Earthquake Safety and Emergency Response (ESER) 2014
Fire Station 35 - The Boathouse
PRESENTATION TO CENTRAL WATERFRONT ADVISORY GROUP - AUGUST 17, 2016

Agenda:

• Project
• Marine Engineering
• Context
• Precedents
Project: AERIAL PHOTO OF EXISTING SITE
Project: COMPARISON: SHADOW STUDY ON BAY: EXISTING - TO BE DEMOLISHED - PROPOSED NEW

• Existing Pier/Dock/Parking: 14,820 GSF
• Remaining Pier (After Demo): 7,000 GSF

• Proposed New Pier*: 19,400 GSF
• Existing Pier Remaining: 7,000 GSF
• Total Shadow (Remaining + New): 26,400 GSF

* includes:
Barge or Pier = 14,400 sf; Ramp = 2,000 sf; Float (200’x15’) = 3,000 sf
for total shadow of all three NEW components on the Bay
EXISTING FACILITY (Historic and Shed)  6,100 gsf

Dormitory (inadequate)
Kitchen
Dining/Day Room
Lockers/Showers/Toilets (single sex)
Fitness
Storage
Workshop

NEW PROPOSED FACILITY    18,305 gsf

Existing Program (Resized to correct Code and Program Requirements)  8,890 sf
- Dormitory (adequately sized)
- Officers’ Quarters
- Kitchen
- Dining Room
- Lockers/Showers/Toilets (separate genders)
- Day Room
- Fitness + Study Rooms
- Storage
- Circulation and Gross Factor to accommodate walls, structure, and mechanical

Existing Offsite Program   1,975 sf
- Jet Skis
- Rescue Boats
- Port Response Vehicles
- Oil Containment Room
- Fire Fighting Hose
- Fire Fighting Foam
- Scuba/Tank Filling
- Specialty Gear/Rescue Gear Storage

Fire Department Program Requirements   7,440 sf
- Fireboat Working Area
- Ambulance Access out of Public Viewing
- Patient area
- Cranes To Raise/Lower Small Watercraft
- Proper Waste Separation
- Proper Decontamination
- Marine EOC
- Wet suit + life jacket storage
- Workshop / Boson’s Room / Hotwork room
- Extractor / Dryer Room
- Decontamination Room
- Safe Fuel Storage
- Public Accessable Toilet
- Elevator + Stairs (Proper Handicap Access and Exiting)
- Circulation and Gross Factor to accommodate walls, structure, and mechanical
Existing Station No. 35 Capacity

Assets
- Two Fire Boats
- One Fire Engine
- 7 SFFD staff “24/7”

Liabilities
- Structurally Unstable Berthing Areas
- No Oil Spill Equipment or Jet Skis
- Limited Storage Areas
- Limited Rescue Unloading Areas
- No Changing Facilities for Women
Proposed New Station Capacity

Assets
- Two Fire Boats
- One Engine
- 12 Staff “24/7”
- Jet Skills & Small Rescue Boats

Enhancements
- Structurally stable building & berthing areas for three fire boats
- Organized storage areas for Fire Safety Equipment e.g. Oil Spill Equipment
- Ambulatory Access
- Equipment for boat access & loading & unloading
- Changing facilities for Women
Table 2-2 Vessel specifications for fire boats at Pier 22.5

<table>
<thead>
<tr>
<th>Name</th>
<th>Guardian</th>
<th>Phoenix</th>
<th>&quot;New Fireboat&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Builder</td>
<td>Yarrows, Ltd., Esquimalt, British Columbia</td>
<td>Hugh F. Munroe of Plant Shipyard, Alameda, CA</td>
<td>Vigor Industrial, Seattle WA</td>
</tr>
<tr>
<td>Year</td>
<td>1951</td>
<td>1955</td>
<td>2016</td>
</tr>
<tr>
<td>Type of vessel</td>
<td>Fireboat</td>
<td>Fireboat</td>
<td>Fireboat</td>
</tr>
<tr>
<td>Displacement</td>
<td>185 long tons</td>
<td>146 tons</td>
<td>260 long tons (300 GRT ITC)</td>
</tr>
<tr>
<td>Length overall (LOA)</td>
<td>88 ft.</td>
<td>89 ft.</td>
<td>88 ft.</td>
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</table>
PIER OPTION

+15.50' New Pier
+4.6' Higher than Current Pier

+14.20' Projected 2070 MHHW (50 yrs)
+3.0' Wave Action & 3.5' 100-Yr Flood

+12.72' Current MHHW
+3.0' Wave Action & 3.5' 100-Yr Flood

+10.90' Current Top of Pier

+7.22' Projected 2070 MHHW (50 yrs)

+BARGE OPTION

+14.30' Projected 2070 MHHW (50 yrs)
+3.0' Wave Action & 3.5' 100-Yr Flood

+12.72' Current MHHW
+3.0' Wave Action & 3.5' 100-Yr Flood

+10.90' Current Top of Pier

+7.77' Projected 2070 MHHW (50 yrs)

+6.22' Current 2015 MHHW

Context: SEA LEVEL RISE
Steel Barge

Steel Barge with Guide Piles and Ramp

Steel Barge with Deck Slab

Marine Engineering: COWI PROPOSAL: STEEL BARGE
Marine Engineering: EXAMPLES OF FLOATING PIERS (BY OTHERS)

**Comfort Criteria** (by COWI)

<table>
<thead>
<tr>
<th>Movement</th>
<th>Comfort criteria, RMS value</th>
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</thead>
<tbody>
<tr>
<td>Roll</td>
<td>2°</td>
</tr>
<tr>
<td>Vertical acceleration</td>
<td>0.02 g or 0.66 ft/s²</td>
</tr>
<tr>
<td>Lateral acceleration</td>
<td>0.03 g or 0.98 ft/s²</td>
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</tbody>
</table>

- Limit of comfort values for roll, vertical and horizontal accelerations in cruise liners (Faltinsen, 1990).
- Criteria to be satisfied under operational conditions.
- During episodes of extreme weather conditions (design conditions), some people will feel uncomfortable.

