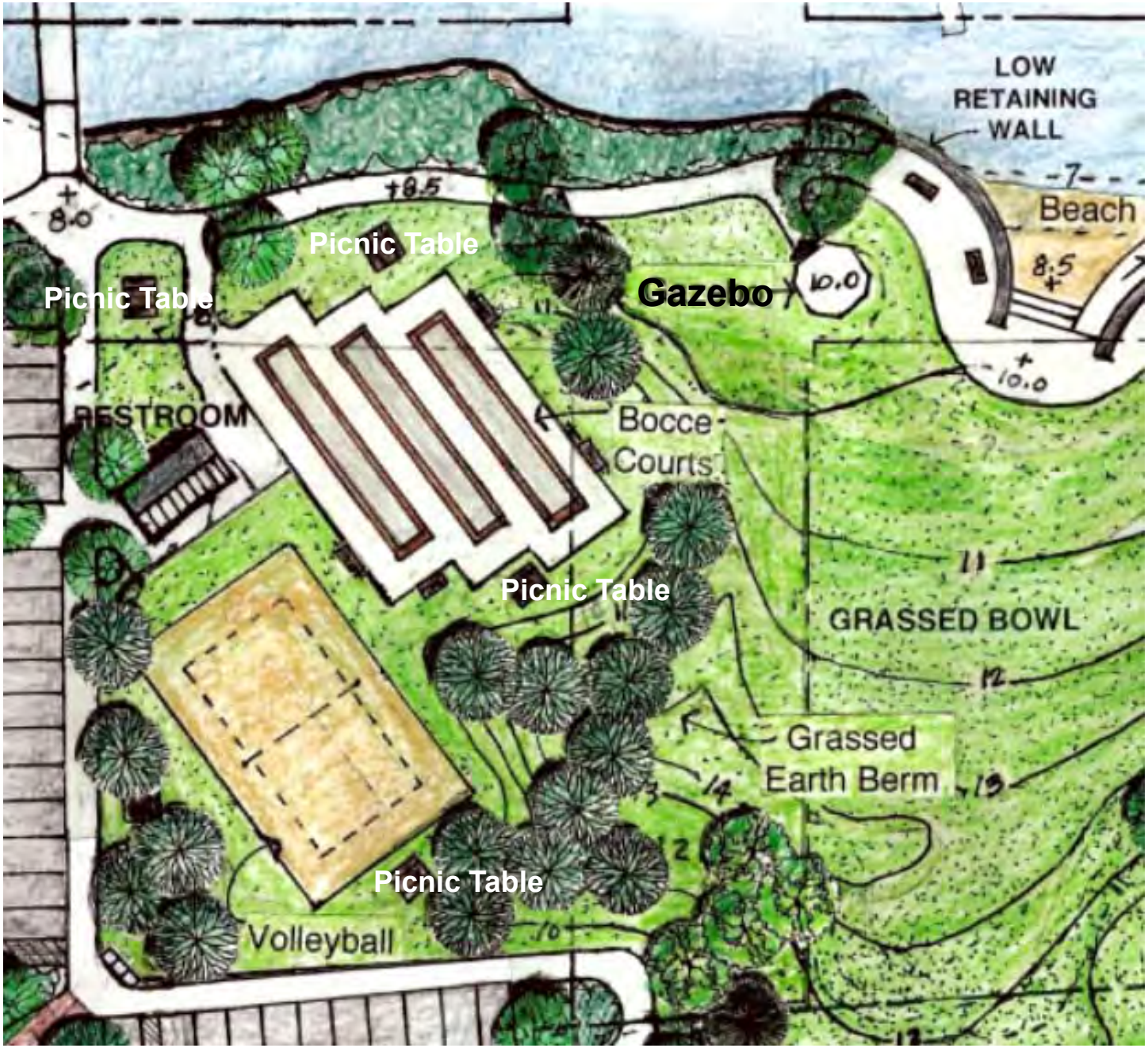
No Parking along the waterfront & minimum parking on railroad right of way.

No toilets at pedestrian entrances.

Overall Schematic Site Plan

Prepared by Friends of Dunphy Park • Jan. 2016

Active Uses



Bocce Ball
Volleyball

Near Parking & Restrooms.

Grading creates shaded, sloped lawn areas for spectator viewing.

Visually connected to Gazebo & Multi Use area.

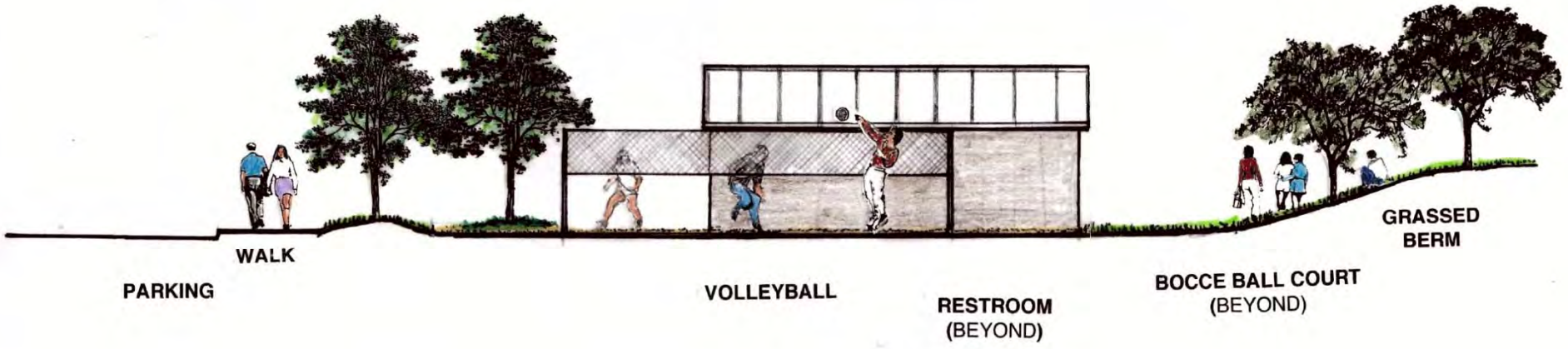
Bocce located near water, similar to existing.

Picnic tables & benches distributed throughout.

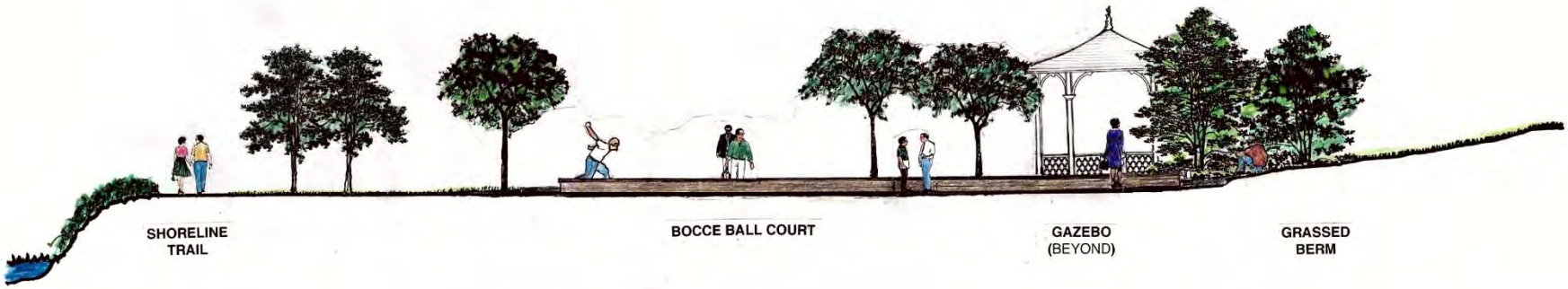
Night lighting under cap of court walls.

Storage provided at Toilet Building.

3 Bocce Courts is max. possible to be in balance with other Park uses. Further expansion would require additional venue.



Section through volleyball court looking toward water



Section through Bocce Ball area looking South

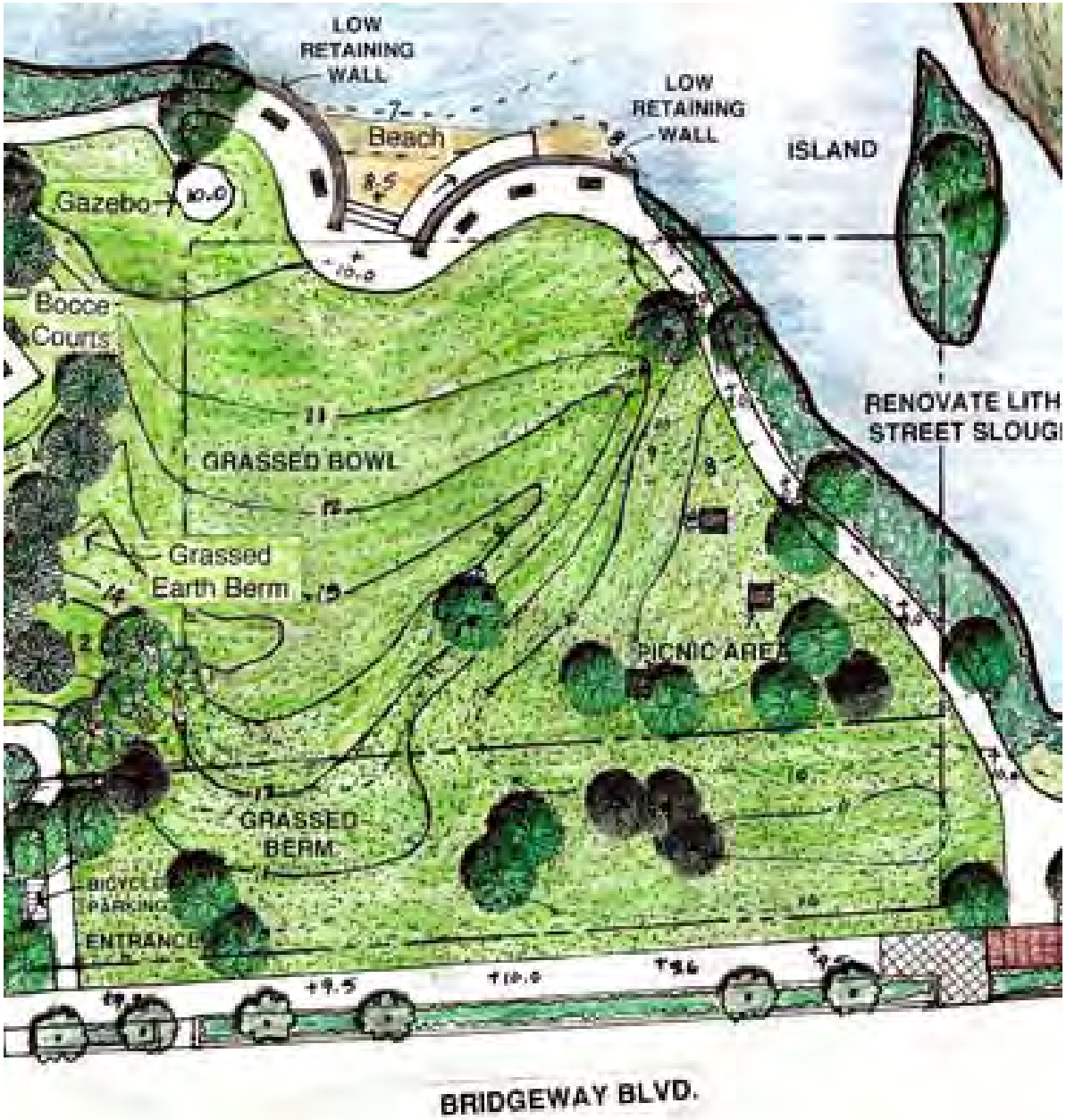
East West cross section looking North

North South cross section through Litho St. Slough Looking East

Overall Schematic Site Plan

Prepared by Friends of Dunphy Park • Jan. 2016

Multi Use



Open, grassed bowl contoured to be visually connected to Bridgeway & Water.
Eliminate parking on Railroad Right of Way between Bee & Litho Streets and blend this area into the Park; thus integrating the Park into the Neighborhood.

Multi Use area is intended for use by the community for individual activities such as playing ball, picnics, frisbee, and birthdays or other special families events.

It will also accomodate large local community events, such as the 4th. of July, Easter, Musical activities and the Chilli Cookoff.

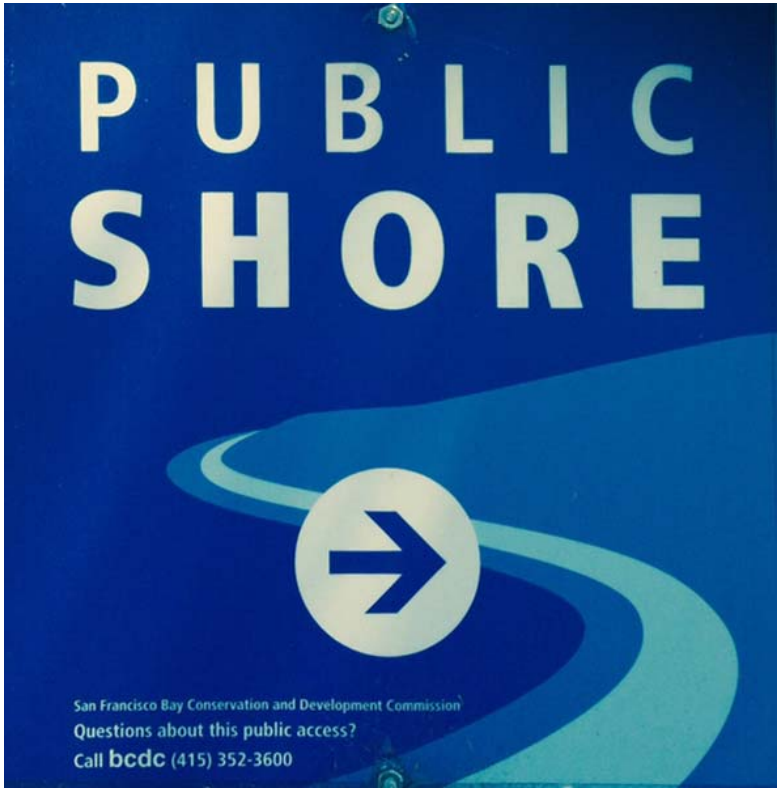
Overall Schematic Site Plan

Prepared by Friends of Dunphy Park • Jan. 2016

Beach

Improve beach with possibility for some water based activities.
Re-orient Cruising Club to open view of water & rehabilitate shoreline.
Improve retaining walls and benches. ADA ramp to Beach.
Raise contours by one foot and add steps & ADA ramp to accommodate seal level changes.

Shoreline Path



Bollards & Bicycle Racks at access pts.

A pedestrian path that is graded to conform to ADA requirements with benches and picnic areas along the way.

The path is integrated with the overall BCDC Public Shoreline Path through Sausalito & ties the various Park activities together.

No bicycling within Park & ample bicycle racks & bollards at access points.

Bicycle & Pedestrian Paths

The Plan does not suggest any changes to the existing Street Bicycle Lane. Change of paving surfaces on joint Bicycle & Pedestrian Path is recommended at Litho Bee & Napa St. entrances to warn of Pedestrian cross Traffic.

City of Sausalito

Ferry Terminal to Gate 6 Road Path Feasibility Study

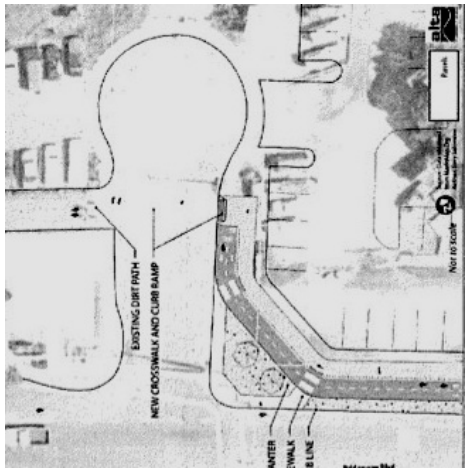
February 2011

alta
PLANNING + DESIGN

The Path proposal in the Study is outside the boundaries of the Dunphy Park Schematic Master Plan but does not conflict with it. It is recommended that the Path Study at Bridgeway and Napa St. be revised and that changes to the pavement at the Litho, Bee and Napa St. Park entrances be included to mitigate danger from pedestrian cross traffic interface.

It is important to understand that the Study is for a very extensive and costly project that involves total replacement of sidewalks, curbs, & street planting over a long distance. This may not be realized for some time. Thus, the Dunphy Park Schematic Master Plan focuses on the existing joint path and street bicycle lane. Should the path project move forward, there will be no conflicts with the Park Plan.

Ferry Terminal to Gate 6 Rd. Path as proposed in the Feb. 2011Alta Planning & Design Feasibility Study



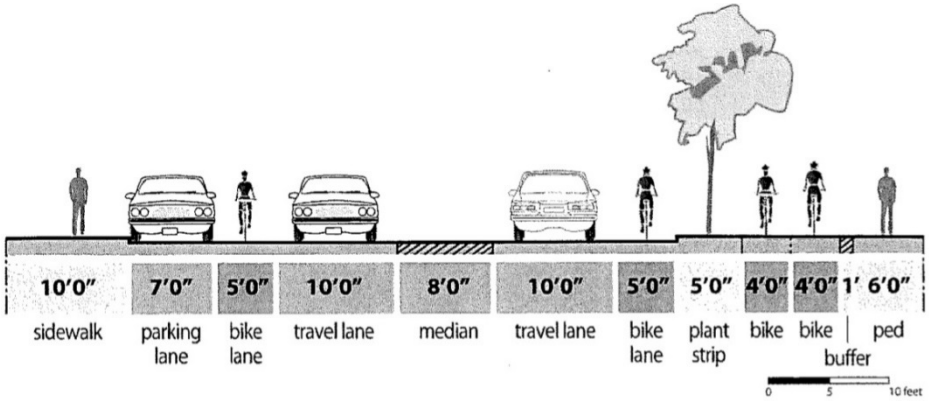


Figure 7-30 Section C Proposed Improvements

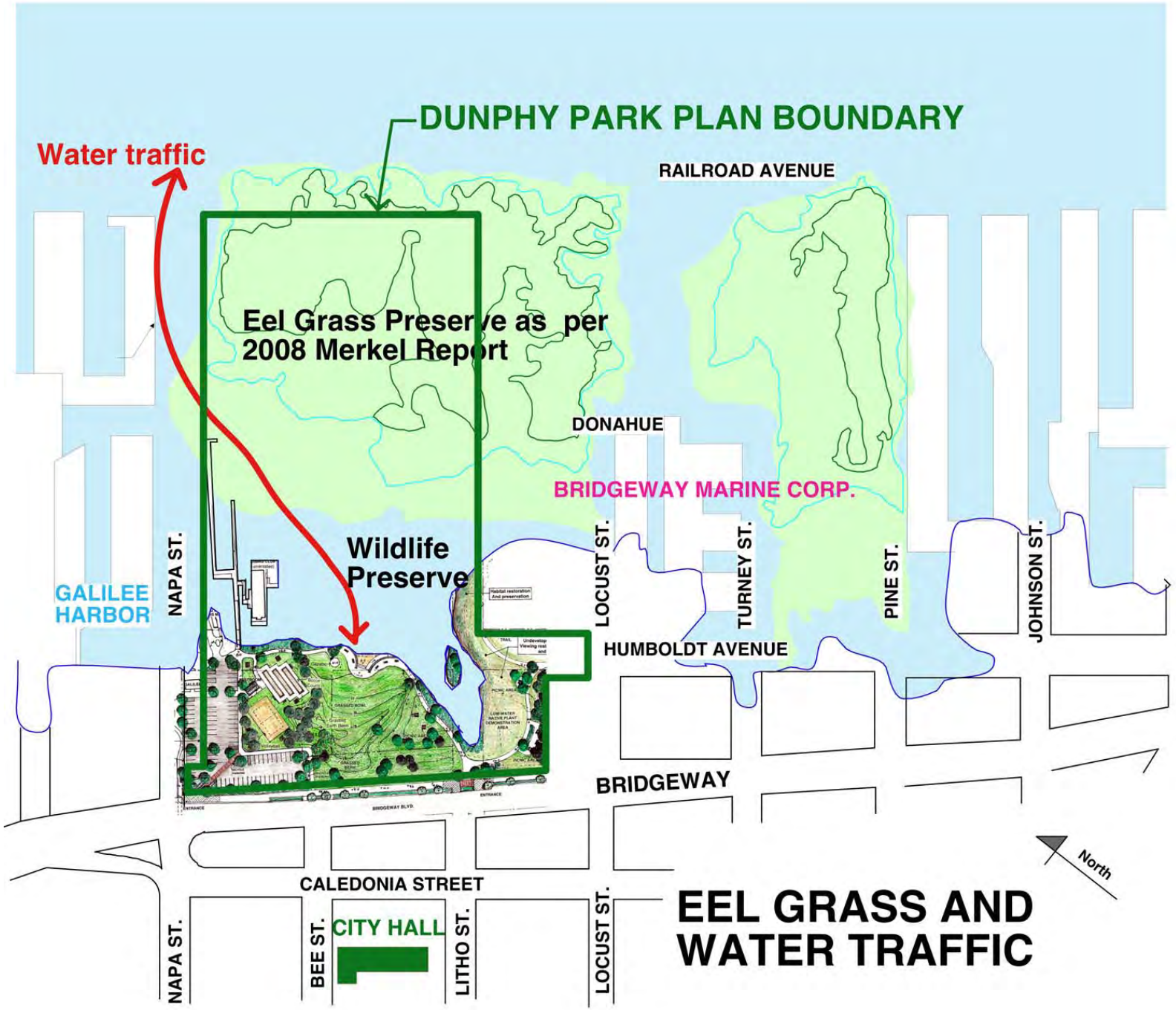
Path Section across Bridgeway

Path proposal @ Bridgeway & Napa St.

that would require adjustment.

Eelgrass
&
Water Traffic

Provide limited access for non motorized vessels without disruption of eel grass & wildlife preserves.