Vernon C. Bain Prison Barge (New York, NY)

Built in New Orleans along the Mississippi River brought to New York in 1992. The 625 ft x 125 ft steel barge is equipped with 14 dormitories and 100 cells for inmates.

Brooke St Pier Ferry Terminal (Tasmania, Australia)

Concrete Barge, Ferry Berth, Market and Restaurants. Completed 2015.

Floating Steel Cofferdam

SR 520, Seattle 44 ft x 36 ft tall.

Gildersleeve School (Ketchikan, Alaska)

The Gildersleeve School in Ketchikan, Alaska was constructed on a 68 ft x 80 ft reinforced concrete barge. The school building has two levels with an apartment on 2nd level.

Barge 225 Floating Offices (Cleveland, OH)

150 ft x 45 ft Steel barge was converted to a restaurant and then in 2013 to an office space.

Brook St. Pier Ferry Terminal (Australia)

Concrete Barge, Ferry Berth, mark and Restaurants.
### Marine Engineering: BUDGET and PROS + CONS OF COWI’S DIFFERENT PIER OPTIONS

<table>
<thead>
<tr>
<th>Type of Pier</th>
<th>Pros</th>
<th>Cons</th>
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<tbody>
<tr>
<td><strong>FIXED PIER</strong></td>
<td></td>
<td></td>
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<tr>
<td>Pier Construction  = $6.4 M</td>
<td>Build on site</td>
<td>Building roof will be higher for Planning review</td>
</tr>
<tr>
<td>Total Site and Building  = $14 M</td>
<td>More contractor participation due to conventional construction</td>
<td>Pier and building will be subjected to high seismic loading</td>
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<tr>
<td>Total Construction Cost  = $23.3 M</td>
<td>No dredging and sheet pile required</td>
<td>Need to place pier higher than sea level rise prediction</td>
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<tr>
<td><strong>TOTAL PROJECT COST</strong> = $36.7 M</td>
<td>Residents in the building not subject to motion,</td>
<td>Steel piles and beams require corrosion protection and inspection for life of pier</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Require impact pile driving. Environmental issue, limited work window.</td>
</tr>
<tr>
<td><strong>FLOATING STEEL PIER</strong></td>
<td>Building roof will be lower for planning review</td>
<td>Limited contractors could do the project</td>
</tr>
<tr>
<td>Pier Construction  = $6.3 M</td>
<td>No dredging and sheet pile required</td>
<td>Need special treatment coating and sacrificial steel for corrosion protection for life of the project</td>
</tr>
<tr>
<td>Total Site and Building  = $14 M</td>
<td>Adaptable to sea level rise</td>
<td>Residents in the building will be subject to motion of the pier</td>
</tr>
<tr>
<td>Total Construction Cost  = $23.1 M</td>
<td>Limited impact from Seismic activity</td>
<td>Utilities to the shore will need flexible joints</td>
</tr>
<tr>
<td><strong>TOTAL PROJECT COST</strong> = $36.6 M</td>
<td>Less environmental impact, fewer piles to drive.</td>
<td>Access ramp will need to adjust per tides</td>
</tr>
<tr>
<td></td>
<td>Separate boarding float may not be required</td>
<td>Require periodic dive inspection</td>
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<tr>
<td></td>
<td></td>
<td>Limited locations in Bay area where it can be built. Need to be transported to site.</td>
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<tr>
<td><strong>FLOATING CONCRETE PIER</strong></td>
<td>Building roof will be lower for planning review</td>
<td>Limited contractors could do the project</td>
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<tr>
<td>Pier Construction  = $8.6 M</td>
<td>More durable against corrosion and deterioration</td>
<td>Need epoxy coated rebar for corrosion protection for life of the project</td>
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<tr>
<td>Total Site and Building  = $16.3 M</td>
<td>Adaptable to sea level rise</td>
<td>Residents in the building will be subject to motion of the pier, less than steel floating pier.</td>
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<tr>
<td>Total Construction Cost  = $27 M</td>
<td>Limited impact from Seismic activity</td>
<td>Utilities to the shore will need flexible joints</td>
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<tr>
<td><strong>TOTAL PROJECT COST</strong> = $42.4 M</td>
<td>Less environmental impact, fewer piles to drive.</td>
<td>Access ramp will need to adjust per tides</td>
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<td>Separate boarding float may not be required</td>
<td>Require dredging and sheet pile</td>
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<tr>
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<td>Limited locations in Bay area where it can be built. Need to be transported to site.</td>
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Context: COMPARISON OF CONTEXT - SIDE VIEWS FOR LENGTH AND HEIGHT

Pier 26 - Adjacent Pier

Pier 28

Pier 15 - Exploratorium

Pier 27 - Cruise Ship Terminal

Pier 22.5 - Fire Station 35
ESER 2014 Bond - Fire Station No. 35 (Pier 22½)
Project Schedule

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Prepared by San Francisco Public Works, Project Management
August 17, 2016