DUNPHY PARK PLAN BOUNDARY
Water traffic
RAILROAD AVENUE
Eel Grass Preserve as per 2008 Merkel Report
DONAHUE
BRIDGEWAY MARINE CORP.
Wildlife Preserve
GALILEE HARBOR
NAPA ST.
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EEL GRASS AND WATER TRAFFIC

Overall Schematic Site Plan

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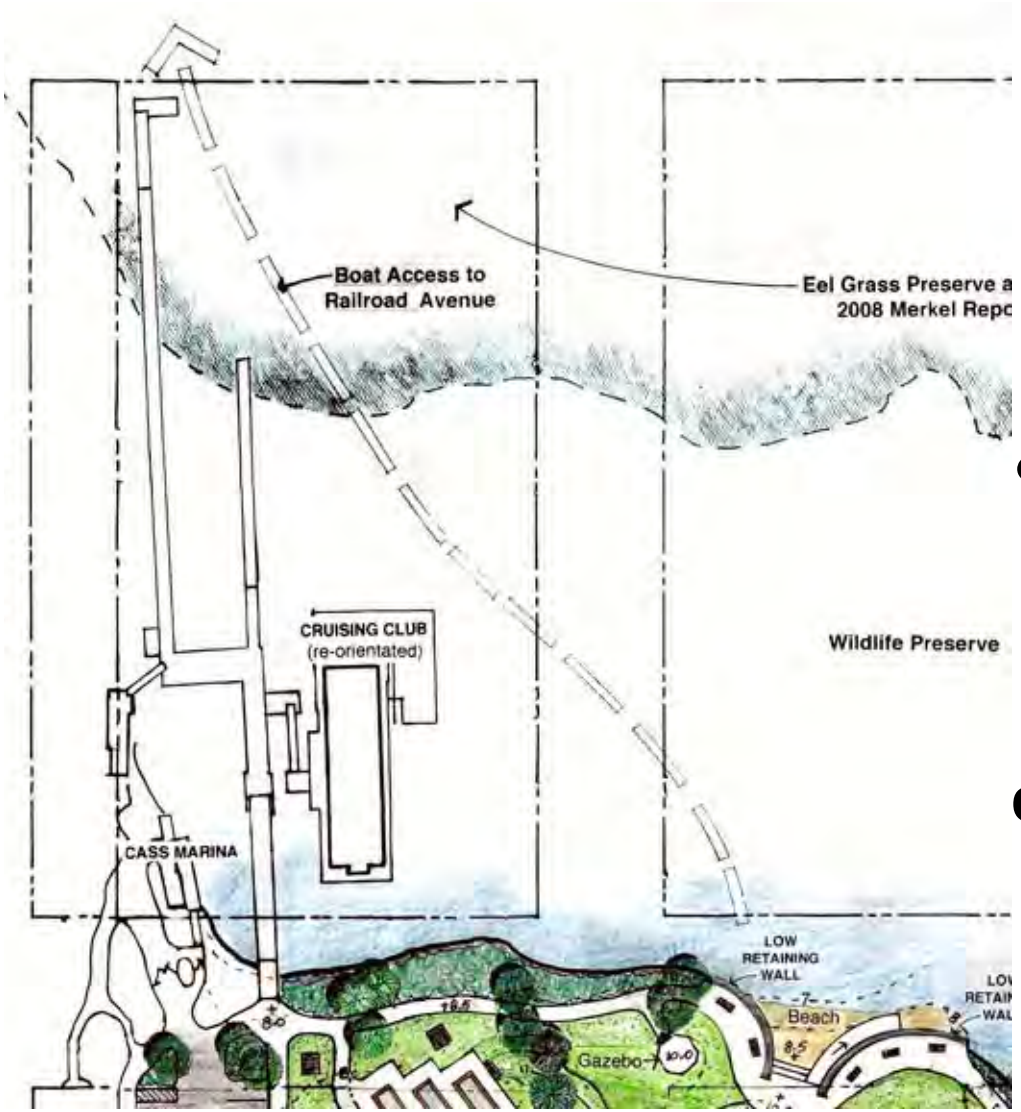
Water Activities



Water traffic shall be limited to small boats without keels.

Facilities for boats shall be provided at Cass Marina & the Cruising Club and shall not extend south of the Cruising Club.

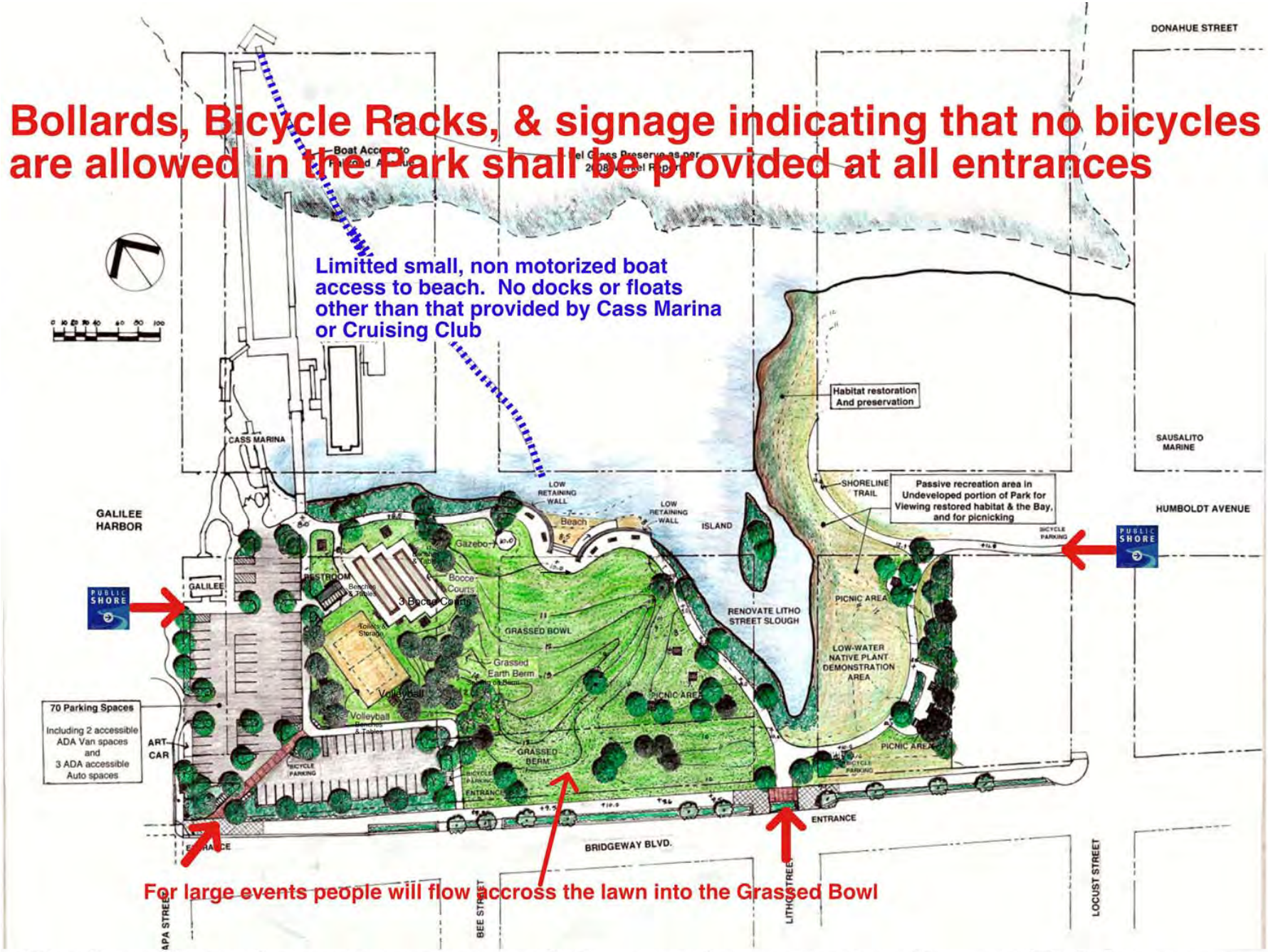
The Schematic Master Plan does not detail this area. The City shall determine who will be served by these facilities.

Waterfront Community

Finding a way to better integrate the waterfront and landside communities is an important concern. Should the City of Sausalito determine that public showers, laundry machines, dingy docks, moorings, etc. are necessary there are locations available. Dunphy Park is not the appropriate venue. Looking to the Dunphy Park Schematic Master Plan as a vehicle for solving waterfront community issues will not solve them and will only delay facing the larger subject.

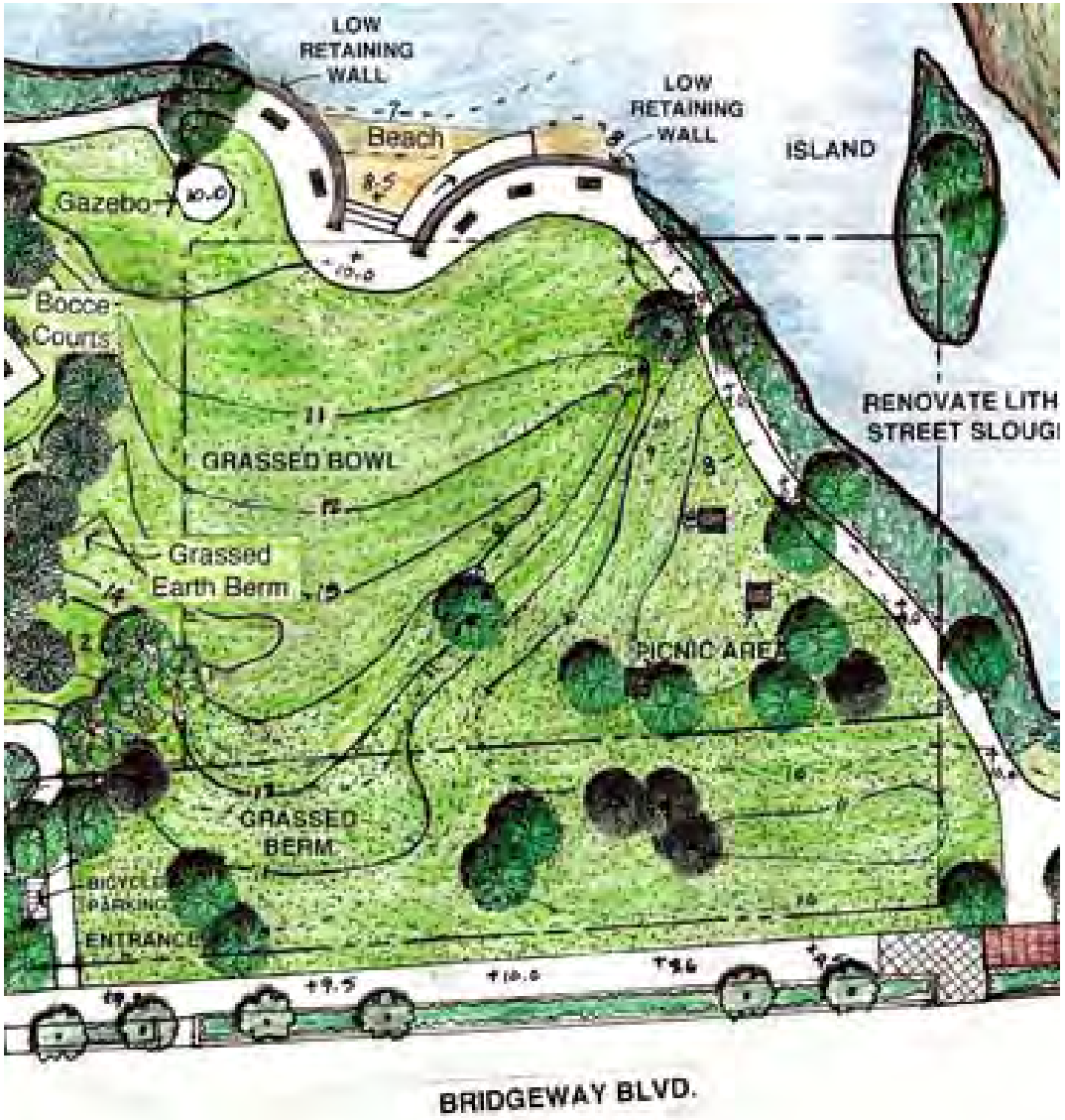
Access

Bollards, Bicycle Racks, & signage indicating that no bicycles are allowed in the Park shall be provided at all entrances



Defined, safe entrances with good cross walks at Bridgeway.

Grading



Rolling contoured berms creating central open grassed bowl while maintaining visual connection to the water from Bridgeway sidewalk. Berms will also provide a certain amount of wind protection.

Improve runoff water management to minimize wet soil and eliminate standing water by re-grading and installing an engineered sub-surface drainage system as required.

Planting

Rolling grass with contoured berms, shade trees, & low water use planting.

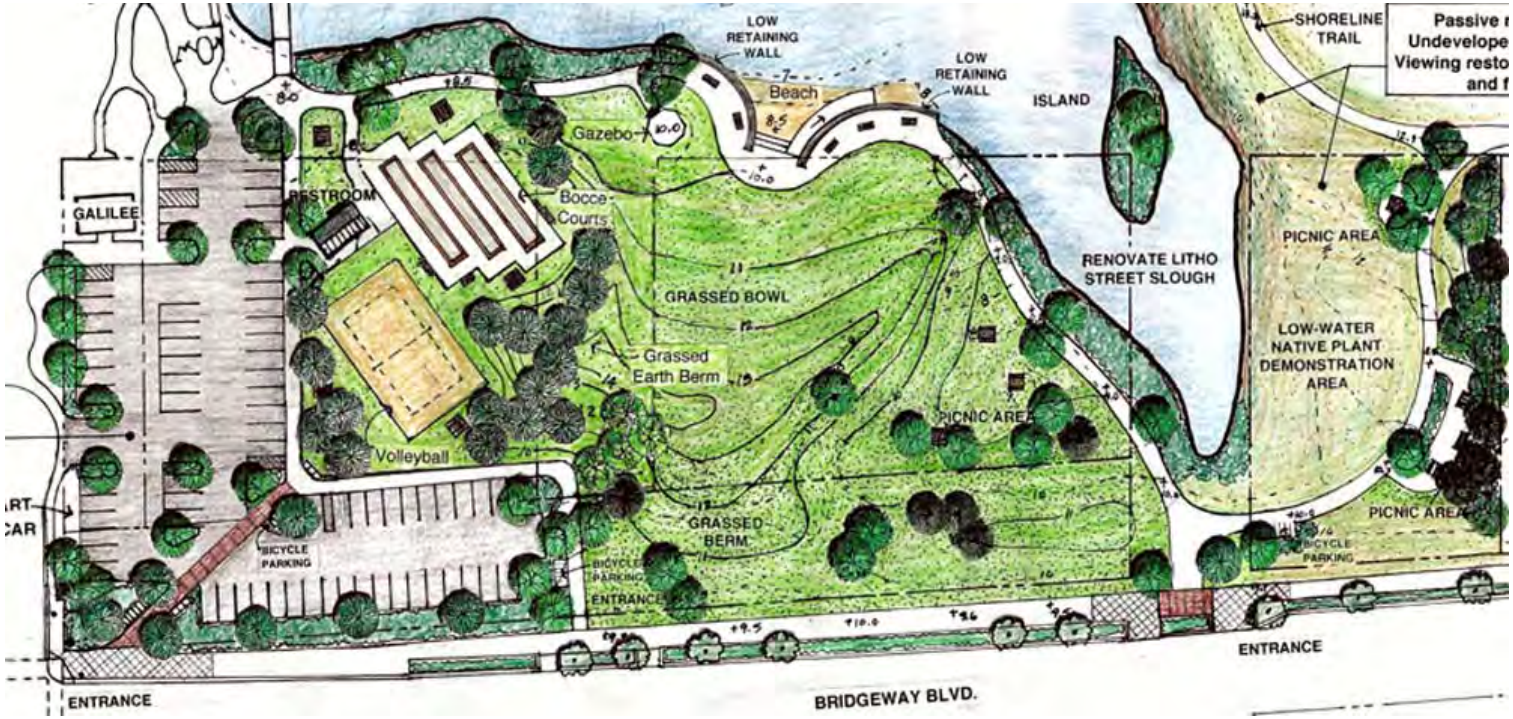
Improve condition of planting by progressively replacing with more appropriate species.

Improve maintenance.

PLANTING CONCEPT

Planting in the Active Areas of the Park is to be predominately, low-water requiring, lawn and deciduous trees with shrub masses used for screening of parking. Low shrubs and groundcovers, as appropriate, are to be used on steep slopes to the Bay. Views of the bay through the park from the sidewalk and bicycle lane along Bridgeway Blvd. are to remain as open as reasonable. Deciduous trees should be used around the Grass Bowl to visually reinforce the bowl form, provide light shade for visitors' use, viewing Bocce Ball and Volleyball as well as views of the activities in the park and the Bay. Dense tree masses providing heavy shade should be used sparingly. Tree choices should allow adequate daylight for healthy lawn growth below.

Planting in the Passive Area of the Park should screen the adjacent undeveloped property along Locust Street with a mixture of evergreen and deciduous trees and shrubs. Deciduous trees should be used around the picnic areas. Remaining open areas between the walk and the Litho Street Slough are to be planted with native plants and grasses to create an area that attracts birds, butterflies and are of interest to the public, essentially providing a place for people to view and enjoy native plants appropriate for use in Sausalito. All existing natural bay related shrubs and grasses should be retained.



Plant List

Trees (deciduous)
Acer negundo 'Sensation' (Sensation Box Elder) - male form only
Cercis occidentalis (Western Redbub)
Crataegus lavallei (Carrier Hawthorn)
Fraxinus oxycarpa 'Raywood' (Raywood Ash)
Ginkgo biloba (Maidenhair Tree) - male trees only
Prunus yedoensis 'Akebono' (Daybreak Cherry) use top graft plants only in moderate watered plantings

Trees (evergreen)
Arbutus 'Marina' (no common name)
Lyonothamnus floribundus (Catalina Ironwood)
Maytenus boaria 'Green Showers' (Green Showers Maytens)
Myrica californica (Pacific Wax Myrtle)
Pinus pinea (Italian Stone Pine)
Quercus agrifolia (Coast Live Oak)
Schinus molle (California Pepper Tree)
Tristaniopsis laurina (Water Gum)

Screening Shrubs (active park area)
Arbutus unedo (Strawberry Tree)
Arctostaphylos densiflora 'Howard McMinn' (McMinn Manzanita)
Carpenteria californica 'Elizabeth' (Elizabeth Bush Anemone)
Ceanothus 'Blue Jeans' (Blue Jeans California Wild Lilac)
Ceanothus 'Dark Star' (Dark Star California Wild Lilac)
Heteromeles arbutifolia (Toyon)
Myrica Californica (Pacific Was Myrtle)

Low Shrubs & Groundcovers (active and passive park areas)
Arctostaphylos hooker 'Monterey Carpet' (Monterey Manzanita)
Arctostaphylos uva-ursi 'Point Reyes' (Point Reyes Manzanita)
Baccharis pilularis 'Twin Peaks' (Dwarf Coyote Brush)
Ceanothus gloriosus 'Anchor Bay' (Anchor Bay Ceanothus)
Ceanothus horizontalis 'Yankee Point' (Yankee Point Ceanothus)
Ribes viburnifolium (Evergreen Currant)
Vaccinium ovatum (Evergreen Huckleberry)

Lawn
Lawn grass should be low-water requiring, cool-season sod that forms a dark green durable low maintenance surface tolerating mowing to 2 to 4 inches high. It should be tolerant of sun and partial shade and native in this area if possible.

Overall Schematic Site Plan

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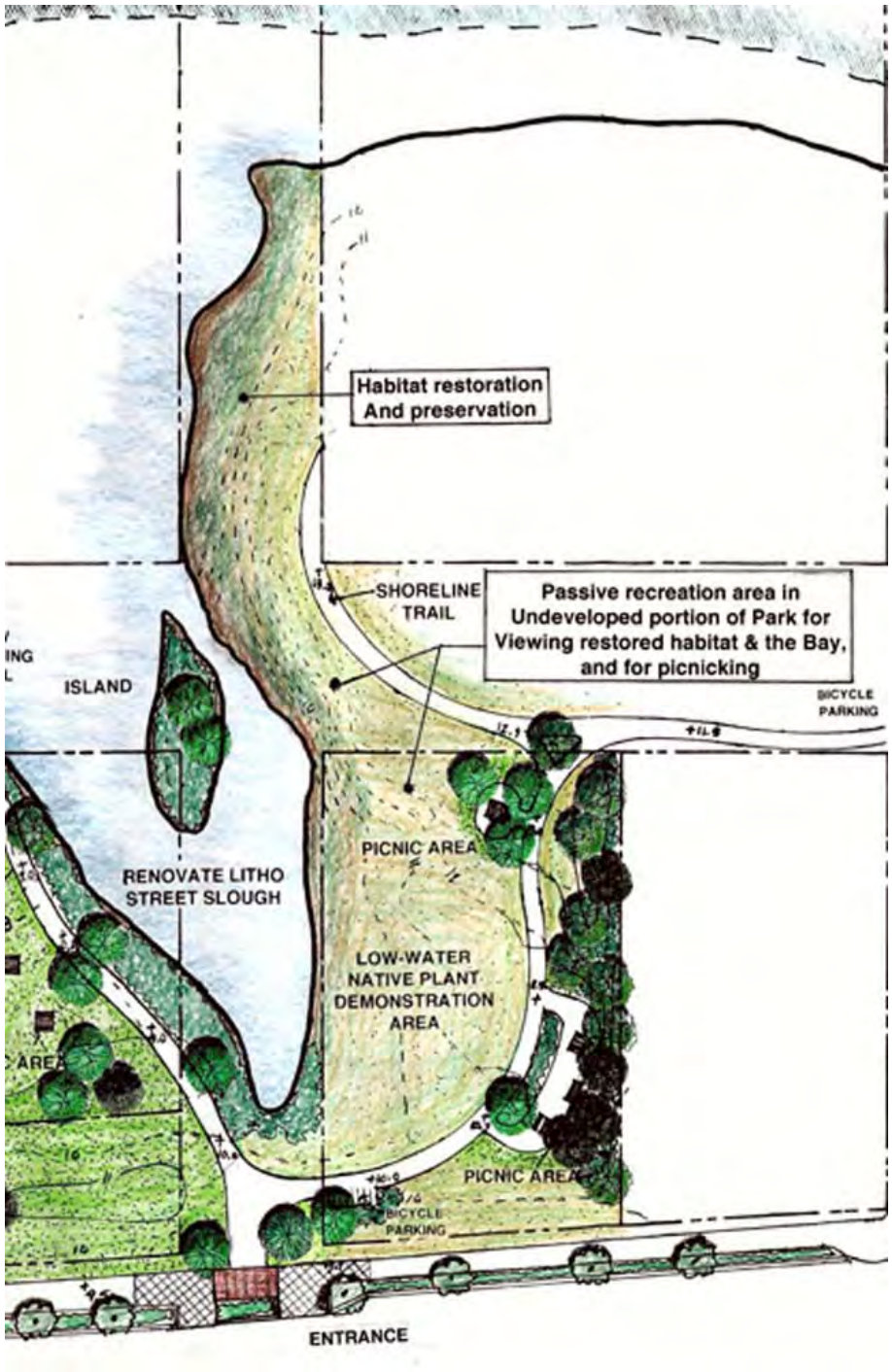
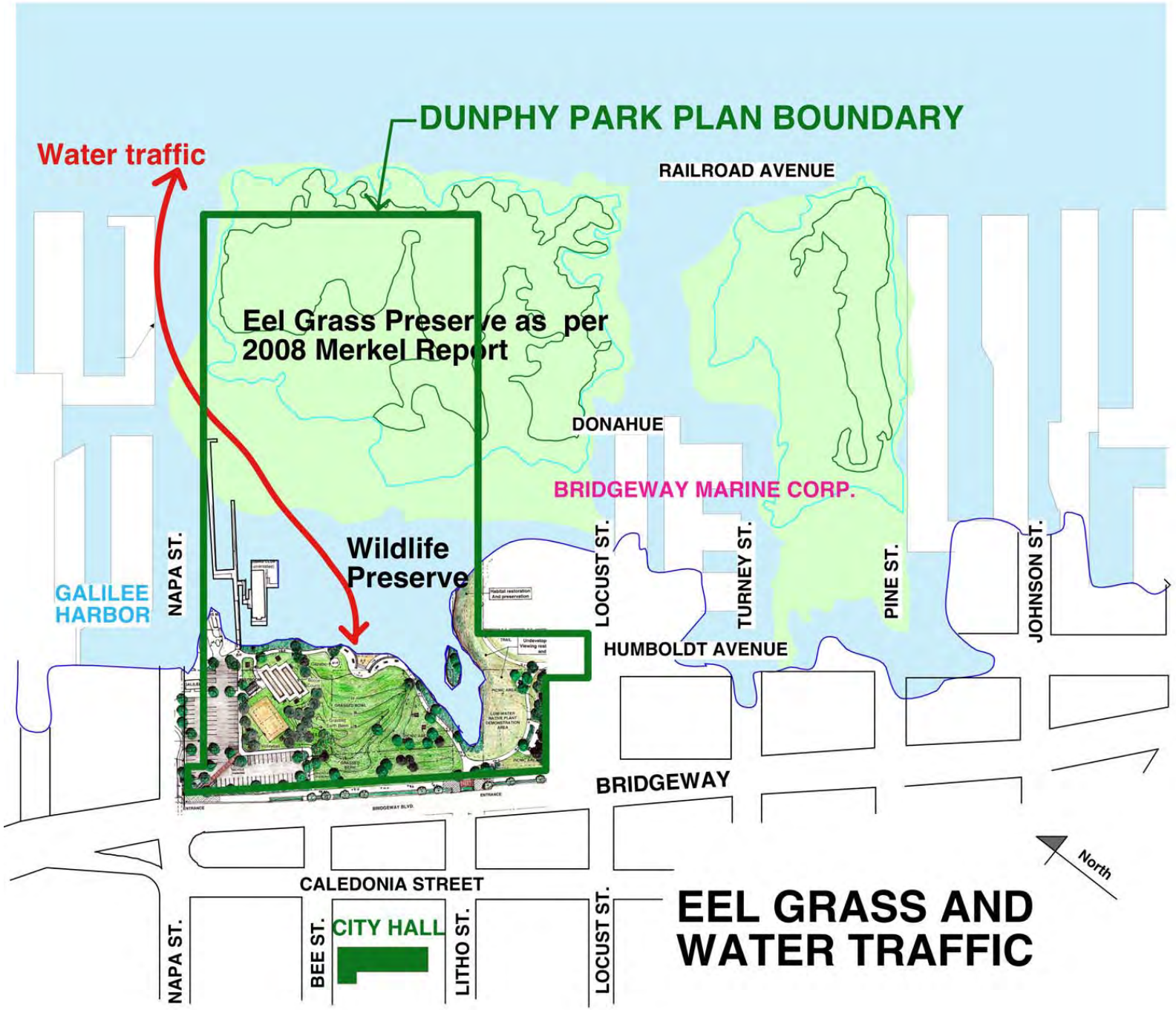
Habitat Restoration and Preservation.

Passive recreation area in undeveloped portion of Park for viewing restored habitat & the Bay, and for Picnicking. Low-water native plant demonstration.

Refer to Marin Audubon Society 11/2/2013 Conceptual Plan. Seek technical and financial assistance for the rehabilitation and maintenance of shoreline and marine habitat. Create island as bird Sanctuary. 50' buffer area along shoreline with no path or bridge; and a fringe of wetland. Renovate Litho St. Slough. Protect and expand eelgrass where possible.

NOTE:
Shrubs and trees in the passive park area should include the appropriate types from the plant list as well as other native and low-water requiring plants that attract birds and butterflies and are "earth-friendly plants". Mowed lawn in the passive park area should be limited to areas around Picnic Areas




DUNPHY PARK PLAN BOUNDARY
Water traffic
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Eel Grass Preserve as per 2008 Merkel Report
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CITY HALL
LITHO ST.
LOCUST ST.
EEL GRASS AND WATER TRAFFIC

References:

•Marin Audubon Society "Planning for Sausalito Marine Property", 11/2/13.
•Merkel & Associates Baseline Eelgrass Survey, 5/7/08.
•Shute, Mihaly & Weinberger LLP "Public trust takings issues relating to the Sausalito Marine Master Plan Project", 10/27/05.
•Linda A Carruthers & Associates Boundry and Topographic Survey, 12/2/13.
•Input from 2013 Public Forum compiled by Friends of Dunphy Park.
•RGH Consultants Geotechnical Study Report, 6/9/15.
•ETS Soil Sample Report, 12/31/14.
•Prunuske Chatham, Inc. Memo, 2/20/15.

Guidelines for the future:

•Dunphy Park has many different components which this Schematic Master Plan ties together harmoniously. Improvements will occur incrementally and, to insure that this harmony and balance is maintained, the Schematic Master Plan must always be consulted when planning each increment. Each component has an effect on the others.

•A secondary toilet facility should be considered in the future at the south end of Park at Locust Street and Humboldt Avenue.

•It is recommended that the City be committed to adequately fund a long term care and maintenance program for landscaping. This program should reflect the variety of uses and site conditions. Ongoing professional consultation may be required.

Overall Schematic Site Plan

Prepared by Friends of Dunphy Park • Jan. 2016

Overall Schematic Site Plan

Prepared by Friends of Dunphy Park • Jan. 2016

Attachment B – Draft Minutes From January 19 & 27

Draft Meeting Summary (1/15/16)

January 19, 2016

Sausalito Parks and Recreation Commission Meeting:
Public Forum on the Dunphy Park Schematic Master Plan

A. WELCOME, INTRODUCTIONS AND FORUM PROCESS

1. Welcome (.Joe Burns, Commissioner)

- Commissioners call role; in attendance Cindy Powers, Sela Seleska, Doreen Gounard, and Joe Burns
    - Doreen Gounard recuses herself from the proceedings due to living in the neighboring subdivision to Dunphy Park, Galilee Harbor.
- Joe Burns leads the session, asks for two-commissioner task force to review the public comments and work with Mike Langford, Director, Parks and Recreation
    - Commissioner Powers nominates Commissioners Seleska and Burns. Motion passes.

2. Dunphy Park Renovations History (Mike Langford, Director, Parks and Recreation)

- Introduces Pam Jones, professional facilitator, who explains her role:
    - Neutral, third-party entity;
    - Facilitated November 2013 Dunphy Park community meeting;
    - Wants process to be inclusive; everyone's voice should heard.
- Jacques Ullman, Friends of Dunphy Park, will provide a presentation on the current schematic master plan which was modified based on the 2013 public input period.
- Langford reviews history of Dunphy Park process
    - In 2013, the City Council ranked getting a schematic plan for Dunphy Park 5th on list of priorities;
    - Public forum held November 2013 → suggested changes to the draft schematic plan;
    - In 2014, Measure F passes; now $1.8 million is dedicated towards Dunphy Plan
        - Meeting is for large-picture input not small: i.e. how many bocce ball courts, not the type of shrubs to go in along the sidewalks.

3. Decision Process (Pam Jones, facilitator)

- Pam Jones reviews the forum ground rules:
    - Generate reactions to the draft schematic plan
    - Fill out speaker cards and be respectful and open to other people's ideas;
    - Each speaker has 3 minutes, one speaker at a time, no interrupting;
    - Questions will be collected and answered at the end of public comment;
    - Sarah Swickard will take notes on the flip charts;

- Allynn McInerney will take detailed meeting minutes to be produced and provided for City and public's review;
- Scheduled to end at 8:30pm.

4. Friends of Dunphy Park Presentation (Jacques Ullman)

- Jacques Ullman gave the presentation about the revised schematic plan for Dunphy Park that was modified after the public forum in 2013 to reflect the comments from multiple interest groups and individuals
- The presentation will be made available for public review on the city's website. Main topics:
    - Mission: to improve and maintain Dunphy Park for public use, as a park and as a habitat reserve -- the last remaining portion of undeveloped waterfront;
    - The schematic plan is a guideline to assure that the future incremental improvement plans are compatible with the City's long-range view for park development;
    - The park was originally built by volunteers in the 1980s and not much has been done to update the park since;
    - The input from public clearly indicated that the plan would have to respond to a wide range of activities, from bocce ball tournaments to wildlife preservation;
    - The plan has six zones: parking, active-use, multi-use, water activities, shoreline restoration and wildlife preserve, and active use.
- Overview of the schematic plan:
    - **Parking**
        - The lot would have 70 spaces, 2 ADA van and 3 ADA auto spaces;
        - Parking along railroad right of way has been eliminated;
        - Parking at north end of park with toilets and active use spaces such as bocce and volleyball courts;
        - No parking along waterfront and minimum parking on railroad right of way.

    - **Active Use**
        - Three bocce ball courts, one volleyball court;
            - Believe that three courts is the maximum that the park can accommodate;
        - Bocce ball courts are located near the water to allow players access to the views;
        - Picnic tables and benches distributed throughout the active use area
        - The active space blends with the rest of the park; there are no clear boundaries between all areas, but it is set up in the northeast corner of the park with a clear enough definition that it is its own area.

    - **Multi-Use Area**

- Open, grass bowl to be contoured to be visually connected to Bridgeway and the water;
- Eliminate parking on railroad right-of-way between Bee and Litho Streets, blend this area into the park, thus integrating park into the neighborhood;
- Open grass to the sidewalk, allows walkers to feel more connected to the park and the water;
- Area is large enough to accommodate community events like Easter, 4th of July events, and the chili cook-off.

- **Waterfront**
  - Goal: to improve beach with possibility for some water-based activities;
  - Re-orient the Cruising Club to open up the view of water and to rehabilitate shoreline;
  - Improve retaining walls and benches, make an ADA ramp to the beach;
  - Raise contours by one foot and add steps and ADA ramp to accommodate sea level changes in the future.

- **Paths**
  - Shoreline Path
    - A pedestrian path, graded to conform to ADA, with benches and picnic areas scattered along;
    - Path is integrated with the overall BCDC Public Shoreline Path through Sausalito and ties the various park activities together;
    - No bicycling within park, along shoreline path;
      - Ample bike racks and bollards at access points;
    - No bikes allowed in the park; ample signage and bollards at all entrances.
  - Bicycle and Pedestrian Path
    - Plan does not suggest any changes to the existing street bicycle lane;
    - The current path proposal in the study is outside the boundaries of the Dunphy Park Schematic Master Plan;
      - Friends of Dunphy Park recommend that the path study at Bridgeway and Napa Street be revised and that changes be made at the Litho, Bee, and Napa Street entrances to mitigate danger from pedestrian cross-traffic interface
    - The Dunphy Park Schematic Plan focuses on the existing joining path and street bicycle lane;
    - Should the path project move forward, there will be no conflicts with the Park plan.

- **Waterfront Activities**
  - Water traffic shall be limited to small boats without keels
  - Facilities for boats shall be provided at Cass Marina and the Cruising Club; shall not extend south of the Cruising Club;
  - Schematic Plan does not detail this area;
    - City shall determine who will be served by these facilities

  - **Eel Grass Preserve**
    - Provide limited access for non-motorized vehicles so as to protect the wildlife preserve;
      - Preserve would be the same as per the 2008 report;
    - Rolling contoured berms in the open grass bowl will be contoured in such a way as to improve runoff.

  - **Cruising Club**
    - Recommend that the Cruising Club be reoriented and turned 90 degrees;
    - If the Cruising Club remains in its current orientation, the Schematic Plan will not change, but the following would be required:
      - All related boating activity would have to be moved from the South end and coordinated with Cass Marina;
      - Cruising Club lease would have to stipulate that on-shore refuse would have to be kept to a minimum and in a designated, visually shielded area;
        - All other facilities specifically related to the Cruising Club, other than parking, would not be permitted on-shore.

5. Public Comment

- Speakers are asked to state name and whether they represent an organization or entity;
- Most responses relative to content from the report given by Jacques Ullman, Friends of Dunphy Park, on the new Schematic Master Plan;
- Responses to and facilitation of questions are fielded by Pam Jones, facilitator.

TOPIC	SPEAKER	COMMENT/QUESTION
Parking	Doreen Gounard, recused commissioner, neighbor to project	I live in Galilee Harbor, and our parking is already overrun with people vising the park, I believe that it is a mistake to eliminate parking at Dunphy.
Parking	Chris Kulina, Resident of Galilee Harbor	Thank the Friends for all they have done for the park. Concerned about the parking in the proposed plan. The significant reduction in parking and only having one point of entry/exit restricts the residents of Galilee Harbor to access our own parking at night.

		Additionally, the railroad right of way (that is being eliminated) houses a lot of parking for public events.
Parking	Sue Verhalen, Resident of Galilee Harbor	Speaking as an older woman who still works 40 hours a week, I am one of the last people who still has a space to park when I come home, especially if the Cruising Club is having an event. I pay for my Galilee spot every month and sometimes don't get to use it due to the overflow from Dunphy park. If you reduce parking, that problem will only become worse.
Parking	Michael Rex, Resident	70 spaces are not sufficient.
Parking	Ray Gergos, Resident, Volunteer who built the original park	I like the idea in theory to have the picnic area where it is; but it is far away from the parking and with children and heavy picnic baskets, I think it is too far to walk. Maybe add a second, small parking space on the south end of the park to help with parking and with access to the picnic area.
Parking	Karen Filoni, Resident	The parking used to separate noisy Bridgeway from the rest of the park, leaving the parking along the railroad right of way solves the lack of parking problem and provides a noise and safety barrier.
North East Corner Congestion	Chris Kulina, Resident of Galilee Harbor	Why are the bocce ball courts being moved? All of the high traffic use is being consolidated to the NE corner where the parking lot causing unnecessary park congestion.
North East Corner Congestion	Mike Uy, Resident of Galilee Harbor	Moving all the activity centers to the NE corner of the park lacks recognition for what the park is actually used for. Too much congestion. The residents come to that park to play bocce, so three quarters of the park will go unused. If the Cruising Club isn't reoriented, the bocce ball courts aren't actually a waterfront view.
North East Corner Congestion	Sue Verhalen, Resident of Galilee Harbor	Please make room for four courts and put them back where they were. That is the number one use of the park.
North East Corner Congestion	Tom Hoover, Resident of Galilee Harbor, Member of Cruising Club	Bocce and volleyball courts right on top of each other won't work: volleyball needs room around it for spectators who would run right into the bocce courts.
North East Corner Congestion	Paul Ralgers, Resident of Sausalito, Former P&R Commissioner	Here representing a coalition of the bocce ba;; club, Cruising Club, and Galilee Harbor: the bocce league has 175 registered players, tw- thirds of whom are voters and supported Measure F with the understanding that bocce would be considered and prioritized. Not happy with the current plan.
North East Corner Congestion	Tammy Blanchard, Bocce player	Excited to see work, recognized the work the Friends have done. However, I believe the NE corner will be congested and present a flow problem. Since 2005, bocce league has gone from one court with games one night a week, to two courts where they play three days a week, and teams have to sit out one week a month. Bocce is a great community effort; please make it a priority of this park.
North East Corner Congestion	Jennifer Spinach , Resident	Bocce courts -are great in their existing locations; all you need to do is add another one. There is way too much congestion up in the NE corner.
Cruising Club	Terry Tucker, Cruising Club Commodore	Concerned about access to the Cruising Club, which has 500 local members, and disturbing the facilities. Also, rotating the CC barge would affect Galilee with increased noise levels.
Cruising Club	Heather Richard, Resident of Galilee Harbor	Representing Cass Marina community boating project (President of the board as a volunteer). Want to ensure that the Cass Marina is considered and that as the Marina grows there will be enough parking to accommodate that growth
Cruising Club	Heather Richard, Resident of Galilee Harbor	Concerned that if the Cruising Club is reoriented, members would share one single entrance with the Sausalito Community Boating Club. I believe this is a bad social mix as often at the Cruising Club there have been weddings and events with drinking, and the Sausalito Community Boating Club has children's programs. Using the same entrance ramp may not be appropriate. If they do reorient, they need their own ramp and entrance.

Cruising Club	Michael Rex, Resident	Turning the Cruising Club around should continue to be explored; it would open up views of the water and people would be amazed. We should study how to mitigate noise affects to the Galilee community.
Cruising Club	Jennifer Spinach, Resident	Concerns about reorienting the Cruising Club: cause erosion; the houses in the north would have blocked views.
Cruising Club	Paul Liberman, Resident	I am concerned that food and other deliveries to the Cruising Club won't be easy if the paths along the waterfront are eliminated. There is also a major rock in the water that would be very difficult to move, but would need to be moved in order to reorient the Cruising Club.
Cruising Club	Tom Hoover, Resident of Galilee Harbor, Member of Cruising Club	If the Cruising Club is reoriented, the winter swells will be very hard on the barge, the ramps, and the facilities.
Cruising Club	Sue Verhalen, Resident of Galilee Harbor	Same concerns as Tom Hoover about the winter swells if the Cruising Club is reoriented. How are you going to pay for the dredging that would be needed to move the barge?
Paths & Waterfront	Sue Verhalen, Resident of Galilee Harbor	Galilee has a waterfront path that is a fire lane. I don't see how in the proposed plan there is enough room for emergency vehicles. It is unreasonable to say no bikes on the shoreline path; people coming from San Francisco that have rented bikes are not going to stay off the path.
Paths & Waterfront	Michael Rex, Resident	The regional transportation corridor, the north/south greenway, has not yet been incorporated into the plan. This is a great opportunity to implement three blocks of that transportation plan.
Paths & Waterfront	Ray Gergos	There should be no signs restricting boats, strongly against any concept that would keep out small boats.
Paths & Waterfront	Michael Rex, Resident	I am all for protecting and enhancing our natural resources, but this park is primarily a recreation park, not a wildlife/wilderness park. What makes Sausalito unique is the shoreline activity. Do not limit access from paddle boards and kayaks. Don't rope off the park from the water front.
Paths & Waterfront	Tom Hoover, Resident of Galilee Harbor, Member of Cruising Club	Can't reorient the Cruising Club; it protects the shoreline that is in front of it from erosion. Plants also provide protection from the wind; please don't cut them down.
Park Safety	Unidentified	There should be a boundary between the park and the road, which could include parking, so that children and dogs aren't running out into the street.
Park Safety	Sue Verhalen, Resident of Galilee Harbor	In the multi-use area, if you do not occupy the space, it will be inhabited. Dunphy park over the years has lost some of the areas, like the kitchen/bbq area, because it became occupied. The design should be more purposeful and not leave so much of the park as open space.
Park Safety	Dennis Hineta, Resident	Park safety is very important to us; this park should not have hiding spaces for people to congregate or smoke. Just fix a few things that are currently wrong with the park – more garbage cans, a cross-walk with lights, no smoking signs – and it will be fine as is.
Park Safety	Jennifer Spinach , Resident	Bringing the park all the way up to the roadway is dangerous for children and dogs;there needs to be some barrier between the park and roadway.
Park Safety	Tom Hoover, Resident of Galilee Harbor, Member of Cruising Club	Worried that all of the open spaces in the park will attract "derelicts."
Wildlife	Chris Kulina, Resident of Galilee Harbor	Concerned that the current plan would remove all of the biggest trees from the park; interested in saving as many trees as possible.
Wildlife	Heather Wilcoxin, Resident	Certain birds congregate in the lagoon for a limited time during the winter months as they migrate from Alaska. I hope that we can keep in mind the migrating birds and help preserve their lagoon habitat.

Facilities	Tom Hoover, Resident of Galilee Harbor, Member of Cruising Club	Being a senior citizen, having only one set of toilets at one place in the park is a bad idea. They should be at both entrances.
Facilities	Ray Gergos, Resident, Volunteer who built the original park	As a senior, I am strongly in favor of many benches – and benches with backs.
Additional Considerations	Heather Richard, Resident of Galilee Harbor	Representing Cass Marina community boating project (President of the board as a volunteer). Want to ensure that the Cass Marina is considered and that as the Marina grows, that there will be enough parking to accommodate that growth
Additional Considerations	Sherwin Smith	New addition to the plan to consider: rowing club. I've been involved in a rowing club for a long time and think that it would bring even more community to the park; it gets people out on the bay. We don't like being near shoreline so we wouldn't interfere with wildlife preservation efforts; happens early in the morning so would not conflict with late morning/afternoon activities; provides a unique public connection to the bay.
Question A	Tammy Blanchard, bocce ball player	Q: How long is this plan going to take? Is it going to be implemented in phases? Is it going to use all of the money allotted or will the construction need more money? What is the budget?
Question B	Unidentified	How many parking spaces are there now?
Question C	Chris Bonds, Cruising Club Chair of Dunphy Park Committee	Regarding the berms, are the sight lines for music festivals going to be affected? There are about three or four music concerts a year that happen in the park; I want to be assured you will still be able to enjoy them.
Question D	Linda Lee, Resident	How are emergency vehicles going to get to the Cass Marina or the Cruising Club?
Question E	Sue Verhalen, Resident of Galilee Harbor	How will priorities be determined for what goes in to the park? What is the process for deciding what gets money spent on it and how are you prioritizing the interior of the park?

6. Closing and next steps

- Questions answered by Mike Langford:

  A: In terms of priorities, grants and other money granting organizations/sponsorship won't give over money until there is a concrete plan. Our top priority is getting a Schematic Plan drawn up and approved so that we can then figure out if there are other funds from independent sources. We can't assign money to items until we have a plan drawn up.

  B: About 130 parking spaces

  C: The berms are very similar to what are already there, so the sight lines will not be obstructed.

  D: Any plan that goes through the city planning process has to be reviewed by the fire and police chiefs; they will make sure there is adequate space for emergency vehicles.

  E: Some items will be prudent to do at the beginning while others are easier to do later. For example, in addition to building one bathroom at the very beginning, it may be prudent to install the plumbing for a second bathroom in case one is needed later.

- Next Steps:
    - Another public form at the January 27, 2016 Parks and Recreation Commission meeting
    - After the hearings, Commissioners Seleska and Burns, will confer with Mike Langford to determine priorities and potential modifications and will discuss potential changes with the Friends of Dunphy Park.
    - The Parks and Recreation Commission will present a recommendation to the City Council for approval
    - City Council is the property owner, so the Council will make the final determination on the Schematic Master Plan. Note: the Council will vote on "where is the volleyball court going to be," not "what kind of sand will be in the court."

        - Mike: The rest of the notes about next steps were not clear. The following is what we had decided. Please reconcile and edit. Pam
    - City Council directs staff to contract with an architect to develop more detailed plans
    - Plans come before the Planning Commission which makes a recommendation to the City Council
    - City Council approves hiring a park designer who will develop the specific plan.
    - City Council hires firm to construct the park modifications.

7. Closing – Joe Burns

- Visit the Friends of Dunphy park website, www.dunphypark.org ;
- These notes as well as the Friends' presentation will be made public on the City website
- The next community meeting is on Wednesday, 1/27/16;
- For next meeting, come with a solution that can go to the council in order to pass the recommendation. We are committed to breaking ground as soon as possible, and if the public brings solutions along with them, that could really help move the Schematic Master Plan Project forward;
- Meeting concluded at 8:30pm.

January 27th DRAFT meeting notes pending

Attachment C – Letters and emails that Staff and Council have received

Mike Langford

From: Lilly Whalen
Sent: Friday, February 05, 2016 4:01 PM
To: Mike Langford
Subject: Fwd: So much for Measure F and any Dumphry Park improvement.

Sent from my iPhone

Begin forwarded message:

> **From:** Lilly Whalen <lwhalen@ci.sausalito.ca.us>
> **Date:** February 2, 2016 at 9:08:31 AM PST
> **To:** Jonathon Goldman <JGoldman@ci.sausalito.ca.us>, Mike Langford <MLangford@ci.sausalito.ca.us>, Melanie Purcell <MPurcell@ci.sausalito.ca.us>
> **Cc:** Adam Politzer <apolitzer@ci.sausalito.ca.us>, Mary Wagner <MWagner@ci.sausalito.ca.us>
> **Subject: Fwd: So much for Measure F and any Dumphry Park improvement.**
>
> FYI
>
> Sent from my iPhone
>
> Begin forwarded message:
>
> > **From:** Tammy Blanchard <tammyblanchard@gmail.com>
> > **Date:** February 2, 2016 at 9:01:51 AM PST
> > **To:** jill hoffman <jhoffman@ci.sausalito.ca.us>, LJ pfeifer <lpfeifer@ci.sausalito.ca.us>, <hweiner@ci.sausalito.ca.us>, <lschinsing@ci.sausalito.ca.us>, <rwithy@ci.sausalito.ca.us>, <ttheodores@ci.sausalito.ca.us>, <apolitzer@ci.sausalito.ca.us>
> > **Cc:** Jim Gabbert <jgabb@aol.com>, Kay Mitzel <kaymitzel@gmail.com>, Ben Brown <brownbenm@gmail.com>, pat zuch new <paz65@sbcglobal.net>, sonja hanson <sonyahanson@hotmail.com>, Peter Van Meter <mycre@pacbell.net>
> > **Subject: Fwd: So much for Measure F and any Dumphry Park improvement.**
> >
> > Hello
> >
> > I attended the Park and Rec meeting where the friends of Dumphy Park presented their master plan for improvements to the park. During the public comment portion if the evening I commented "I am not a professional but the project looks like it will cost more than the 1.8 million in our budget" and I asked if they knew how much the project would cost ... They (the city staff) said that they did not yet know. Which is exactly why we are over budget By 400K before breaking ground on the Sweeney park....this is absolutely unacceptable!!!
> > See article below.

Rather than rob from the other projects...Please let us know what steps we need to take to delay this project until the plans can be modified to meet the allocated 1.2 million.

Tammy Blanchard
831-332-7744

Begin forwarded message:

> **From:** Marv Hovatter <vtmarv@yahoo.com>
> **Date:** February 1, 2016 at 9:14:33 PM PST
> **To:** Tammy Thomas-Blanchard <tammyblanchard@gmail.com>, Kay Mitzel <kaymitzel@gmail.com>, Jim Gabbert <jgabb@aol.com>, Tim Nousen <timnousen@aol.com>
> **Subject: So much for Measure F and any Dumphry Park improvement.**
>
> I was reading **Sausalito voter-approved parks measure not enough to cover first project** on Marin Independent Journal for iPhone and thought you might be interested in reading it too.
>
> Sent from Big Marv's iPad

Mike Langford

From: Meg Fawcett <mgfawcett@sonic.net>
Sent: Sunday, January 24, 2016 6:23 PM
To: Mike Langford
Cc: Jacques Ullman; Paul & Ursula Leffingwell
Subject: Comments on Dunphy Park Schematic Master Plan

January 24, 2016

Dear Park and Recreation Commissioners and Mr. Langford:

I attended the January 19th public forum on the Schematic Master Plan for Dunphy Park and I am so appreciative of the enormous amount of effort by Paul Leffingwell and Jacques Ullman in developing it and their sensitivity to the various user groups for this relatively small space. I am very supportive of the Plan as presented.

My highest priorities for Measure F funds are as follows:

Concentrating parking as shown on the Plan and prohibiting parking on the remaining right-of-way. (I don't think that the number of parking spaces should be predicated on occasional large events as there is never "enough" parking and anyway the City should be encouraging locals to walk!)

Correcting the drainage on the property so it isn't so boggy and wet and is capable of sustaining new healthy trees, shrubs and lawn. I particularly love the grassed berms creating a grassed bowl.

Expanding the contoured landscaping, as shown on the Plan, into the railroad right-of-way between Bee and Litho streets thereby making the park much more inviting to the general public for daily use and providing a nice entrance to the park and the shoreline trail.

It is my understanding that funds are already allocated in the 2015-2016 budget for a permanent bathroom. The porta-potties are truly an eye sore!

Finally, I see no reason why channel markers can't be placed to protect the eel grass beds which are so important in preserving the herring that come into our Bay to spread their eggs.

Thank you all for your efforts.

Sincerely,

Meg Fawcett
72 Cypress Place

Mike Langford

From: Lilly Whalen
Sent: Thursday, January 28, 2016 10:20 AM
To: Adam Politzer; Mike Langford
Subject: Fwd: Dunphy Park Meeting 1/27/16
Attachments: DUNPHY PARK OPTION 12716.png; ATT00001.htm; ATT00002.htm; ATT00003.htm

FYI. Nina is the HLB's newest member

Sent from my iPhone

Begin forwarded message:

> **From:** "Nina LeBaron" <nina@islandarchitecture.net>
> **To:** "Parks & Recreation Commission" <ParksRecCommission@ci.sausalito.ca.us>, "Mike Langford" <MLangford@ci.sausalito.ca.us>
> **Cc:** "Lilly Whalen" <lwhalen@ci.sausalito.ca.us>, "Jill Hoffman" <jhoffman@ci.sausalito.ca.us>, "Ray Withy" <rwithy@ci.sausalito.ca.us>, "Linda Pfeifer" <lpfeifer@ci.sausalito.ca.us>, "Tom Theodores" <ttheodores@ci.sausalito.ca.us>, "Herb Weiner" <hweiner@ci.sausalito.ca.us>, "Pedestrian & Bicycle Advisory Committee" <PBAC@ci.sausalito.ca.us>, "Jonathon Goldman" <JGoldman@ci.sausalito.ca.us>, "John Rohrbacher" <JRohrbacher@ci.sausalito.ca.us>
> **Subject: Dunphy Park Meeting 1/27/16**
>
> Dear Park Commissioners and Director,
>
> I've been to two Dunphy Park Meetings and it appears that the problems with the design have not been addressed. I appreciate the process in creating improvements to this important park and apologize for coming in late in the design process.
>
> Before you make a decision, there needs to be more studies of the other options that were presented at the past two pubic meetings.
> There needs to be another design meeting to present the other options before you cast your votes .
>
> What is the budget for the park and how much can actually be done? While I appreciate all the work that has done by the "Friends of Dunphy Park" committee and Jacques Ullman, they are un-responsive to any changes to their design of reduced parking. This is alarming considering all the concerns that have been raised. Parking for the existing community of users is clearly not addressed.
>
> The constituents of the park were not all included in the initial design phase of the park, from what I can understand:
> 1. Cruising Club (the need for close parking by elderly users, the need for food delivery & emergency vehicle parking with a turn around, need for enclosed trash area)
> 2. Gallilee Harbor Residents (the need of their parking to not be over-taken by park users)
> 3. Cass Marina Users (how many users does this represent?)
> 4. Bocce Club Members (how many users does this represent & how is the growth provided for?)

5. Kayak Club & Container (how many users does this represent?)
6. Caledonia Street Businesses: Theatre, Portuguese Hall (the need for over-flow parking for events with $70 parking tickets if you park in the residential areas).

There are equal concerns for not loosing parking as there are for deceasing parking. If you would please take into consideration the points I bring up in my illustration and list of concerns when you go over the design by the Friends of Dunphy Park:

Overall Schematic Site Plan

Prepared by Nina Le Baron, AIA of "Island Architecture" for Jan. 27, 2016 Public Meeting

Mike Langford

From: Alice Merrill <alicem3@mindspring.com>
Sent: Thursday, January 28, 2016 10:24 AM
To: Mike Langford
Subject: Dunphy Park input

Hi Mike,

I was not able to go to either of the meeting recently.

A couple of things;
Doreen has a point of if the events are already happy when move them. As is Bocce mostly. And if this is going to move into the next 50+ years a revamp could be a good idea. Both sides . . . I'm good at that.

Parking:
There should absolutely be the same amount of parking as there is now. I realize that the right of way is always a jumble but it does have an amount one can count that will fit. A bit more parking is good by me but not essential.

On that note, I do not agree that the park has to be made so much bigger with the view to the street. Walkers can find the park even if they have to walk across a small parking lot and the drivers should not be looking.

Water side access:
Funny how I read more access to the water from a water side pint of view. Clearly the Friends of Dunphy Park were thinking from the land side. There is not nearly enough water side access to this park for the money being spent. And the designation of "Wildlife Preserve" clearly, once again, means that the Friends is not thinking a out water side use.

The beach is tiny. I thought that the Hobie Cat races was a fun use of the park. Realistically for them it is too far away from the actual "sailing grounds" so they might be looking for someplace more suitable. But I would not want to think that we are making such an event impossible with this Wildlife preserve designation.

Beginnings:
My father was one of the founding fathers (- : of Friends of Dunphy Park because of what Eben Gossage was cooking up. It was in response to that and has now taken on a life of its own. I can assure you that if he were still around water access would be an important part of any plan.

Thanks, Alice

Begin forwarded message:

From: William Miller <hanneloreandbill@me.com>
Date: January 19, 2016 at 9:46:40 AM PST
To: Jacques Ullman <jacquesullman@sbcglobal.net>
Subject: Re: Dunphy Park Schematic Master Plan

Hello Jacques,
We send the following letter to mlangford@ci.sausalito.ca
But it was returned.
We have resided in Sausalito since 1981 and have reviewed the plans
For development of Dunphy Park provided to us by Jacques Ullman.
We strongly support the planned revisions to the Park including
The relocation of the bocce ball courts and parking.
Hannelore and Bill Miller
16 George Lane
Sausalito

Good luck
H.

Mike Langford

From: Barbara Salzman <bsalzman@att.net>
Sent: Wednesday, January 27, 2016 4:12 PM
To: Mike Langford; jacques Ullman
Subject: Dunpy Park Plan

TO: PARK & RECREATION COMMISSION

ATT: MIKE LANGFORD

RE: DUNPHY PARK PLAN

I am writing to emphasize Marin Audubon's concern about protecting the Dunphy Park shoreline, and particularly the outboard bay waters and the eelgrass beds that could be impacted by uses originating at the park or nearby. We are concerned about disturbances to the diving birds, waterfowl and shorebirds that use the Bay waters and maintaining a passive use are along the shoreline.

Please place me on your email or mailing list to receive notices of future meetings. We understand that that the focus of the meeting this evening will be on development uses
within the park. We want to participate at the appropriate time when the shoreline and Bay water will be the main focus.

Thank you.

Barbara Salzman

Marin Audubon Society

(415)924-6057

My land address is:
48 Ardmore Road
Larkspur, CA 94939

Mike Langford

From: christene scarpino <cscarpino@me.com>
Sent: Thursday, January 28, 2016 8:22 AM
To: Mike Langford; Joe Burns
Cc: Adam Politzer
Subject: Dunphy Park Schematic Plan - comments from last night

January 28, 2016

Hi Mike & Joe,

Thank you for hosting the second public commentary meeting. I did not get up and speak but decided to write you instead. You both know how many hours I put into Measure F so there should be no doubt in your mind as to my intention for moving forward to create the best park upgrades possible.

And, I realize it is an uncomfortable role to be advocating for more parking and better flow for vehicles but I am concerned about the impact to Galilee Harbor Community Association (GHCA) and our residents. In fact, I have been concerned during the Measure F campaign (and before that during the budget discussions) but was convinced that in approving the Measure, we would be part of the decisions over what impacts our property.

In my meetings with Adam, we touched on the evidence of "empirical data" that was the foundation to the design of the parking lot with its projected circulation flow and the compliance of regulations (ADA, BCDC, CEQA). Can I assume that the schematic has met all regulations and our requirements for GHCA - as we will be sharing parking? GHCA supplied The Friends our stipulations in June of 2014. I trust that the Park and Rec Commission will be reviewing this for any red flags.

Is the Commission adhering "*to ensure that parks and recreational uses are **compatible with adjacent uses** and the character of the area in which they are located*". Last night, I heard GHCA's concerns with their proposed revisions, I heard the Cruising Club's concerns with their proposed revisions and I heard Cass Marina's concerns for their future with their proposed revisions and I heard from the Portuguese Hall that they had concerns.

The folks that seemed most pleased with the park are the people who do not live or work directly adjacent to the park or had something to gain, like a third bocce court. While I agree that it is beautiful design, I would like to be convinced with numbers and facts that this will not cause problems. No one wants to be an obstructionist in

this process. But since we are a government of democracy, I should hope a healthy allowance of input from the "adjacent uses" will assist in any risk mitigation.

There was an architect tonight (with the maroon vest) that proposed a wonderful plan that included many of our concerns - I would like for this to be considered along with all of the other revisions you requested from the "adjacent uses" listed above.

And my questions in which I would appreciate a response:

1. How will we be informed of the steps and the process that the Commission will be undertaking before it goes to the City Council?

2. And most importantly, will GHCA be informed by written record of the Commission's contemplation and reasoning for your decisions over each of our concerns and proposed solutions?

As discussed, we are happy to walk the park and our property with a Commissioner if that helps the process.

Thank you,

Christene Scarpino

Mike Langford

From: Terri Thomas <tl2thomas2@gmail.com>
Sent: Saturday, January 23, 2016 9:53 AM
To: Mike Langford
Cc: HEATHER RICHARD
Subject: Kayaks and Dunphy Park Plan
Attachments: North Basin rpt_Avocet_Research_Associates_2009.pdf.pdf; Kelly_Evens_Waterbird Disturbance_Tech_Rpt_2013pdf.pdf.pdf

Hello Mike,

My name is Terri Thomas and I am on the Cass Gidley (Sausalito Community Boating Center) Board of Directors. I approached you at the end of the public meeting last week and you graciously offered that I could send you my comment by e-mail Thank you for that.

The Cass Gidley Board supports the Dunphy Park Plan, including the recommended Ecological Preserve. One commenter at the public meeting requested literature that shows kayak impacts on birds. Attached please find two local papers that directly apply to this issue. There is a large body of literature on this topic and I am happy to supply more if needed. I also have literature on the disturbance of kayaks to harbor seals. They will also come into the Dunphy Ecological Preserve area.

High recreational value exists for wildlife observations and seeing these animals from shore. There isn't much public shoreline, in Sausalito, where eelgrass is so close that the ability to see these animals and this ecosystem can be enhanced and interpreted to the public right where they can see it.

Hopefully this aspect of the plan will be able to stay intact.

Thank you,

Terri Thomas
Director, Sausalito Community Boating Center

Boating Disturbance to Waterbirds in California Estuaries.

By John P. Kelly[1] and Jules G. Evens[2]

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Email: kellyjp@egret.org
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ACR Technical Report 89-12-6

Cypress Grove Research Center
P.O. Box 808, Marshall, CA 94940

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Every living being exhibits a mysterious mixture of tolerance and sensitivity in relating to the surrounding world. Human interactions with nature, throughout history, seem confounded by this mystery, often failing to determine or even consider how much, how close, or how often an activity can be implemented without harm. An extensive scientific literature confirms that the nearly ubiquitous use of motorized boats in coastal waters frequently exceeds the tolerances of other species, imposing potentially important threats to the conservation of wintering and migrating waterbirds (e.g., Kaiser and Fritzell 1984, Burger 1998, Davidson & Rothwell 1993, Madsen 1994, Galicia and Baldasserre 1997, Loong 2002, Takekawa 2008, Borgmann 2010). Mathews (1982) studied water-based recreation in Britain and ranked motorized boating as the greatest disturbance to wintering waterfowl, followed by sailing, wind-surfing, rowing, and canoeing.

Local and regional conservation plans in coastal California acknowledge the adverse effects of boat disturbance to waterbirds, but the impacts are poorly documented and practical management objectives remain out of reach (PRBO Conservation Science and the San Francisco Bay Joint Venture 2004, Shuford 2011, Pitkin and Wood 2011, Gulf of the Farallones National Marine Sanctuary et al. 2013). Nonetheless, a careful look at boating disturbance may reveal opportunities for making simple adjustments in current management or, even more simply, avoiding new activities likely to increase collateral damage.

Tomales Bay waterbird surveys

ACR's ongoing surveys of loons, grebes, cormorants, ducks, and other waterbirds on Tomales Bay, conducted three to four times each winter since 1989 (Kelly and Tappen 1998), offer a glimpse into the consequences of waterbird disturbance by motorized boats. Each survey involves a team of 16 to 18 highly proficient birders riding on three motorized boats in a systematic effort to count every bird on the bay. This is no simple task, as parts of the bay are often jammed by spectacular concentrations of avian life. Baywide numbers often top out at 35,000 waterbirds, not including gulls or shorebirds, of more than 50 species—counted at distances of up to a quarter mile on seas that, even when relatively flat, can conceal the presence of small grebes or other birds.

To effectively count the waterbirds on Tomales Bay, we must avoid forcing them into the air; that results in a beautiful but confusing mayhem and causes considerable risk of counting birds twice when they fly to other areas in the bay. Peregrine Falcons often follow fast-moving boats, using them as mobile blinds from which they launch attacks on ducks fleeing from the boat disturbances. Even at slower speeds, however, our survey boats can disrupt waterbirds' foraging activities, their use of important feeding areas, and other behaviors that may be necessary for their continuing use of the bay. So we creep along our standard transects at about four knots, often slowing to count heavy concentrations of birds. In spite of this cautious survey effort, some waterbirds flush ahead of the boats. To more accurately measure the natural (undisturbed) feeding distributions of waterbirds, we use an elaborate method of accounting for birds that fly ahead of the boats into other sections of the bay. During these baywide cruises, we occasionally witness the effects of disturbance by other motorized boats and human activities.

In contrast to most other coastal lagoons and estuaries in California, Tomales Bay has surprisingly little boat traffic. However, areas used by waterbirds and boats are often the same, leading to alternating (interrupted) use by birds. Published evidence strongly suggests that estuarine birds may be seriously affected by even occasional disturbance during key parts of the feeding cycle. For example, when American Wigeon, an

abundant duck species in many California estuaries, are flushed from eelgrass (*Zostera maritima*) feeding areas, they will abandon the area until the next tidal cycle, unless the disturbance occurs early in tidal feeding period (Fox et al. (1993). Similar disturbance events are conspicuously revealed by Brant (small marine geese), which frequently lift into large flocks that signal distributional shifts limiting their access to eelgrass foraging areas (Henry 1984, Stock 1993).

Disturbance trials in San Francisco Bay

In a collaborative study with colleagues at Avocet Research Associates (ARA 2009), we measured the disturbance behaviors of waterbirds in San Francisco Bay. Our results showed that many waterbird species require long distances just to avoid interference by an approaching kayak (Table 1). It seems clear that far greater buffer distances would be needed to avoid disturbance by *motorized* boats. Hume (1976) found that Common Goldeneyes were especially sensitive, flushing from their positions when motor boats came within 350-720 m. Obviously, ensuring this level of protection would be difficult or impossible in most urbanized estuaries. On a practical level, the effective protection of wintering or migrating waterbirds from direct disturbance by boats in coastal California may depend on opportunities for conservation planning in relatively undisturbed waters, such as Tomales Bay.

Avian responses to human disturbance, or "habitat intrusion," are analogous to their responses to predators. In waterbirds, escape flight ("flushing") is the most observable response to disturbance, but prior to taking flight waterbirds often swim, above or below the surface, to keep a safe distance from boats. In addition, other more subtle behavioral or physiological responses may precede this escape response, including "head alerts," reduced feeding rates, the production of stress hormones, and increased heart rates (Tarlow and Blumstein 2007). Each of these subtle responses exacts an energetic cost. For this reason, following procedures used by Rodgers and Schwickert (2003), we calculated buffer distances needed to (1) protect birds from at least 95 percent of the expected flushing responses and (2), by adding 40 m to the recommended distances, avoid physiological or behavioral stress before birds actually flush.

Numerous studies document that waterbirds compensate for increased levels of disturbance either by increasing their food intake, to balance the energetically expensive flight responses, or by flying to other less profitable but less disturbed areas to feed (Tuite et al. 1983, Knapton et al. 2000; Figure 1). Repeated flushing during winter may prevent waterbirds from accumulating enough fat and protein reserves to override periods of low food availability, prepare for migration, and/or store energy needed for breeding (Ward and Andrews 1993, Galicia and Baldassarre 1997, Kelly et al. 2002),). Disturbance-related energy costs may even delay migration and arrival in the breeding grounds and, ultimately, reduce reproductive success (Owen and Reinecke 1979, Schummer and Eddleman 2003). If waterbird feeding opportunities are already limited, increased disturbance may lead to abandonment of the area, lower reproductive success, or even starvation (Davidson and Rothwell 1993, Baldassarre and Bolen 1994).

Habituation is unlikely

Some species of birds may "habituate" to human activity, lowering their sensitivity to interference (Nisbet 2000, Whittaker and Knight 1998, Chatwin et al. 2013). However, the biology of wildlife habituation, which is concerned with potential declines in the responses of individuals to repeated stimuli, is frequently misunderstood and used inappropriately to explain how animals respond to humans (Bejder et al. 2009). Apparent "habituation" may simply reflect differences in the tolerances of different waterbird species or individuals to different stimuli in different times, locations, or other ecological contexts (Burger 1981). In our study in San Francisco Bay, we found no trends in the responses of waterbirds to repeated disturbance during winter and, therefore, no evidence of habituation (ARA 2009). In fact, scientific evidence is lacking to support predictions that wintering and migrating waterbirds might habituate to disturbances by motorized boats (Banks and Rehfisch 2005, Burger and Gochfeld 1991). The absence of a substantial capacity for habituation by wintering or migrating waterbirds is further supported by evidence that waterbirds react to disturbances by boats by flushing at similar distances in different areas (Rodgers and Smith 1997, Rodgers and Schwikert 2002, Takekawa et. al. 2008, ARA 2009, Borgmann 2010). In contrast to predictions of habituation, waterbirds exposed to repeated disturbance by motorized (or non-motorized) boats are

more likely to decrease their feeding rates, expend more energy on vigilance, and decline in abundance (Figure 1; Hume 1976, Skagen et al. 1991; Pfister et al. 1992; Burger and Gochfeld 1998, Robinson and Cranswick. 2003).

The challenge of protection

Rodgers and Schwikert (2002) recommended that the size of protected areas used by mixed-species assemblages should be based on the largest flush distances of the most sensitive species and allow for the increased sensitivity of larger flocks. The results of our disturbance trials in San Francisco Bay are consistent with this recommendation (Figure 2). Mori et al. (2001) provided similar support and, in addition, found that flushing distances also increased with species diversity. Based on our results from San Francisco Bay and available information from other investigators, we recommend a minimum buffer zone of 250 m as a general, "one-size-fits-all" guideline to protect high-use waterbird areas from disturbance by non-motorized boats—but substantially larger buffer zones would be necessary to protect important waterbird areas from disturbance by *motorized* boats. Given this, our remaining coastal wetlands of special value to waterbirds (e.g., sites recognized by the Ramsar Convention on Wetlands of International Importance) are worthy of increased protection if they are to remain viable habitats for waterbirds.

Model species: migrating and wintering Brant

Brant (*Branta bernicla*) are small marine geese that provide an appropriate model for minimizing disturbance to waterbirds because they are less tolerant of human activity than smaller species, form large, easily provoked flocks and, as game birds, are especially sensitive to anthropogenic disturbance (Reed et al. 1998, Rodgers and Schwikert 2002, Takekawa et al. 2008). "Black" Brant (*B. b. nigricans)*, the Pacific Coast subspecies of Brant, is a California Bird Species of Special Concern (Davis and Deuel 2008). Well over a thousand Brant winter on Tomales Bay, increasing to migratory peaks of nearly 5,000 each spring (ACR, unpublished data). Similar migratory peaks occur in Morro Bay, and numbers of staging Brant in Humboldt Bay may exceed 25,000 (Davis and Duel 2008). However, these abundances underestimate their use of California estuaries, because over 130,000 Brant depend on the network of coastal refueling sites as they wing northward each spring, from wintering areas in Mexico and California to their arctic breeding areas (Pacific Flyway Council 2002, Davis and Duel 2008).

Brant are obligate feeders on eelgrass (*Zostera marina*), and their survival and reproductive fitness is determined largely by their access to this primary forage plant (Reed et al. 1998). Recent increases in numbers of wintering Brant (Davis and Deuel 2008) have been attributed to a long-term reduction in disturbance (Moore and Black 2006) and the more recent recovery of eelgrass habitats along the California Coast (Unitt 2004). However, traditional wintering areas in Mexico have been subjected to intensive development and hunting disturbance, severe enough to drive wintering Brant offshore into nearby ocean waters (Smith et al. 1989). Therefore, local increases in California might reflect the movement of birds away from degraded wintering areas in Mexico, and the additional importance of non-urbanized, low-disturbance habitat along our coast. However, the reasons for recent abundance shifts by Brant remain unknown.

Sources of human disturbance that adversely affect Brant include motorized boats, kayaks, jet skis, wind surfing, recreational and commercial shellfish harvest, fishing, commercial and residential development, and even the development of trails (Pacific Flyway Council 2002). To safely avoid disturbance to Brant, motorized boats would have to operate no closer than a few hundred meters or more from concentrations intensively used habitat areas (Laursen et al. 2005). Disturbance to Brant during winter and staging is of particular concern because it can negatively affect their ability to build energy reserves for migration and breeding, lower their reproductive success (Henry 1980, Derksen and Ward 1993, Reed et al. 1998, Ward et al. 2005) and, in turn, limit or reduce population growth (Pacific Flyway Council 2002).

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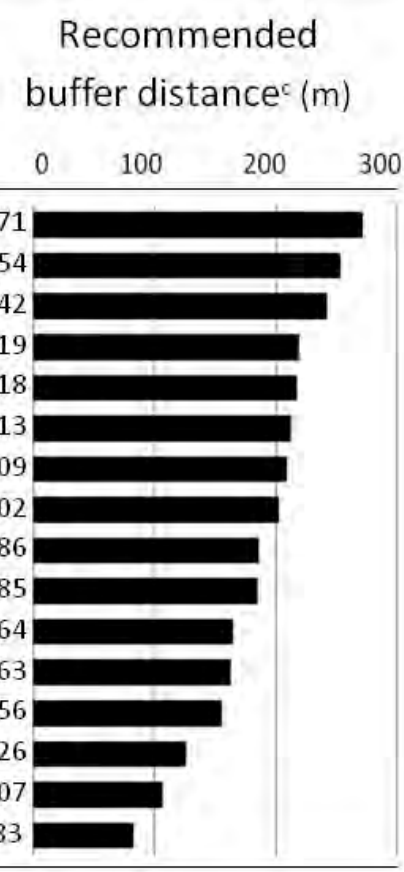
Table 1. Recommended buffer distances needed to protect non-breeding waterbirds from disturbance by an approaching kayak, based on disturbance trials (*n*) conducted in San Francisco Bay (ARA 2009).

	Trials (*n*)	Response[a] Mean ± SD	Flush distance Mean[b] (m)	Recommended buffer distance[c] (m)
Scaup species	30	4.5 ± 0.55	94	271
Surf Scoter	37	4.1 ± 0.76	61	254
Greater Scaup	31	4.6 ± 0.43	99	242
Red-breasted Merganser	13	3.3 ± 1.14	28	219
Common Loon	16	3.9 ± 0.76	51	218
Double-crested Cormorant	23	4.1 ± 0.63	61	213
Ruddy Duck	56	4.1 ± 0.62	60	209
Lesser Scaup	16	3.9 ± 0.70	51	202
Canada Goose	19	4.0 ± 0.60	54	186
Bufflehead	51	4.1 ± 0.56	58	185
Clark's Grebe	23	3.7 ± 0.67	41	164
Common Goldeneye	24	3.6 ± 0.72	37	163
Western Grebe	30	3.7 ± 0.65	40	156
Horned Grebe	37	3.2 ± 0.78	24	126
American Coot	28	3.2 ± 0.62	24	107
Mallard	19	2.9 ± 0.53	18	83



[a]Mean ± standard deviation of log-transformed flush distance (m)

[b]Back-transformed mean of (log) distance

[c]Upper 0.95 standard normal deviate of flush distances = 40 m.

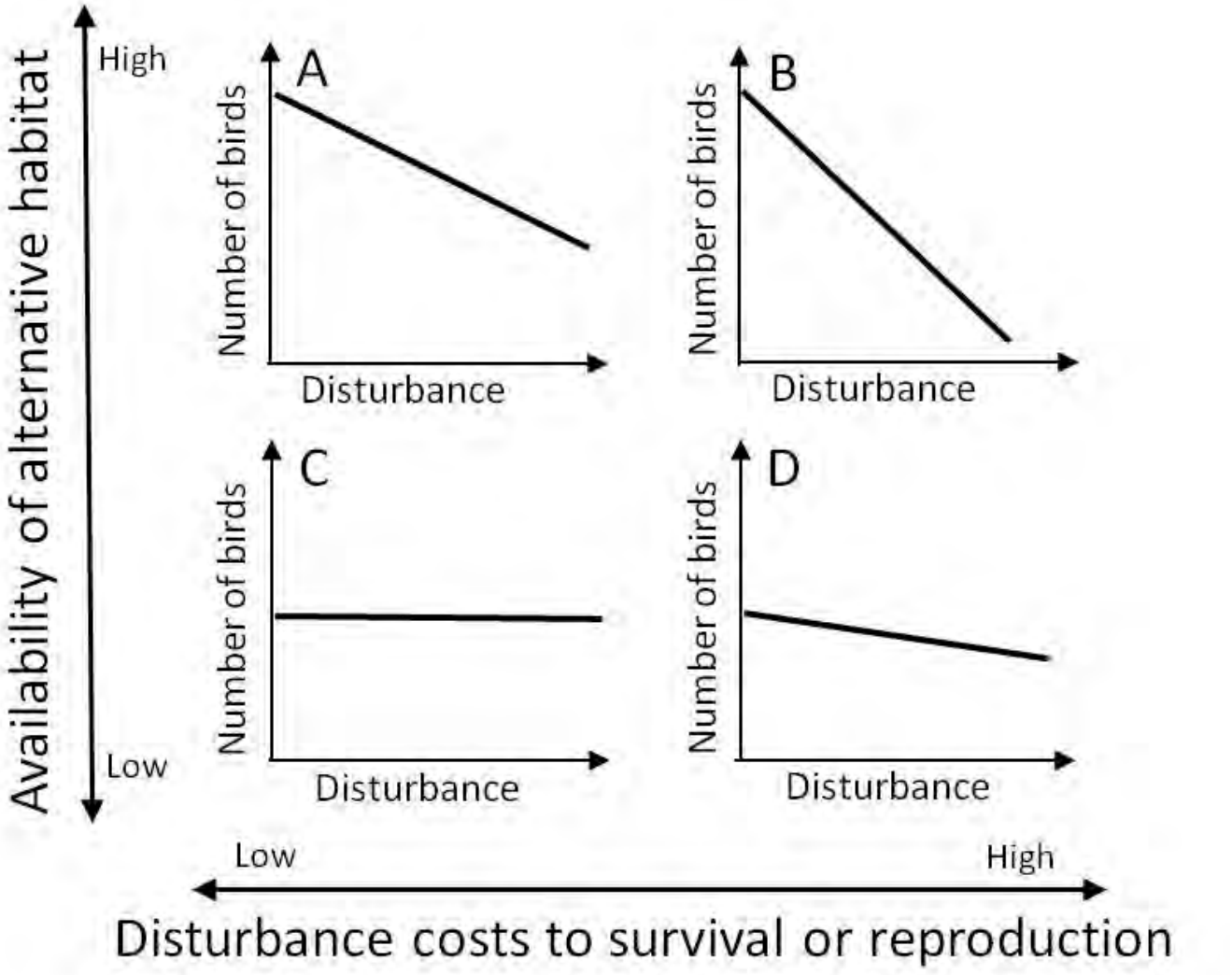


Figure 1. Four scenarios regarding disturbance effects on waterbird abundance (adapted from Gill et a. 2001). If alternative (undisturbed) feeding or roosting habitat is available (A and B), individuals move away from disturbed sites. Similarly, if the costs to survival or reproductive potential are high (B and D), birds move away from disturbed sites. If a lack of alternative habitat forces waterbirds to remain in disturbed areas (C), the number of waterbirds may remain relatively stable in spite of increasing disturbance but declining survival or reproductive potential may create an "ecological trap."

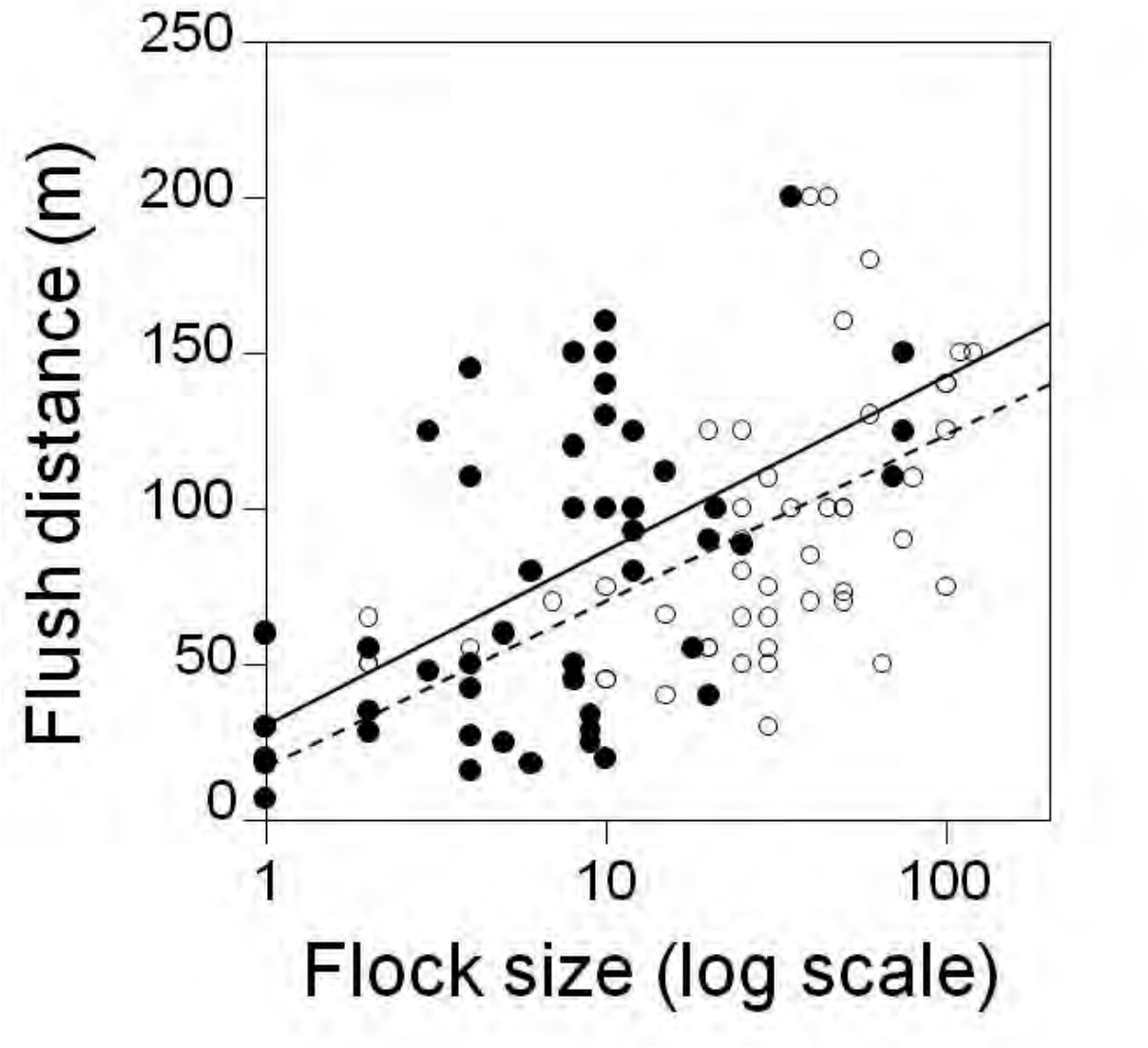


Figure 2. Waterbird disturbance trials in Berkeley's Eastshore State Park, San Francisco Bay, revealed that larger waterbird flocks flush at greater distances than smaller flocks in response to an approaching kayak (Surf Scoter: solid circles, solid line; Greater Scaup: open circles, dashed line; ARA 2009). Disturbance distances are likely to be substantially greater in locations with extensive waterbird use, such as Tomales Bay, where birds form much larger flocks and are subject to interference by motorized boats.

North Basin Waterbird Study

Eastshore State Park

Berkeley, California

2004-2007

Prepared by

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Prepared for

State of California Department of Parks and Recreation
Eastshore State Park

1 November 2007
Revised
30 September 2009

Contents

Figures and Tables

I. Introduction

In early December 2003 the California Department of Parks and Recreation (DPR) issued a Request for Proposals (RFP) for a waterbird study for Eastshore State Park stating the following Project Objectives:

- Conduct a survey of waterbird and wader use of the North Basin;
- Study the impacts that non-motorized boating activities may or may not have on waterbirds and waders in the North Basin
- Provide recommendations and management guidelines for boating activities so that waterbirds and waders are not adversely affected.

Avocet Research Associates (ARA) prepared a proposal in response to that RFP and submitted it to DPR on December 12, 2003. On January 8, 2004, DPR completed its evaluation of the proposals and informed ARA that it had been selected as the consultant for the Eastshore State Park study.

ARA submitted a "North Basin Rafting Waterbird Study Plan," as required by the RFP on February 23, 2004. Both the RFP and the study plan were circulated to interested parties and comments were submitted to DPR. These parties provided extensive comments on and criticisms of the original study plan. ARA agreed with DPR to revise the study plan in an attempt to address the various comments of the reviewers and to clarify the methods and scope of the study. This revised study plan was sent to a team of scientists with expertise in San Francisco Bay waterfowl and disturbance studies for peer review in April 2004. The Plan was finalized on June 2, 2004.

ARA began conducting observational surveys of waterbirds in the North Basin in January 2004, prior to completion of the Plan. This initiative was taken in order to capture waterbird data during the 2004 winter season and thereby complete the study in a more timely manner. These initial observational surveys were modified post-hoc (where possible). Surveys conducted in the 2004-07 period were designed to conform to the methods described in the final revised study plan. The experimental portion of the study—to determine waterbird response to disturbance—commenced in November 2004.

In this report we present the results of avian population surveys over four winter periods (October through April) and three summer periods (May through September) and the results of disturbance trials conducted during three winter periods. We evaluate

waterbird abundance and distribution with respect to season, locations within the basin (subareas), and depth classes within the basin. “Waterbirds” include species belonging to the following avian taxonomic groups: Anatidae (Ducks, geese, and swans); Gaviidae (loons); Podicipedidae (grebes); Pelecanidae (pelicans); Phalacrocoracidae (cormorants) and Rallidae (coots). “Waders” refers to the Ardeidae (herons and egrets) and shorebirds of the Order Charadriformes (plovers, oystercatchers, sandpipers). The Laridae (gulls and terns) are treated separately. For the purposes of this study, these groups were divided into categories based on feeding behaviors that defy taxonomic boundaries: divers, dabblers, waders, and larids (Appendix A).

The disturbance trials were conducted independently from the avian population surveys and are treated in a separate section of the report. However, results of the disturbance trials were used in concert with the results of the population surveys to inform management recommendations.

II. Purposes of the study.

Two basic questions were addressed in this study:

1) What species of waterbirds currently use the North Basin, in what abundances, and in what seasons?
2) How might the increased use of non-motorized watercraft affect distribution and abundance of waterbirds within the basin?

To measure waterbird use of the Basin, ARA conducted 75 observational surveys over a three-year period, capturing four winter seasons and three summer periods. Surveys were conducted at approximately two-week intervals during the period of peak bird use (August through April). Two additional surveys each winter were added opportunistically to capture anomalous weather events. During the period of minimum use (May through September), surveys were conducted once a month at minimum. Survey dates, and tidal conditions are summarized in Table 1.

Table 1. Schedule of avian abundance surveys with weather and tidal conditions.

Shaded surveys (n=51) were included in analysis of the "winter period" (season of maximum abundance). Non-shaded surveys (n=24) were classified as "summer period" and were conducted to capture wader use, migratory pulses, and breeding season use by locally nesting species. Tidal categories (high, mid, low) were classified according to tidal levels (relative to the NOAA chart datum, mean lower low water) that dominated throughout the census: high = >3.0 feet; mid = 2.0 to 4.0 feet; low = <3.0 ft. Tidal trend describes the predominate tidal dynamic during the census period: rising (rise), static (slack), or falling (fall). Wind categories are based on the Beaufort scale and cardinal direction given in degrees (°).

#	Date	Time	Tide	Trend	Wind speed	Wind dir °
1	1/22/04	9:45	high	slack	2	120
2	1/29/04	10:00	low	fall	1	170
3	2/12/04	9:50	low	fall	2	310
4	2/26/04	7:30	low	slack	6	210
5	3/11/04	9:30	low	slack	1	200
6	3/26/04	9:30	low	slack	3	300
7	4/8/04	9:18	low	slack	4	270
8	4/22/04	9:15	low	slack	5	280
9	5/9/04	9:15	low	rise	5	280
10	5/20/04	10:00	low	rise	4	270
11	6/3/04	10:10	mid	rise	4	260
12	6/15/04	11:15	high	rise	3	260
13	6/28/04	11:15	high	rise	4	280
14	7/13/04	10:10	high	rise	2	270
15	7/23/04	9:30	high	rise	4	290
16	8/5/04	9:35	low	slack	3	270
17	8/17/04	9:30	low	rise	4	270
18	9/2/04	9:15	low	slack	3	340
19	9/14/04	9:55	mid	rise	3	270
20	9/29/04	9:00	low	rise	4	280
21	10/11/04	9:30	high	rise	1	90
22	10/26/04	9:30	high	rise	4	260
23	11/9/04	9:45	high	slack	2	250
24	11/30/04	9:35	low	rise	0	0
25	12/16/04	9:35	low	slack	2	320
26	1/1/05	9:00	high	slack	3	190
27	1/19/05	9:30	high	fall	3	90
28	2/2/05	9:30	high	fall	0	0
29	2/18/05	9:40	high	fall	2	160
30	3/1/05	9:50	low	slack	3	290
31	3/15/05	9:35	low	slack	3	20
32	4/1/05	9:30	low	fall	3	300
33	4/13/05	9:45	low	slack	4	260
34	5/3/05	9:40	high	slack	4	280
35	5/16/05	9:30	high	slack	4	270
36	6/14/05	9:30	mid	fall	4	280
37	7/13/05	9:45	low	slack	4	290
38	8/18/05	9:30	mid	rise	4	310
39	9/14/05	9:35	high	rise	4	280

#	Date	Time	Tide	Trend	Wind speed	Wind dir °
40	10/4/05	9:30	mid	rise	3	320
41	10/18/05	9:30	mid	rise	2	300
42	11/3/05	9:30	high	rise	4	270
43	11/16/05	9:00	high	fall	3	80
44	12/2/05	9:30	high	fall	5	200
45	12/15/05	9:30	high	rise	0	0
46	1/3/06	9:30	high	slack	2	260
47	1/16/06	9:30	high	fall	2	300
48	2/4/06	9:45	high	slack	2	250
49	2/17/06	9:30	high	fall	3	290
50	3/3/06	9:30	low	rise	4	230
51	3/17/06	9:30	high	fall	4	170
52	3/29/06	9:30	high	fall	4	230
53	4/18/06	9:30	high	slack	4	290
54	5/5/06	9:30	high	rise	4	280
55	6/16/06	9:30	high	fall	4	270
56	7/11/06	9:30	mid	fall	3	270
57	8/10/06	9:30	mid	fall	3	320
58	10/13/06	9:30	high	rise	4	260
59	11/3/06	9:30	low	slack	2	190
60	11/14/06	9:30	low	rise	4	140
61	11/29/06	9:30	low	rise	3	310
62	12/13/06	9:30	low	rise	2	180
63	12/27/06	9:30	mid	rise	6	150
64	1/12/07	9:30	mid	fall	7	290
65	1/20/07	9:30	high	rise	0	0
66	1/30/07	9:30	high	slack	3	330
67	2/13/07	9:30	mid	fall	0	0
68	2/20/07	9:30	low	rise	1	260
69	2/27/07	9:30	high	fall	3	240
70	3/6/07	9:30	high	rise	3	280
71	3/13/07	9:30	high	fall	2	300
72	3/27/07	9:30	high	fall	4	260
73	4/10/07	9:30	mid	fall	4	280
74	4/20/07	9:30	low	rise	1	180
75	4/24/07	9:30	mid	fall	5	290

In order to quantify responses of wintering waterbirds to disturbance by non-motorized watercraft, experimental disturbance trials were conducted on six days each year during the period of peak waterbird abundance (November through February). A total of 24 trials per year (±4 per survey date) were conducted, for a total of 74 disturbance trials along 5 separate transect lines (Table 2, Figure 5). Each trial generated multiple independent events (see Methods), leading to 689 measurements of waterbird species disturbances.

From the results of these surveys we developed recommendations designed to "minimize disturbance to rafts of wintering ducks and other waterbirds in the North

Basin" and prevent "significant adverse impacts" (Eastshore State Park General Plan, pg III-76, Section c. North Basin).

Table 2. Schedule of disturbance trials conducted at North Basin, 2004-07.

Trial#	Date	start	end	T1	T2	T3	T4	T5	# events	Tide	Trend	Beaufort	Wind dir	weekend?
1	11/12/04	10:15	12:30	√		√	√	√	38	L	F	1	320	N
2	12/09/04	9:50	11:10		√	√	√	√	27	L	S	3	160	N
3	12/30/04	10:00	11:30	√	√	√			30	H	S	3	150	N
4	01/15/05	15:00	15:30					√	17	H	F	2	110	Y
5	02/12/05	10:55	13:00		√	√	√		48	H	S	0	0	Y
6	03/04/05	8:30	10:45	√	√	√		√	37	H	R	1	340	N
7	03/27/05	12:00	14:35	√	√	√	√	√	53	H	S	1	300	Y
8	10/30/05	7:10	10:13	√	√	√	√	√	46	H	R	2	290	Y
9	11/19/05	12:30	15:10	√	√	√	√	√	54	H	F	1	70	Y
10	12/09/05	9:00	11:30	√	√	√	√	√	48	H	F	2	80	N
11	01/11/06	14:12	16:20	√	√	√	√	√	44	L	S	1	140	N
12	01/25/06	11:00	13:30	√	√	√	√	√	36	M	F	0	0	N
13	02/18/06	8:15	11:30	√	√	√	√	√	34	L	R	1	30	Y
14	03/04/06	8:50	11:20	√	√	√	√	√	33	L	R	2	220	N
15	11/17/06	7:30	10:00	√	√	√	√	√	48	H	R	1	350	N
16	12/15/06	12:00	2:30	√	√	√	√	√	61	L	F	0	0	N
17	02/20/07	8:00	10:30	√	√	√	√	√	35	L	R	1	250	N
				14	15	16	14	15	689					

III. Study site

The study site included the shoreline and open water of the North Basin, a roughly rectangular embayment, on the eastern shore of central San Francisco Bay, located on the waterfront adjacent to the City of Berkeley (Figure 1). The Basin is fully tidal but somewhat buffered from prevailing winds and waves by a man-made peninsula, Caesar Chavez Park (45.8 ha), along its western boundary. The basin itself is 54 ha in aerial extent bound by a shoreline 2228 meters in length (east shore 831-m; south shore 554-m; west shore 843-m). The north boundary, the mouth of the basin (734 m), is open to the bay waters. The shoreline is highly disturbed substrate. Much of the eastern shore during this study was a parking lot, and a footpath follows the remainder of the shoreline. There is now a new sports field complex along the north portion of the eastern shore, where the parking lot once was. The western shore accommodates a rather intensive amount of recreational foot traffic, especially during fair weather and on weekends.

We expanded the study site beyond the strict boundaries to include adjacent waters that were used by the waterbirds that occurred within the basin (often drifting, swimming, or flying in-and-out the mouth) and waters that might be accessed by small watercraft entering or leaving the basin. These waters included an additional 46 hectares outside the basin (Figure 3). Therefore, the size of the entire study site was 100 ha.

Intertidal habitat is limited (<5% of area) to the southern edge of the site, concentrated mostly in the southeast corner. Subtidal habitat predominates, but the basin is relatively shallow, with depth contours ranging from 0.0 to 1.5 meters below mean lower low water. Depths greater than 1.5 meters extend into the north boundary and predominate in the adjacent waters (Figure 1).

Figure 1. North Basin study site with depth contours overlain at 0.5 meter intervals [NGVD 29 @ 0.0']. The red line (separating water depth zones 2 and 3) delineates the 1-m depth contour.

IV. Methods

IVa. Waterbird counts

Protocols and Methods.

Bird censuses (absolute counts) were conducted from six fixed points evenly distributed around the perimeter of the basin (Figure 2).

Figure 2. North Basin study site with distribution of observation points used during avian population surveys. UTM coordinate [NAD83 Zone 10S] for each point, as follows:

#1. 0560488/4192832
#2. 0560709/4192342
#3. 0560891/4191668
#4. 0560288/4191690
#5. 0560038/4192093
#6. 0559531/4192156

We partitioned the study area into five subareas, to facilitate coverage and to identify areas of relative use by waterbirds (Figure 3).

Figure 3. Survey plots within the North Basin Study Area. The study area encompassed 100 hecatares. The size of each plot was as follows: A (46.0 ha); B (17.4 ha); C (11.7 ha); D (10.7 ha); E (14.2 ha).

Each avian population survey was conducted in the morning and spanned approximately three hours. In the study plan we had anticipated initiating surveys on high (flood) tide and continuing through the falling tide to capture low tide conditions. We modified the protocol for two reasons: (1) after several trial surveys (1/20/04 and 1/22/04) it became apparent that the entire site was subtidal and numbers of open-water birds seemed not to vary noticeably between high- and low-tide phases; and, (2) constraints imposed by such tidal conditions would have limited the number of potential survey days and prevented thorough coverage of variation in waterbird abundances. Therefore, we modified protocols to capture both high- and low-tide conditions within a seasonal period (Table 1).

Tide heights were determined from the nearest NOAA correction location at Alameda and a designated minimum time period of 0.5 hrs between counts. Each count was assumed to be independent in the analysis.

Overall, high tides dominated on nearly half the surveys (47.4%) and low tides dominated on approximately one-third (35.5%); mid-range tides were less frequent (17.1%). These proportions were roughly equivalent during winter and summer census periods. Regarding tidal trend, rising tides predominated (40.8%), whereas falling tides (30.2%) and slack tides (28.9%) were roughly equivalent. Considering the winter period only, the tidal trends were fairly evenly divided between falling (38.5%), slack (32,7%) and rising (28.9%).

On each survey, birds present were identified to species. The total number of individuals using the site during each census period was tallied and assigned to a subarea (Figure 3). Beginning in December of 2005, each individual or flock was assigned to a band-width based on its distance from shore (0-100 m, 200-300 m, 300-400 m, and >400 m). *Post hoc*, each individual or flock was assigned to one of four mean tide depth contour intervals of the study area (Figure 2). These were then pooled into two depth classes (<1-m or >1-m) during data analysis: (1) shallow (<1-m), and (2) deep (>1-m). The subarea boundaries were considered fixed boundaries regardless of tide height (Figure 3).

The sample unit of measurement consisted of total number of birds (abundance) by species in each depth section of the Basin per survey. One or two ARA biologists counted the number of birds present on each census ("absolute counts") using 20x (or higher) power telescopes. Observer(s) used field judgment to avoid multiple counting within or among subareas, i.e., movement of flocks or individuals was noted and accounted for in the final tally for that time period. The manageable bird numbers at the site combined with the site's small size and well-defined boundaries allowed constant observation, even when moving between observation points. Birds were assigned to the section in which they were first observed on a given census. Parenthetical notes indicated when a flock was detected in an additional section and these numbers were not included in the census totals. A recorder accompanied the observer to transcribe the data to a data sheet. Data was electronically archived and is stored with ARA and California State Parks.

To avoid over- or under-counting, the field observer(s) made a rough estimate of the total numbers of birds on the lagoon at the beginning and end of each census.

Discrepancies between overall estimates and recorded numbers were adjusted in the field based on recounts of common species and on the observer's best judgment.

Movements of individuals or flocks in-and-out of the basin were noted and reconciled with overall numbers by the observer in the field. The cause of the movement, if known, was recorded. Each census measured the peak number of individuals of each species and relied on peak counts during the census period.

Analysis of Waterbird Count Data

We analyzed differences in species abundances using a mixed-model analysis of variance, with Year as a random effect and Subarea and Water Depth zones (Figures 1 & 3) as fixed effects. Prior to analysis, we natural-log-transformed the abundance data to improve the normality of residuals and stabilize group variances. The results for uncommon species that did not meet the assumptions of parametric (ANOVA) tests are reported with summary statistics. To facilitate comparisons among count areas and water depth zones that differed in areal extent, and to compare the results with values from other Bay Area locations, we converted bird abundances to densities (birds per 100 ha) prior to analysis of each species (or pooled species group) and weighted the density for each water depth within each count area by its areal extent. Significant main effects of count area or water depth on species densities were followed by pairwise multiple comparisons based on an experimentwise error rate of $P < 0.05$.

Disturbance trials

Protocols and Methods.

The waterfowl disturbance experiments described by Rodgers and Smith (1997) and Rodgers and Schwikert (2003) provided a template for the design of this portion of the study. The methodology was modified, however, to accommodate non-motorized watercraft and the smaller size of the study site. Kayaks were used exclusively during the disturbance trials and are considered surrogates for other watercraft types (canoes, sailboards, etc.).

Human disturbance to waterbirds has been documented and quantified in a number of studies (Burger 1981, Dahlgren and Korschgen 1992, Davidson and Rothwell 1993, Kahl 1991, Klein 1993, Masden 1994, Rodgers and Schwikert 2003). In this study, ARA biologists used an experimental approach to answer the question: To what extent

do non-motorized watercraft affect distribution, abundance, and behavior (decision to flush) of waterbirds within the basin?

On six occasions each year within the November-March time period of peak waterbird use we initiated disturbance events with kayaks. (Birds are more sedentary and site tenacious in mid-winter than during migratory periods.) On each occasion we initiated four independent disturbance trials building a sample size of 74 trials over three winter periods. Each set of experimental trials was spaced at 2-week minimum intervals to avoid the problem of habituation in responses of birds to the disturbance stimulus. We judged that the site was large enough and experimental treatments mild enough to allow a planned disturbance event in one quadrant of the site without disturbing birds in other quadrants. To ensure independence, each trial on a given date targeted different individuals or flocks. Trials conducted on a given date were separated by at least 30-minutes and by 400-m and were conducted in a different subarea of the site (Table 2). We attempted to sample species responses evenly across transects, 1 *versus* 2 kayaks, weekday *versus.* weekend. Each trial included multiple disturbance events. We assumed each of these events to be an independent response to disturbance because each trial was separated from another in distance (>100 meters) and time (0.5 hrs), different individuals and flocks were targeted, and flushed flocks usually moved out of the subarea in which the disturbance occurred.

Birds were approached by kayak when foraging or loafing. We intended to record the initial alert response (e.g. head alert) to a watercraft approach when possible, but this proved impossible given the background level of disturbance (traffic noise, runners and walkers along the shoreline, etc.). Therefore, flush distance was used as the primary measure of disturbance. Flush distance was defined as the distance from the kayak(s) at the moment a bird begins swimming, diving, or flying away from the approaching watercraft. The distance was measured to the first (closest) bird in the group that flushed. Kayaks ceased paddling immediately when the first bird(s) began to flush and waited for several minutes before continuing to progress along the transect path.

A laser digital range finder (Bushnell Yardage Pro with calibrated accuracy of ±1-m from 10 to 500-m) was used to measure distance at which the first flush response was observed. When conditions precluded use of a rangefinder (e.g rain), the observer simply estimated the distance to the nearest meter.

The observer approached the target bird or flock from a distance of at least 200-meters, in a direct (>30°) path, using a steady stroke and moderate speed typical of a

touring kayak. At the moment the bird(s) began to move from the foraging or loafing location a straight-line distance was measured or estimated. For each trial we recorded:

- First flush distance and flush species;
- Group size (all species);
- Proportion of individuals in group, by species;
- Proportion of individuals of each species that flushed.

An effort to measure differential disturbance responses of waterbirds to sailing craft that had been contemplated in the study plan was completed as part of this study.

Analysis of Disturbance Trials

We conducted 74 disturbance trials, with a combined total of 689 disturbance events, following transect routes through the North Basin (see Figure 5) with varying species composition among trials. We analyzed the responses of each species for which we obtained at least 10 disturbance-distance observations.

To ensure independence among waterbird species responses, disturbance trials were conducted at least 30 min apart. As observers approached waterbirds by kayak, species response distances were measured when the first individual of each species responded, either by swimming away, diving, or taking flight.

We examined the scatter plots of flock size vs. response distances for evidence of outliers or nonlinear patterns that might confound estimates of recommended distances for particular flock sizes.

We used analysis of variance (ANOVA) to examine possible differences in species disturbance responses between number of kayaks (1 vs. 2 or 3; three kayaks were used on only one of 16 trial days), tide level (high, medium, low), year (winters of 2003-2004, 2004-2005, 2005-2006, 2006-2007), weekday vs. weekend, and transect area (shoreline: Transects 1 and 2; mid-basin: Transects 3 and 4; outer-basin: Transect 5; Figure 5). Disturbance trials were scheduled to sample as evenly as possible among these categories. Although the number of samples for each species varied among categories, linear analyses can easily handle the unbalanced data among groups if the assumptions of ANOVA are satisfied (Quinn and Keough 2003). We used the Shapiro-Wilk test statistic to determine if disturbance responses were normally distributed for each species. Natural-log transformations [$y = \ln(x)$] successfully normalized the data for all species analyzed. We examined plots of residuals against predicted values and

used Levene's Test to test for equality among group variances. Results suggested that the ln-transformed data satisfied the assumption of homogeneity of variances. No significant differences were found in species responses related to the main effects of year, tide level, transect area, weekday vs. weekend, or number of kayaks ($P > 0.05$). We did not examine the possibility of influences related to interactions among these effects. Therefore, we pooled the data for each species across these categories.

Intraseasonal declines in disturbance response would suggest habituation to human activity, whereas intraseasonal increase would suggest increasing sensitivity through the winter. Therefore, we included Intraseasonal timing (number of days since 30 October within each winter season) and species flock size (number of conspecific individuals in each flock) as covariates in determining patterns of variation of disturbance responses and in estimating recommended distances to avoid disturbance to waterbirds. However, we found no evidence among the species analyzed for habituation based on the intraseasonal timing of disturbance trials (linear regressions, $P > 0.05$).

Other investigators have determined that disturbance distances of waterbirds are likely to be influenced by the presence of individuals of other species (Thompson and Thompson 1985; see citation in Rodgers and Smith 1997). Although response distances of multiple species were recorded during each trial, we considered each trial-x-species response to be independent,. The disturbance sensitivity (response distances) of five species increased significantly with the size of species groups (Table 11; significant linear regressions, $P < 0.05$). Although the overall size of mixed species flocks is likely to increase waterbird sensitivity (response distance) to disturbance, species flock size and mixed-species abundance were significantly correlated ($r = 0.36$ over all species combined, $n = 432$, $P < 0.001$) and, after accounting for flock size, the residual effects of mixed-species abundance were no longer significant ($P > 0.05$) in all species except Bufflehead and Clark's Grebe. Therefore, we adjusted the predicted response distances for species flock size but not for mixed species abundance. In addition, the influence of overall waterbird abundance seemed less likely to influence species responses because single-species groups were often encountered sequentially as the kayak(s) traveled along the transect, rather than simultaneously during each trial. Whenever flock size significantly affected response distances, we reported the recommended distance to avoid disturbance of single individuals and also the maximum flock size observed during the disturbance trials (Table 11).

The recommended distances to avoid disturbing waterbirds follow the model presented by Rodgers and Smith (1997). This method uses the mean and standard deviation of sampled responses for each species to calculate the upper 95 quantile of the standard normal deviate of disturbance distances, to provide a conservative and reasonable margin in predicting distance that are sufficiently unlikely to result in disturbance to resting or feeding waterbirds (Rodgers and Smith 1997). The addition of 40-m to the calculation of buffer distances is "a conservative strategy to minimize agnostic responses by birds prior to their flushing and to take into consideration the possibility that mixed species assembleges (Thompson and Thompson 1985, Gutzwiller *et al*. 1998) are more vigilant and sensitive than single-species groups or individuals" (Rodgers and Schwikert 2003).

Recommended distance = $\exp(\hat{\mu} + z_{0.95} * \hat{\sigma}) + 40$ m ,

where $\hat{\mu}$ and $\hat{\sigma}$ are the sample mean and standard deviation of ln-transformed response distances [$y_i = \ln(x_i)$] and $z_{0.95}$ is the upper 0.95 quantile of the standard normal variable ($z_{0.95} = 1.6495$). The addition of 40 m to the recommended distance provides a buffer that allows for:

(1) unmeasured increases in the sensitivity (response distances) of birds responses associating in mixed-species flocks (Thompson and Thompson 1985);

(2) undetected physiological responses, alert behaviors, or foraging interruptions in bird response prior to flushing (swimming, diving, or flying);

(3) potentially reduced stimulus related to the low-profile of kayaks; and,

(4) responses to larger groups of kayaks or other non-motorized watercraft.

V. Avian Surveys: Results and discussion

On 75 avian surveys we recorded 70,778 individual waterbirds (96.1 percent during the winter period, 3.8 percent in the summer period). The total number of waterbirds in the winter period averaged 1388 birds per count [SE = 184.5; min-max = 124-5488] and in the summer period, 113 birds per count [SE = 24.4; min-max = 16-607]. The occasional absence of common species or species groups may have been the result of disturbance events in which birds were flushed from the site (e.g. low-flying plane) prior to an individual survey. Excluding zero counts of important species (e.g. scaup), mean waterbird density during winter was 1920.9 birds/km^2 [SE = 161.5; min-max = 142-5424] and during summer 184.6 bird/km^2 [SE = 57.7; min-max = 121.0-

299.8]. Including all surveys, mean winter density of all subareas combined was 1071.3 birds/ km^2 [se 165.5; range 742 to 1691]. Overall, we observed 83 species of waterbirds during our avian surveys of North Basin (Appendix A); 81 species occurred during the winter period and 63 occurred during the summer period.

Seasonal Use

In a two-year baywide study, Accurso (1992) reported peak numbers of wintering waterfowl in early December and mid-January with diving ducks accounting for >92% of the Central Bay's waterfowl throughout winter. Bollman *et al*. (1970), surveying selected sites, reported peak waterfowl numbers in early and mid-December. Annual mid-winter surveys by USFWS are normally conducted in early January, and may not sample the peak. The seasonal occurrence of diving ducks in the North Basin (Figure 4) was typical of seasonal abundance patterns in San Francisco Bay. Graphs depicting seasonal abundance of each the four most abundant rafting waterbird species are given in Appendix B.

As in the greater San Francisco Bay (see Takekawa *et al*. 2000), the winter period at North Basin supported the highest abundance of waterbirds and species that raft on open water. Winter percentages by species group were 35% diving birds; 31.3% shorebirds;15% "dabblers" (surface feeding waterfowl); 13% larids (gulls and terns); and 5% ardeids (herons and egrets). Diving ducks tend to arrive *en masse* in mid-October to early November, with some variation among years, a mid-winter peak in numbers, and fairly rapid decline during spring. By mid-April abundances are relatively low. This seasonal use pattern is well represented by four of the most abundant waterfowl species at North Basin, all diving ducks (see Figure 4 and Appendix B).

Summer numbers, though substantially lower than winter numbers, captured more waders as a percentage of the avian community: waders (36.5%); divers (31.8%); dabblers (13%); larids (14.3%), and ardeids (5%). This was expected since wader occurrence peaked during fall and spring migratory pulses, as it does at other San Francisco Bay (SFB) sites (Takekawa *et al*. 2000, Stenzel *et al*. 2002).

Scaup serve as an emblematic species, not only because they are one of the most abundant waterbird species at North Basin (this study) and throughout SFB (Accurso 1992), but because they were among the first to arrive in the fall and the last to depart in the spring, a pattern noted in other studies (Denson and Bently 1962, Accurso 1992). Scaup were also the most sensitive species to kayak disturbance with the largest

mean flush distance (Table 11) and therefore they should be used to implement buffer zones for mixed-species sites (Rodgers and Schwikert 2003).

Interannual variation in arrival and departure dates of waterfowl varies as the result of either local conditions or those distant from the Bay Area. Accurso (1992) surveyed the entire bay from October through April and reported peak numbers for some species as early as October 3-4 and as late as March 20-21.

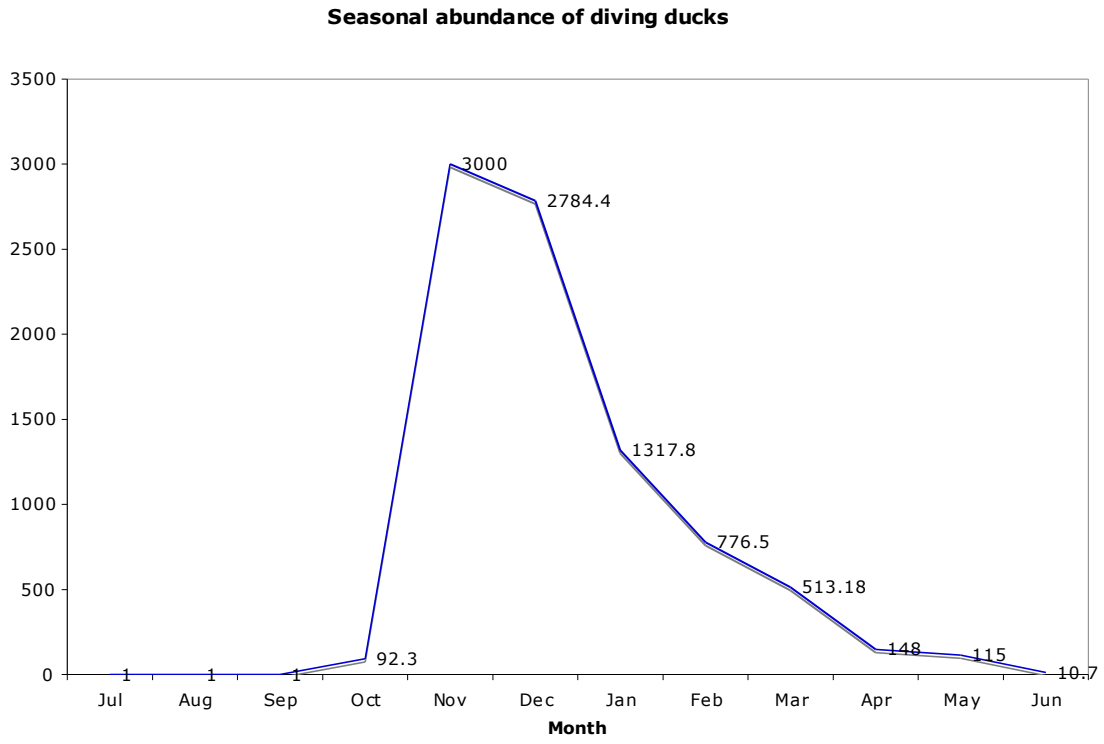

Figure. 4. Seasonal mean abundance of the four most common species that comprised 90 percent of all waterbirds counted in all winter period surveys, 2004-07 [Ruddy Duck 47.3%; two scaup species 36.3%; Bufflehead 6.4%].

Summer Bird Use

For the 15 most abundant species overall (which accounted for >98 % of birds counted), summer use was approximately 10 percent of the winter use for both waterbirds and shorebirds. Non-migratory (locally breeding) species Double-crested Cormorant and Canada Goose) showed the highest summer values relative to winter numbers: Shorebird densities were derived only from counts on which birds were present, i.e., zero counts were omitted, due to the paucity of available intertidal habitat and the consequent sporadic occurrence (Give percentages of counts on which

shorebirds were present) of shorebirds. Summer bird abundance for all waterbirds detected in the North Basin over three seasons (2004-2006) ranked by mean abundance values, is given in Appendix C.

Table 3. Comparison of winter and summer mean abundance values of the most common waterbirds at North Basin. (Unidentified scaup were apportioned to species based on percentages of identified birds.)

Species	winter mean	summer mean	summer/winter ratio
Waterbirds (total)	948.9	92.2	0.10
Ruddy Duck	445.5	34.5	0.08
Greater Scaup	292.6	22.6	0.08
Bufflehead	60.7	7.2	0.11
Lesser Scaup	55.2	2.1	0.04
Surf Scoter	27.5	3.5	0.13
Clark's Grebe	15.1	2.3	0.15
Horned Grebe	11.9	2.0	0.17
Western Grebe	11.2	1.5	0.13
American Coot	10.8	1.8	0.07
Common Goldeneye	9.78	4.4	0.35
Double-crest. Cormorant	7.6	7.5	0.99
Canada Goose	1.0	2.8	0.45
Shorebirds (total)*	135.0	14.8	0.11
Western Sandpiper*	62.3	3.5	0.06
Least Sandpiper*	48.3	4.2	0.09
Willet*	24.4	7.1	0.29

** shorebird values omit zero counts*

Species richness was also related to season. Overall, summer surveys detected 63 species on site; winter surveys detected 81 species. Species occurring during the winter period but not during summer are given in Table 4, below.

Table 4. Waterbird species detected during winter period, but not during summer period.

American Avocet	Gr. White-fronted Goose	Red-breasted Merganser
Black-necked Stilt	Herring Gull	Redhead
Blue-winged Teal	Lesser Yellowlegs*	Ring-necked Duck
Canvasback	Mew Gull	Red-throated Loon
Common Merganser	Northern Pintail	Ruddy Turnstone
Great Blue Heron	Northern Shoveler	Surf Scoter

*late migrant; not a winter species

Only two species were detected in summer, but not winter: Heermann's Gull and Baird's Sandpiper.

Winter Use: Abundance and Density

Mean winter abundances of all waterbirds on all winter surveys, by year, ranked by relative abundance are given in Table 5. Mean densities of each species by subarea are given in Table 6. Species codes are provided in Appendix A. Because the size of the census area was 100 hectares (1-km^2), overall mean abundance values are equivalent to overall mean densities (birds/ km^2).

Accurso (1992) reported scaup as the most abundant species in SFB accounting for 43-47 percent of the bay's waterfowl. In North Basin, the Ruddy Duck were more abundant than scaup (Table 5), possibly reflecting the relative shallowness of the site and the protection from open bay waters it affords.

Table 5. Winter waterbirds at North Basin, 2004-07, ranked by abundance.

Code	Species	Mean	SE	Median	Min	Max
RUDU[1,2]	Ruddy Duck	445.45	79.25	267.00	0	2326.0
Scaup[1,2]	Scaup species	342.00	46.40	219.00	0	1641.0
GRSC[1,2]	Greater Scaup	292.58	42.79	198.64	0	1577.0
BUFF[1,2]	Bufflehead	60.65	8.61	43.00	0	294.0
LESC[1,2]	Lesser Scaup	33.08	10.25	13.00	0	471.0
SUSC[1,2]	Surf Scoter	27.45	6.70	14.00	0	327.0
CLGR[2]	Clarks Grebe	15.44	1.97	13.00	2	82.0
HOGR[2]	Horned Grebe	11.90	1.11	11.00	0	40.0
WEGR[2]	Western Grebe	11.22	1.90	8.00	0	84.0
AMCO[2]	American Coot	10.78	1.60	10.00	0	47.0
COGO[1,2]	Common Goldeneye	9.78	3.14	5.00	0	158.0
DCCO[2]	Double-crested Cormorant	7.63	3.51	3.00	0	177.0
AMWI[3,4]	American Wigeon	1.29	0.58	0.00	0	26.0
EAGR[2]	Eared Grebe	1.14	0.31	0.00	0	12.0
ACGO[3]	"Aleutian" Cackling Goose	1.04	1.04	0.00	0	53.0
CAGO[3]	Canada Goose	1.04	1.04	0.00	0	53.0
CANV[1,2]	Canvasback	0.76	0.67	0.00	0	34.0
PECO[2]	Pelagic Cormorant	0.47	0.10	0.00	0	2.0
COLO[2]	Common Loon	0.45	0.11	0.00	0	3.0
PBGR[2]	Pied-billed Grebe	0.45	0.13	0.00	0	5.0
GWTE[3,4]	Green-winged Teal	0.43	0.30	0.00	0	12.0
RNDU[3,4]	Ring-neck Duck	0.41	0.39	0.00	0	20.0
GADW[3,4]	Gadwall	0.39	0.16	0.00	0	6.0
NOSH[3,4]	Northern Shoveler	0.35	0.35	0.00	0	18.0
BAGO[1,2]	Barrow's Goldeneye	0.27	0.09	0.00	0	2.0
CITE[3,4]	Cinnamon Teal	0.27	0.15	0.00	0	5.0
AWPE[3]	American White Pelican	0.22	0.22	0.00	0	11.0
NOPI[3]	Northern Pintail	0.14	0.14	0.00	0	7.0
RBME[1,2]	Red-breasted Merganser	0.12	0.05	0.00	0	1.0
RTLO[2]	Red-throated Loon	0.06	0.03	0.00	0	1.0
BWTE[3,4]	Blue-winged Teal	0.04	0.04	0.00	0	2.0
COME[2]	Common Merganser	0.02	0.02	0.00	0	1.0
COMU[2]	Common Murre	0.02	0.02	0.00	0	1.0
LTDU[1,2]	Long-tailed Duck	0.02	0.02	0.00	0	1.0
REDH[1,2]	Redhead	0.02	0.02	0.00	0	1.0
ROGO[3]	Ross's Goose	0.02	0.02	0.00	0	1.0
WWSC[1,2å]	White-winged Scoter	0.02	0.02	0.00	0	1.0
	All waterbird species	954.083	124.452	735.00	100	3545.0
	Diving ducks[1]	886.58	124.35	679.00	56	3488.0
	Diving birds[2]	949.04	123.90	733.83	99	3526.0
	Surface-feeding species [3]	4.20	2.17	0.00	0	105.0
	Dabbling ducks[4]	2.92	1.25	0.00	0	51.0

[1] Diving ducks: CANV, REDH, LESC, GRSC, BUFF, LTDU, BAGO, COGO, SUSC, WWSC, COME, RBME, RUDU

[2] Diving birds: Diving ducks + AMCO, CLGR, WEGR, COLO, RTLO, HOGR, EAGR, PBGR, DCCO, PECO, COMU

[3] Surface feeders: Dabbling ducks + AWPE, ACGO, CAGO, ROGO

[4] Dabbling ducks: GADW, GWTE, AMWI, NOPI, NOSH, BWTE, CITE.

Table 6. Mean densities (standard errors) of winter waterbirds in the North Basin, 2003-4 through 2006-7. See Figure 3 for subarea locations and Table 5 for species codes.

Bird density (birds / 100 ha.)

Species	Area A	SE	Area B	SE	Area C	SE	Area D	SE	Area E	SE
AMCO	3.794	(1.360)	33.807	(7.740)	20.278	(5.495)	2.199	(1.216)	3.866	(1.767)
AMPE	0.469	(0.469)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
AMWI	0.554	(0.512)	1.578	(0.967)	6.536	(4.417)	0.000	(0.000)	0.000	(0.000)
BAGO	0.128	(0.095)	0.451	(0.316)	0.335	(0.335)	0.733	(0.441)	0.138	(0.138)
BUFF	62.916	(14.458)	43.611	(8.704)	57.818	(9.663)	95.290	(18.209)	50.400	(14.342)
BWTE	0.000	(0.000)	0.000	(0.000)	0.335	(0.335)	0.000	(0.000)	0.000	(0.000)
CAGO	1.961	(1.961)	0.000	(0.000)	1.173	(1.173)	0.000	(0.000)	0.000	(0.000)
ACGO	3.794	(1.360)	33.807	(7.740)	20.278	(5.495)	2.199	(1.216)	3.866	(1.767)
CANV	1.066	(1.023)	0.225	(0.225)	1.341	(1.341)	0.733	(0.576)	0.000	(0.000)
CITE	0.085	(0.085)	0.000	(0.000)	1.676	(1.173)	0.367	(0.367)	0.000	(0.000)
CLGR	19.922	(3.993)	7.971	(1.880)	5.195	(1.458)	15.576	(3.276)	18.442	(3.195)
COGO	10.614	(1.566)	2.705	(1.072)	4.022	(1.382)	4.765	(1.489)	24.303	(20.041)
COLO	0.725	(0.199)	0.113	(0.113)	0.000	(0.000)	0.367	(0.257)	0.414	(0.234)
COME	0.000	(0.000)	0.000	(0.000)	0.168	(0.168)	0.000	(0.000)	0.000	(0.000)
COMU	0.043	(0.043)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
DCCO	4.092	(0.958)	2.705	(1.035)	30.334	(27.617)	11.545	(4.837)	3.452	(1.253)
EAGR	0.853	(0.286)	1.352	(0.635)	1.508	(0.572)	1.649	(0.815)	1.105	(0.536)
GADW	0.128	(0.095)	0.000	(0.000)	2.514	(1.317)	0.367	(0.367)	0.000	(0.000)
GRSC	264.659	(49.746)	212.869	(54.679)	321.930	(123.98)	383.544	(153.993)	387.965	(103.045)
GWTE	0.938	(0.659)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
HOGR	9.548	(1.157)	8.677	(1.397)	14.245	(2.529)	25.289	(5.144)	11.461	(1.719)
LESC	45.473	(18.639)	29.750	(9.858)	40.864	(9.446)	17.592	(6.312)	2.255	(1.295)
LTDU	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.138	(0.138)
NOPI	0.298	(0.298)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
NOSH	0.682	(0.682)	0.225	(0.225)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
PBGB	0.341	(0.127)	0.225	(0.158)	0.838	(0.359)	0.367	(0.257)	0.829	(0.701)
PECO	0.895	(0.221)	0.000	(0.000)	0.000	(0.000)	0.550	(0.311)	0.000	(0.000)
RBME	0.128	(0.072)	0.000	(0.000)	0.000	(0.000)	0.183	(0.183)	0.276	(0.193)
REDH	0.000	(0.000)	0.000	(0.000)	0.168	(0.168)	0.000	(0.000)	0.000	(0.000)
RTLO	0.128	(0.072)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)

Bird density (birds / 100 ha.)

Species	Area A	SE	Area B	SE	Area C	SE	Area D	SE	Area E	SE
RNDU	0.810	(0.768)	0.225	(0.225)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
ROGO	0.043	(0.043)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
RUDU	264.194	(93.965)	604.237	(211.224)	514.832	(121.231)	1082.646	(235.265)	300.746	(168.253)
SUSC	30.520	(4.759)	44.512	(34.925)	11.061	(3.258)	19.058	(5.656)	16.432	(5.011)
WEGR	12.126	(2.569)	3.634	(1.253)	4.357	(1.132)	14.477	(3.885)	20.768	(10.118)
WWSC	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)	0.138	(0.138)
SCAUP	322.195	(56.649)	249.268	(61.303)	404.524	(127.598)	421.294	(155.051)	405.686	(107.030)
Dabbling ducks	2.685	(2.139)	1.803	(0.985)	11.061	(6.160)	0.733	(0.513)	0.000	(0.000)
Divering ducks	692.570	(155.629)	945.233	(247.068)	994.267	(173.981)	1624.702	(317.838)	798.257	(260.129)
Surface-feeers.	5.158	(4.128)	1.803	(0.985)	12.234	(6.229)	0.733	(0.513)	0.000	(0.000)
Diving birds	749.384	(155.644)	1005.633	(247.860)	1071.023	(175.592)	1696.170	(318.338)	863.012	(262.100)
All waterbird species	756.246	(154.844)	1007.436	(247.878)	1083.253	(175.257)	1697.453	(318.258)	863.012	(262.100)

Mean winter density of Ruddy Duck [445.5 birds/100 ha] at North Basin was near the high end of the range reported at other studies. Accurso reported 148 birds/100 ha on open water; Swarth *et al*. (1982) found 550 birds/100 ha on low salinity salt ponds in the South Bay. The disparity in the reported densities among habitats suggests that Ruddy Ducks concentrate in relatively confined and shallow bodies of water like North Basin.

Mean winter scaup density [341.6 bird/100 ha] for the site was lower than reported by Accurso [597-603 birds/100 ha], but within the range found elsewhere in the Central Bay (Avocet 2002; Table 9). Scaup tend to use larger bodies of deep water, but concentrate in protected embayments to loaf when conditions are not ideal for foraging. Accurso's study identifies the Central Bay as supporting 20% of the waterfowl in the SFB system and as an especially important subregion for scoter, scaup, and bufflehead. During mid-winter surveys in 1989, SFB scaup accounted for 56-92 percent of the population on the Pacific flyway (Accurso 1992).

Bufflehead occurred in higher overall densities (mean = 60.6 birds/100 ha) than reported in Accorso's study (37.8 birds/100 ha), but within the range reported by Shuford et al. (1989) for Point Reyes (25.7-102.4 birds/100 ha) and in lower densities than reported by Kelly and Tappen (1998; 97-405 birds/100 ha) on the outer coast.

Table 7. Comparison of overall waterbird densities at different SFB sites.

Area name	Area size (ha)	D (birds/km^2)	Months/Years	Source
South Bay-East[1]	132.5	1302.5	Nov 2000-Feb 2001	Ford *et al.* 2001
Tomales Bay	28.5	516-1091	Winter 1989-96	Kelly & Tappen 1998
North Basin	**100.00**	**954**	**Oct-Apr (4 yrs)**	**This study**
W. Central SFB (SFO)	14.6	450.7	Winter 2000/01	Avocet 2000
SFB total	1016.9	421.6	Winter 1998/89	Accurso 1992
North SFB baylands	858.3	320	Winter	Takekawa *et al*. 2001*
South SFB open water	194.7	260-290	Winter 1998/89	Accurso 1992
Central SFB open water[2]	214.5	179-246	Winter 1998/89	Accurso 1992
SFB total	1016.9	210.9	Jan. 9. 2002	USFWS 2002*
South SFB open water	194,7	203.3	Jan. 9. 2002	USFWS 2002*
Central SFB open water[2]	214.5	118.5	Jan. 9. 2002	USFWS 2002*

[1] South Bay-East included the eastern half of SFB between the San Mateo Bridge and the Oakland Bay Bridge.
[2] Areal values for SFB and subareas were calculated from Goals Report (1999), Appendix B—"Past and Present Acreage" using values for "bays."
* Sources followed by asterisks are based on aerial surveys which include a low bias, especially for smaller species such as Bufflehead and Ruddy Duck (Kelly & Tappen 1998).

Overall densities of waterbirds at North Basin compared with densities available from other sites, albeit over a wide disparity of years, show North Basin supporting relatively high concentrations of waterbirds in winter (Table 7). This is explained by high concentrations of Ruddy Duck, two scaup species, and Bufflehead.

The North Basin provides waterbird habitat relatively protected from wind and storm surges and adjacent to the open waters of the Central Bay. Numbers of waterbirds peak in winter and may reach very high densities sporadically, during extreme weather or migratory staging. Highest concentrations of each species are provided below (Table 8).

Table 8. Most common open-water birds at the North Basin study site (100 ha) with peak count densities (birds/ km^2), dates, and coefficient of variation (CV of densities). These 12 species comprised 98.7% of all wintering waterbirds.

Species	peak density	peak date	CV
Ruddy Duck	2326	11/30/04	0.25
Greater Scaup	1577	11/29/06	0.57
Lesser Scaup	471	12/13/06	0.71
Surf Scoter	327	12/15/04	0.30
Bufflehead	294	11/30/04	0.19
Double-crested Cormorant	177	2/18/05	0.35
Common goldeneye	158	2/4/06	0.30
Western Grebe	84	3/26/04	0.50
Clark's Grebe	82	4/22/04	0.39
Canada Goose*	53	1/3/06	0.28
American Coot	47	3/3/06	0.22
Horned Grebe	40	1/3/06	0.19

*Includes Cackling Goose

Table 9. Mean densities (se) of the five most common waterbird taxa at North Basin compared with other sites in the Greater San Francisco Bay Area and Humboldt Bay. Values in bold are calculated from means of multiple year surveys. Values from other studies are based on single surveys or peak numbers reported in a single year. Fractional values are rounded off except for values <10 birds/km^2.

Species	Area	D (birds/km^2)	Years of study	Source
Scaup spp.	North Basin	**342**	2004-07	This study
	North SFB	597-603	1988-89	Accurso 1998
	W. Central Bay (SFO)	**302**	2000-01	Avocet 2002
	S. Humboldt Bay	257	1987-88	Nelson 1989
	Point Reyes	**26-102**	1967-82	Shuford et al. 1989
	Tomales Bay	**109**	1989-96	Kelly & Tappen 1998
Ruddy Duck	North Basin	**446**	2004-07	This study
	S. SFB salt ponds	550	1982	Swarth et al. 1982.
	S. SFB salt ponds	148	1989	Accurso 1992
	Point Reyes	**103-410**	1967-82	Shuford et al. 1989
	W. Central Bay (SFO)	**36**	200-01	Avocet 2002
	S. Humboldt Bay	16	1987-88	Nelson 1989
	SFB open water	13	1988/9	Accurso 1998
	Tomales Bay	**46**	1986-96	Kelly & Tappen 1998
Bufflehead	North Basin	**60**	2004-07	This study
	W. Central Bay (SFO)	63	2000-01	Avocet 2002
	SFB open water	6.6	1988-89	Accurso 1998
	N. SFB salt ponds	38	1988-89	Accurso 1998
	S. Humboldt Bay	287	1987-88	Nelson 1989
	Point Reyes	**26-102**	1967-82	Shuford et al. 1989
	Tomales Bay	**194**	1986-96	Kelly & Tappen 1998
Surf Scoter	North Basin	**33**	2004-07	This study
	SFB	137	1988-89	Accurso 1992
	S. Humboldt Bay	67	1987-88	Nelson 1989
	Point Reyes	**26-102**	1967-1982	Shuford et al. 1989
	Tomales Bay	**239**	1986-96	Kelly & Tappen 1998
	W. Central Bay (SFO)	**5.2**	2000-01	Avocet 2002

These comparisons, for all their limitations, illustrate that North Basin provides relatively high-value habitat for Ruddy Duck. Scaup (both species pooled) and Bufflehead occur in similar densities to other proximate San Francisco Bay waters, and Surf Scoter occurs in somewhat lower densities than SFB as a whole.

General Comments on locally abundant species.

Ruddy Duck and two scaup species account for 83.5% of all rafting waterbirds in winter. When Bufflehead and Surf Scoter are included in the totals, these five species together account for 92.9% of all wintering waterbirds.

Ruddy Duck, one of the smallest of the North Amrican diving ducks, uses a variety of open wetlands and is often associated with Bufflehead. More than one-half the Ruddy Ducks in North America winter along the Pacific Coast and the majority of these in California, primarily in SFB and at the Salton Sea (Miles 2000, Brua 2001). Densities observed at North Basin were among the highest reported for Central San Francisco Bay (see Accurso 1992, Miles 2000). Unlike many waterfowl species, Ruddy Duck populations are apparently stable or increasing throughout North America (Brua 2001). The fact that they are not a favored hunting target may account for their population health. Ruddys tend to dive rather than fly to escape danger (disturbance).

Scaup are a favored target species for hunters and are therefore "generally wary of the human form and alert to nearby human activity; increase distances when activities perceived threatening. . . [and] sensitive to disturbance from recreational boating (kayaks, canoes, sailing dinghies, etc.)" (Kessel *et al*. 2002). The population data for U.S. midwinter scaup populations (1955–1999) indicates a significant declining trend ($r^2 = 0.632$; $P < 0.001$). This decline represents a continent-wide loss of 21,400 scaup/yr since 1975 (Kessel *et al*. 2002).

Bufflehead, like Ruddy Duck, is a small diving duck, whose predominant winter habitat is saltwater where it uses "shallow waters in secluded coves, harbors, estuaries . . . [but] avoids open coastlines" (Gaulthier 1993). Buffleheads feed in open, shallow water (ca. < 3 m deep). All prey is captured when diving; it feeds on mollusks and crustaceans. Bufflehead is one of the few species of ducks whose numbers have increased over the last 50 years (Gaulthier 1993). Our observations indicate that Buffleheads forage actively in North Basin. Ruddy Ducks often occur in mixed flocks with Bufflehead in North Basin.

Surf Scoter is rather heavy-bodied and tends to occur in deeper and rougher, more open waters than the other diving ducks. It occurs in the highest densities (140 birds/100 ha) in Subarea A of North Basin. Apparently the population is experiencing a downward trend in the West. (Savard *et al.* 1998).

Distribution of waterbirds within the North Basin

Differences in waterbird densities among subareas of the North Basin (Figure 3) and between water depth zones (Figure 1) indicate use of all subareas by waterbirds and predominant use of areas greater than 1 m in depth (Table 10)

Table 10. Effects of Area (A), Water Depth (D), and Year (Y) on waterbird densities in the North Basin. Significant main effects of D are followed by "<" or ">" indicating greater density in water depths less than or greater than 1 m, respectively. Significant main effects of A are followed by multiple pairwise comparisons, with Subareas arranged left-to-right, from largest to smallest mean density (Table 6), and horizontal lines above groups of comparisons that did not significantly differ (Tukey procedure, experimentwise $P < 0.05$).

Species	ANOVA[a]	Water depth with highest density	Subarea densities (ranked from left to right)
American Coot	A D AD	<1 m	B C E A D
Clarks Grebe	Y** A** D** AD**	>1 m	A E D B C
Common Goldneye	A*		A E[b] D C B
Double-crested Cormorant	Y** D* AD	>1 m	
Eared Grebe	Y**		
Greater Scaup	Y* D** AD**	>1 m	
Horned Grebe	Y AD** YD		
Lesser Scaup	A AD* YD*		A C B D E
Pied-billed Grebe	Y**		
American Wigeon[c]	(no significant effects)		
Ruddy Duck	Y** D** AD**	>1 m	
Surf Scoter	Y A** D AD**	>1 m	A B[d] D E C
Western Grebe	A D** AD**	>1 m	A E D C B
Bufflehead	D** AD**	>1 m	
Common Loon[e]	A** D**	>1 m [f]	A E D C[g] B
Scaup species	Y** D** AD**	>1 m	
Diving ducks	Y** D AD** YD YAD**	>1 m	
Diving birds	Y** A AD		D C B A E
Dabblers	A		C A B D E
Surface-feeding birds	A		C A B D E
All waterbird species	Y** A AD		D C B A[h] E

[a]Mixed-model ANOVA with Year as random effect; letter indicates *F*-ratio significant at $P < 0.05$, *$P < 0.01$, **$P < 0.001$.
[b]Mean density E>A but not significantly different from other areas because of large variance (Table 6).
[c]Analysis limited to reduced area of occurrence (Areas A-C).
[d]Mean density B>A but not significantly different from other areas because of large variance (Table 6).
[e]Analysis limited to main effects because Common Loons did not occur at water depths < 1 m.
[f]No Common Loons at depths < 1 m (one-sample $t_{254} = 32.7$, $P < 0.001$)
[g]Mean density C<B but not significantly different from other areas because of large variance (Table 6).
[h]Mean density A<E but not significantly different from other areas because of large variance (Table 6).
[h]Mean density A<E but not significantly different from other areas because of large variance (Table 6).

The results (Table 10) led to the following inferences regarding waterbird use within the North Basin.

1) Overall, waterbirds (as a combined group) did not show preferential use of water depths.
2) Based on species-by-species analysis, neither American Coot, Common Goldeneye, Pied-billed Grebe, Eared Grebe, Horned Grebe, Lesser Scaup, nor American Wigeon showed significant preferential use of waterdepth.
3) Eight of 15 species analyzed occurred in significantly greater densities in subareas where water depths were > 1m; none of the species analyzed showed a preference for shallow subareas < 1m.
4) Many species showed variation in use of water depth that was at least partly dependent on choice of subarea. (Feeding activity vs. resting behavior was not distinguished in the data. This suggests that areas may be used for different purposes or that birds may be responding to other influences such as wind exposure or human disturbances.)
5) Twelve of 15 species analyzed, as well all combined species groups, had depth preferences that differed among the subareas where they occurred (i.e., significant "AD" interaction.
6) Common Loon, Common Goldeneye, and Surf Scoter significantly preferred the outer waters of Subarea A over all other subareas.
7) Although Surf Scoter preferred Subarea A, Diving Ducks as a group showed no significant subarea preference.
8) Diving birds in general as a group significantly avoided Subarea E.
9) Most species and species groups significantly avoided Subarea E.
10) American Coot significantly preferred the west side of the Basin.
11) Western Grebe significantly preferred the outer waters (Subarea A) and west side of the Basin (Subareas D and E).
12) Lesser Scaup, Common Loon, Surf Scoter, and Common Goldeneye significantly avoided the west side of the North Basin.
13) Clark's Grebe significantly avoided Subarea C (independently of water depth, even though they prefer deeper water).
14) Subarea C supports significantly more Surface Feeders and Dabblers than Subarea E, and "tended" (this tendency did not cross the threshold of experimentwise significance among multiple comparisons) to support more surface feeders and

dabblers than Subareas A, B, or D. (This is an important point because the "experimentwise error rate of P<0.05" means that there is < 5% random chance that any between-subarea comparisons for a given species would be as great as those observed.)

15) Subarea D supports significantly more Diving Birds than Subarea E, and "tended" (see comment 12 above) to support more diving birds than Subarea A, B, or C.

16) Subarea preferences were not evident for Double-crested Cormorant, Eared Grebe, Horned Grebe, Pied-billed Grebe, Greater Scaup, American Wigeon or Diving Duck species combined.

17) The relative use of count areas and water depths by most species varied significantly among years ("YA, "YD," and "YAD" interactions)

VI. Results of disturbance trials

During disturbance trials performed over three winter periods, we covered 72.8 km of open water and initiated 689 disturbance events (one event every 105.7 meters traveled). Of those, we examined a total of 568 events for the 16 species or species groups for which there was a large enough sample size per species (≥10 events) to determine reliable flush distances (Table 11). Fifty-two percent of the earliest (most distant) flush responses of species were by swimming, 31% by diving, and 16 % by flight.

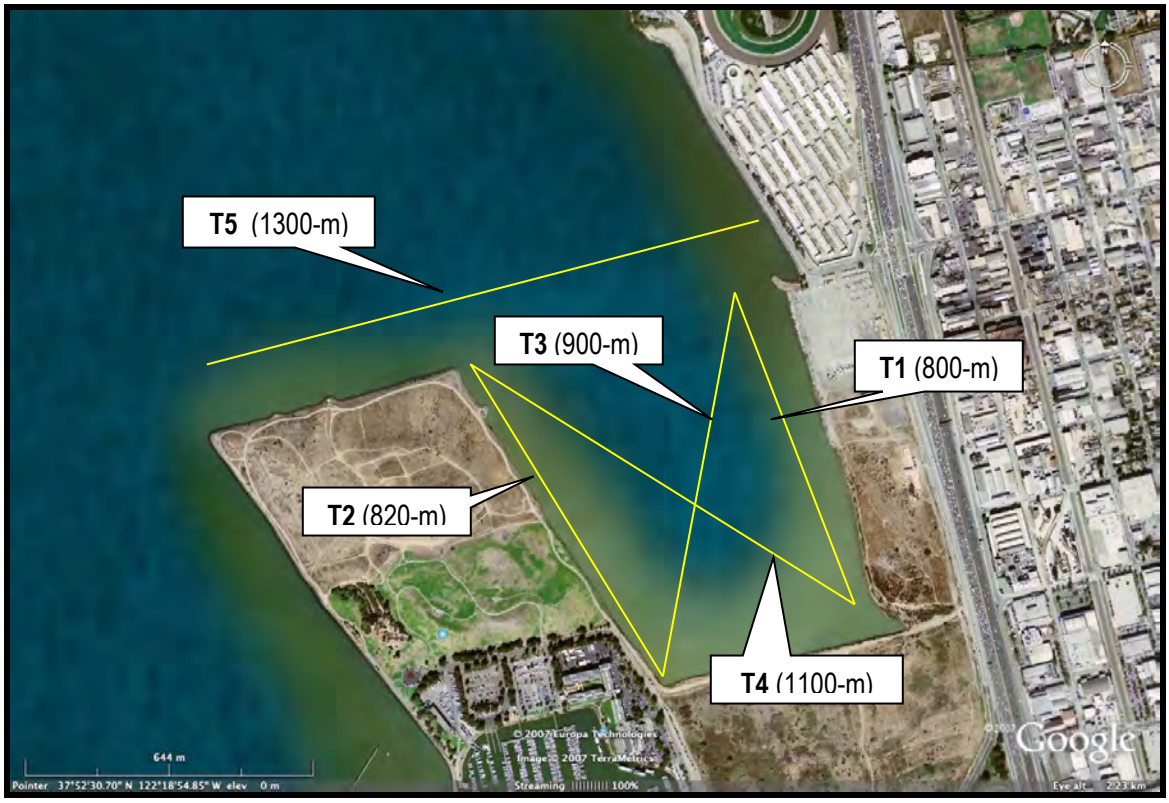

Figure 5. Distribution of the five transects (T1-5) within the North Basin that were traversed by kayak in the disturbance trials. The length (m) of each transect is given in parentheses.

Table 11. Mean and standard deviation (SD) of ln-transformed disturbance response distances, back-transformed mean response distance, and recommended distances (m) to avoid disturbance of waterbird, based on species behavioral responses to 1 or 2 approaching kayaks.

Species	n	Mean[a]	SD[a]	Mean response distance (m)[b]	Flock size[c]	Recommended distance (m)[d]
American Coot	28	3.18	0.621	24		107
Bufflehead	51	4.06	0.556	58	1	92
					50	174
Canada Goose	19	3.99	0.602	54		186
Clark's Grebe	23	3.72	0.668	41	1	78
					12	202
Cm. Goldeneye	24	3.62	0.724	37		163
Common Loon	16	3.93	0.756	51		218
Double-crested Cormorant	23	4.11	0.628	61		213
Greater Scaup	31	4.59	0.433	99	1	127
					120	246
Horned Grebe	37	3.17	0.779	24		126
Lesser Scaup	16	3.94	0.699	51	1	86
					8	252
Mallard	19	2.87	0.534	18		83
Red-br. Merganser	13	3.32	1.136	28		219
Ruddy Duck	56	4.10	0.623	60		209
Scaup species	30	4.54	0.549	94	1	141
					100	218
Surf Scoter	37	4.11	0.762	61	1	97
					25[e]	153
Western Grebe	30	3.68	0.649	40		156

[a] Mean and standard deviation of log-transformed data: $y_i = \ln(x_i)$

[b] Back-transformed mean: $\mu\hat{} = \exp(\bar{y})$

[c] If the linear effect of species flock size on disturbance response was significant ($P < 0.05$), the regression equation was used to calculate recommended distance for solitary individuals (Flock size = 1) and maximum observed flock size (Flock size > 1):

Bufflehead: y = 3.81 + 0.017*(Flock size) - 0.0012*(Intraseasonal day)

Clark's Grebe: y = 3.08 + 0.110*(Flock size) + 0.002*(Intraseasonal day)

Greater Scaup: y = 4.16 + 0.007*(Flock size) + 0.002*(Intraseasonal day)

Lesser Scaup: y = 3.17 + 0.194*(Flock size) + 0.001*(Intraseasonal day)

Scaup species: y = 4.16 + 0.004*(Flock size) + 0.003*(Intraseasonal day)

Surf Scoter: y = 3.64 + 0.024*(Flock size) + 0.003*(Intraseasonal day)

[d] Recommended distance = exp ($\mu\hat{}$ + 1.6495 * $\sigma\hat{}$) + 40 m.

[e] Outlier observations for Surf Scoters flocks of 70 and 35 occurred but the remainder of the Surf Scoter flocks observed during trials were less than 25 individuals.

We developed species specific buffer zones based on observed flush distances (Table 11). The recommended distances in Table 11 are likely to underestimate the sensitivity of waterbirds to more than one or two kayaks or to some other types of stimuli. Flock size effects appeared to be linear on a natural-log scale for all species analyzed, but the limited sample sizes suggest that these effects are only roughly estimated and may result in biases that over or underestimate the sensitivity of waterbird species.

VII. Discussion of avian disturbance.

To reduce or minimize human disturbance of wildlife in a public place, some research provides direction. People are more likely to support restrictions if they understand how wildlife will benefit (Shay 1980, Purdy *et al*. 1987, Klein 1993). This brief synopsis of the available evidence on human disturbance to wildlife, and waterbirds in particular, provides a rationale for management decisions.

"Disturbance" describes any interruption in the normal behavior of waterbirds. Normal behaviors primarily involve foraging or roosting, although social interaction and community dynamics may be affected as well. "Flushing" is the most observable response to disturbance and involves moving away or fleeing from the source. In waterbirds, a flushing response includes swimming, diving, or flying and is usually preceded by an alert response (e.g. "head alert"). Subtle behavioral or physiological responses to disturbance are likely to precede flushing and go undetected by observers.

Many studies have demonstrated that birds concentrate where there is the best opportunity to maximize energy gain (Cayford 1993, Davidson & Rothwell 1993). Flushing may reduce the time waterbirds spend feeding or resting and cause them to move to suboptimal feeding or resting areas. Studies have documented displacement of wintering waterfowl to less productive foraging areas (Tuite *et al*. 1983, Knapton et al. 2000) or complete abandonment of foraging habitat under increased levels of disturbance (Tuite *et al*. 1983). Repeated flushing increases energy costs to waterbirds, and may have cumulative effects on migratory energy budget and, ultimately, reproductive success (Ward and Andrews 1993, Galicia and Baldassarre 1997,Cywinski 2004).

Several studies have documented loss of feeding time due to disturbance by motorized watercraft (Kaiser and Fritzell 1984, Kahl 1991, Galicia and Baldasserre 1997). The literature contains fewer studies of disturbance response of waterbirds to

non-motorized watercraft. However, Kaiser and Fritzell (1984) found that a high density of canoeists correlated with reduced use of the river edge by green herons in the Missouri Ozarks. In general, "*Approaches from the water seem to generally disturb birds more than from the land: e.g. in one study Curlews flew from a sail board at 400 m away compared with about 100 m from a walker (Smit & Visser 1993)"* (Rothwell & Davidson 1993). However, that observation was in reference to migrant and/or wintering birds; nesting herons are more sensitive to sources of disturbance from land than from boats-Vos *et al*. 1985.

Human disturbance of various types may reduce species diversity and abundance at both the landscape and regional level (Boyle and Samson 1985, Rodgers and Smith 1997). Increasing human use of natural areas increases incidence of disturbance and tends to disrupt foraging and social behavior of wildlife (Burger 1981, 1986, Klein 1993, Werschkul *et al*. 1976). Mori *et al*. (2001) found that flight distances (between the position of a flush response and the disturbance source) correlated positively with flock size and species diversity, and flight distances tended to be longer for waterfowl species that used open water for foraging than those that used it primarily for resting. Our observations suggest that North Basin is used both for foraging and loafing.

A variety of activities on the open water habitat increase the likelihood of disturbance. Less disturbance is likely to result from one type of recreational activity than from many (see Davidson & Rothwell 1993). Low variation in the type and intensity of watercraft activity, it may allow wintering birds to habituate and thereby reduce the incidence of disturbance.

Various studies have tried to evaluate the biological impacts of habituation. Tolerance of human activity, resulting in habituation, is well-known among birds (Nisbet 2000). In a study of waterbird response to human use of a sanctuary in Florida, Klein *et al*. (1995), found that resident birds were less affected than migrants by humans, and migrants were more affected upon arrival than they were after a subsequent period of exposure. For these reasons we eliminated Mallard, the predominant resident waterfowl at North Basin and an essentially domesticated species, from consideration in our disturbance analysis.

It is difficult to determine or predict when and what level of disturbance will threaten the energy balance in waterbirds, However, even before birds begin to operate on an energy deficit, disturbance behaviors may compromise bird's foraging efficiency or

their avoidance of predation risk. During certain conditions and times of year, waterbirds are close to their energy balance thresholds and are, therefore, more vulnerable to increased energy demands imposed by disturbance.

- During periods of prolonged storm events, foraging is more difficult and the energy demand for thermoregulation tends to be higher.
- Periods of feather molting have high-energy demands, however, most of the most common waterbirds that occur in North Basin molt on their breeding grounds, not in SFB.
- Migration exacts high energy costs and waterbirds must build up their stores of fat in preparation for their long-distance migration from San Francisco Bay to their nesting grounds in the spring. (Indeed, there is evidence that prior to the spring migration birds are feeding at or near their maximum intake (Ens *et al*. 1990)).

Recreational activity tends to be markedly seasonal, as does the occurrence of waterbirds. Fortuitously, these periods phase each other, at least in part. Boating activity is highest when weather is most temperate (April through September). Bird abundance is greatest during the “winter” period (mid-October thru mid-April). October and April, months of heightened migratory activity, are the periods when use of the Basin by recreational watercraft and rafting waterbirds are most likely to conflict.

Rodgers and Schweikert (2003) recommended that buffer zones for mixed species flocks should be based on the largest flush distance or the species most sensitive to human disturbance. However, these authors also point out a danger of unnecessarily alienating boating enthusiasts by proposing buffer zone distances that are too large and biologically unsound.

From a resource management perspective and as a practical matter, it is probably best to use a “one size fits all” approach when designing set-backs (buffer zones) between areas of human activity and areas of high-use by waterbirds. Scaups showed the greatest sensitivity to disturbance and were one of the most abundant waterbird species in the population surveys. If Rodgers and Schweikert’s model was applied to North Basin, a buffer zone of 250 meters from areas of high-use by rafting waterbirds would be a conservative guideline for minimizing the impacts of non-motorized watercraft on rafting waterbirds. However, given the relatively small size of the Basin, and the fact that it is enclosed on three sides, such a conservative approach may not be tenable.

VIII. Conclusions and Recommendations

The San Francisco Bay estuary is arguably the most valuable migratory and wintering habitat for waterbirds on the west coast of North America. San Francisco Bay is included as one of 34 waterfowl habitats of major concern in the North American Waterfowl Management Plan (USFWS 1989) and is the winter home for more than 50 percent of the diving ducks in the Pacific Flyway (Accurso 1992, Takekawa *et al*. 2000). SFB is also included within the Western Hemisphere Wader Reserve Network as a site of international importance because it supports more than a million waders (shorebirds) in migration (Kjelmyr *et al*. 1991, Harrington and Perry 1995).

How does North Basin fit into and contribute to the value of SFB as waterbird habitat? The Basin's primary value is as a loafing and foraging area for several species of diving birds in winter (October through March). The vast majority (95.8%) of these belong to eight species of diving birds: Ruddy Duck, scaup (two species), Bufflehead, Surf Scoter, and three species of grebes (Table 5). We found relatively low use of the site by waders and dabbling ducks.

Based on our abundance surveys and disturbance trials, the following characteristic of the site should provide a basis for management decisions relevant to human access.

1) Subarea E, the northwest quadrant of the North Basin proper, tends to support the lowest numbers of waterbirds (with the exception of Western Grebe).
2) Subarea D, the southwest quadrant of the Basin, is a section with relatively high waterbird use.
3) Most waterbird species occurred in significantly greater densities in areas where water depths were > 1m; only American Coot showed a preference for shallow (<1 m) areas.
4) Use of count areas and water depths by most species varied significantly among years.
5) Diving birds tended to occur in higher numbers in subarea A. All species combined, however, showed the highest numbers, on average, in Subarea D (significantly higher than in Subarea E, but not significantly higher than in Subareas A-C).

The inferences drawn from the analysis of waterbird distributions within the North Basin, coupled with the results of the disturbance trials, lead us to the following guidelines for designing and permitting access to the North Basin by non-motorized watercraft. These parameters will have to be balanced against other considerations when designing access points to the North Basin.

1) A buffer zone of 250 meters from areas of high-use by rafting waterbirds is recommended for avoiding the impacts of non-motorized watercraft on rafting waterbirds.
2) If a boat launch area is designated in North Basin, the northwest corner of the site (Subarea E) with watercraft traffic directed around the Caesar Chavez Park to the west, within 50 meters of the shoreline, would be the best site to minimize disturbance to rafting waterbirds. However, because this shoreline is not under State Park ownership (Cyndy Shafer and Brad Olson, pers comm.), the next most appropriate site would be the northeast corner of Subarea B (Figure 3). To minimize disturbance, watercraft should be directed to paddle due west, cross the Basin, then hug the shoreline of Caesar Chavez Park en route to the open water of SFB. Education could enhance this option; see recommendation #4, below. This location would also serve to route users away from Subarea D, a sector of the site that supported some of the highest numbers of waterbirds in this study.
3) Allowing kayaks or other watercraft to traverse the deeper, open water of North Basin in seasons of high waterbird use (mid-October through mid-April) will increase disturbance incidents and may cause a decrease in the use and value of the site to rafting waterbirds. Disturbance events will be much reduced in the season of low use by rafting waterbirds (mid-April to mid-October). Serendipitously, we expect watercraft use to be much greater in the summer months than in late fall and winter, therefore providing a de facto reduction in level and frequency of disturbance. Furthermore, rafting waterbirds tend to congregate in greater numbers within North Basin during wind and storm events, a weather variable that discourages use of the site by recreational watercraft users. These complementary circumstances will help to minimize disturbance of waterbirds.

4) Seasonal (winter) closures could further reduce impacts. The most effective period for closure would be the season of greatest use, typically mid-October through January. (Numbers start to decline rather dramatically beginning in January—Figure 4). Because intermittent disturbance is likely much more tolerable than constant disturbance, winter weekday closures would be another tool for reducing the frequency of disturbance.
5) Education has been shown to be an effective tool in conservation. People are more likely to support restrictions if they understand how wildlife will benefit (Shay 1980, Purdy *et al*. 1987, Klein 1993). An educational program, either through signage, presentations to boating groups, or a combination of these approaches, could augment seasonal restrictions and provide an opportunity to further reduce the incidence of disturbance.

IX. Postscript: Limitations of the study and caveats

Concurrent surveys of control sites for evaluating waterbird abundances in the North Basin, where the shoreline is dominated by public recreational use, were not within the scope of this study and it is not clear that any adequate control sites exist. Two sites have been suggested, however: (1) Clipper Cove between Yerba Buena and Treasure Islands; and, (2) the basin on Richmond shoreline between the Point San Pablo and the West Contra Costa County Landfill site (J. LaClair, BCDC, pers. comm.). We did conduct concurrent surveys at Seabreeze Cove, immediately south of North Basin, and those data are archived with ARA and State Parks. Analysis of those data was beyond the scope of this study, but it is apparent that Seabreeze Cove supports even higher densities of waterbirds, especially waders, than North Basin (R. Stallcup, pers, comm.).

Because larger birds are less tolerant of human disturbance than smaller birds (Rodgers and Schwikert 2003, Fernandez-Juricic *et al*. 2002), large species like pelicans, cormorants, and herons may already be avoiding the site as a result of current human use levels. Also, individuals of some sensitive species may be avoiding the site because of current levels of human use. If so, underlying habitat values and potential waterbird use might be higher than those observed. We have taken a conservative approach to disturbance statistics in an attempt to compensate for this likelihood.

We have discussed with the respective researchers the methods and results of two other recent (or ongoing) disturbance studies—the San Francisco Bay Trail and the

Albany Flats. Both of those studies measured a wide array of potential shore-based disturbances and environmental factors using stepwise multiple regression to examine the effects of human approach on wader behavior (Trulio and Sokale 2006, Stenzel *et al*. 2003). Neither study found strong correlations between wader disturbance and trail use, possibly because the responses of waterbirds to disturbance may be primarily behavioral, rather than numerical, or because differences in bird use associated with human disturbance may be obscured by substantial underlying variation in waterbird abundance. To avoid confounding factors that may have been encountered in those studies, and to contribute to the economy and efficiency of this study, we elected to employ an experimental approach rather than an observational approach to evaluate disturbance effects based on overall abundance variation. Experimental responses are easily distinguished and measured, and they often lead to stronger inferences than can be generated by observational results.

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Dunphy Park Plan proposed Bocce Court Layouts (using Galilee Harbor revised plan) 1/27/16

This illustrates placement of six bocce courts, four of which are being asked for currently. You can get an idea from the placement of six which four would be preferred for immediate improvement—along the drive or along the new path. Looking towards the future, it would be desirable to plan for future expansion by shaping the contours of this area in the master plan even if we only install only four at this time.
The courts are laid out in parallel to one another in pairs. The median between each of the two in a pair is meant to be only approximately 12" wide—just enough space to mount a light standard—two total for each pair of courts placed ¼ of the way from the ends of each court. There should be sufficient room on the outer edges of the pair for people to stand and watch games in progress. Nearby there should be picnic tables as a necessary and social amenity.

One of the courts nearest the path can be accessible. San Rafael, has such a setup; they have a movable side board at each end of one court that allows handicap access without a barrier.

Advantages of this layout and added courts

- **keeping the bocce courts in south side of the park reduces the cost of relocating them to the north corner of the park.**
- **closer placement of two courts in a pair more effectively uses the space available—you get more courts in the area currently used by bocce.**
- **four courts would double the number of teams playing at any given time.**
- **four courts widens the possibility of teams being able to play more than one game against an opponent on a given day—this is better bocce.**
- **having an accessible court expands the public use to more people other than just being a spectator—it *includes* those with accessibility needs.**
- **the addition of a second restroom nearby also accommodates *all* users of the south end of the park, especially those who need accommodations.**
- **the storage/equipment area in the suggested plan placed at the north end could also be sited by the south end restroom nearer to the bocce courts.**

respectfully submitted

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Dunphy Park Plan proposed Bocce Court Layouts (using Galilee Harbor revised plan) **1/27/16**